REGIONAL PLANNING IN TRANSITION

Policy narratives at the intersection of regional planning and sustainable infrastructure transitions

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ABSTRACT

Regions and cities are sites of infrastructural intensity and agglomeration presenting both challenges and opportunities for sustainability. Infrastructure and transport decisions and commitments are aligned to spatial and sustainable development through regional level policy and planning for allocating economic, social, and physical resources. Many infrastructure systems are locked into unsustainable paths, resulting in policy, land use and infrastructure relationships that are path dependent and mutually reinforcing. This thesis examines how policy narratives that have developed over time have informed the regional planning approach to sustainable socio-technical transitions in infrastructure systems, particularly transport. The role of regional planning in sustainable transitions is partly enacted through policy narratives, which are constitutive of relationships between regional, infrastructure and transport planning and sustainable transitions within a strategic policy mix. An explanatory case study of regional planning in South East Queensland, Australia examines how regional planning and policy narratives comprise relations with infrastructure system transitions. Key policy narratives and sub-narratives are derived through analysis of policy and planning. These narratives were analysed and discussed through an application of the Multi-Level Perspective, a sustainable transitions framework for analysing co-evolutionary interactions in socio-technical systems. The research finds that regional planning narratives reveal infrastructure systems and their relation to their regional and urban context are reconfigured amid tensions, resistance and trade-offs that inhibit and displace innovation and transition pathways. In its current traditional form, planning is bound to highly institutionalised and normative conditions that resist innovative, co-evolutionary and transformative change in directing to sustainable regional transitions and futures.

Keywords: Sustainable transitions, infrastructure systems, regional planning, socio-technical systems, policy narratives, multi-level perspective

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Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature

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I pay my respects to the First Nations people as the traditional owners of the land on which I live, study and work. I recognise their sovereignty was never ceded.

When I enrolled in my PhD in 2015, I anticipated achieving this in three years. Those aspirations did not eventuate, and five years later, I am finally able to submit this work. No sooner had I enrolled in this endeavour than parental care needs became apparent and urgent. As post-war migrants, my parents' lives were ruptured by the horror of war and they were denied the most basic education. Their desire for a better life, their work ethic and their sacrifices imprint on their family in diverse ways. In 1985 I was the first of their children to attain a higher education qualification, and in 2020 I am the first to complete a PhD. These are modest intergenerational gains that have arisen from their heroic steps on a broken path. Even in middle age, these firsts are felt with great appreciation and I take this opportunity to share my gratitude to and respect for my parents whose pathways brought us here. This research was also partially financially supported through the Australian Government Research Training Program Scholarship.

With the PhD in completion, in a field that has seemingly grown exponentially since 2015, I am ever grateful to those who have been so generous, understanding, patient and caring during this long and difficult time: the PhD was relatively straightforward compared to the emotional turmoil of caring for a parent with dementia. In particular, my supervisory team, Principal Supervisor, Dr Severine Mayere, and, Associate Supervisor, Dr Deanna Grant-Smith: thank you for your open and inquiring minds, thank you for your generous advice and conversations, thank you for new and challenging opportunities, thank you for your friendship and so much more. Dr Robyn Keast is acknowledged as my initial Associate Supervisor whose early contributions have informed and shaped this work. I am grateful for unexpected support from a handful of colleagues and friends whose regular queries, advice and proddings about my progress and welfare enfolded me in the QUT community. I also thank all those who agreed to be interviewed for this research. I appreciate your time, honesty, reflection and openness in those lengthy interviews which grounded this research in the living experience and political realities of planning and policy. By my reckoning, the accumulated planning and policy experience of interviewees exceeds 500 years!

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These acknowledgements were initially written in early 2020 when swathes of this country were being devoured and destroyed by bushfires of unprecedented ferocity and magnitude, with governments unable (or unwilling) to respond at the scale required. Our cities are airless, our national parks are destitute, our wildlife is decimated, our people are displaced, lives have been lost, our infrastructures are in ruins, our landscapes are scarred, our local economies are seared, and our towns lie in cinders. We can never forget these terrible months of ravaging fires and inept politics. It is my hope that this work makes some contribution in response to our shared sustainability challenges in a life-affirming, future-shaping and humanitarian way.

GLOSSARY AND ABBREVIATIONS

BCC	Brisbane City Council
Brisbane Metro	Brisbane Metro will develop a 21 kilometre corridor that connects 18 stations along rapid transit busways.
Cross River Rail	A second cross river rail link has been planned for Brisbane for over a decade to address rail capacity issues in the SEQ region. Cross River Rail is a new 10.2 kilometre rail line between inner city stations. It includes 5.9 kilometres of tunnels under the Brisbane River and CBD and is projected to have network and regionwide benefits.
EDQ	Economic Development Queensland is a State Government statutory authority set up under the Newman Government. It undertakes land use planning and property development with emphasis on economic development, infrastructure development and priority development areas.
ESD	Ecological Sustainable Development
GHG	Greenhouse Gas/Gases (such as carbon and methane)
Gold Coast Light Rail	Also known as G:Link. This light rail system is being built in multiple stages to serve the Gold Coast with a rapid transit solution. Stages 1 and 2 are complete. The final stage is due to commence construction.
IRTP	Integrated Regional Transport Plan
MLP	Multi-Level Perspective is a sustainable transitions framework for examining socio-technical transitions and innovation through the interaction of three levels: landscape, regime and niche.
PDA	Priority Development Areas are land holdings that the State Government declares as having potential to deliver economic and community benefits. Some, not all, PDAs are overseen by EDQ.
SEQ	South East Queensland is a region in the state of Queensland comprised of 12 Local Government areas: Brisbane, Gold Coast, Logan City, Redland City, Scenic Rim, Ipswich, Lockyer Valley, Toowoomba (urban extent), Somerset, Noosa, Sunshine Coast and Moreton Bay.

SEQRP	South East Queensland Regional Plan is a statutory plan introduced in 2005 and revised in 2009. The plans have a 21-year planning horizon. The third regional plan, released in 2017, is called *ShapingSEQ* has a 50-year planning horizon to 2067.
STRN	Sustainable Transitions Research Network
TMR	Department of Transport and Main Roads (State Government)
TransLink	TransLink is a division of the Department of Transport and Main Roads with varied responsibilities in Queensland regions for bus, rail, ferries, trams, active transport, demand responsive transit, long distance rail, coach, air and bus travel, and taxi regulation.
ULDA	Urban Land Development Authority was a State Government statutory authority established by the Bligh Government with a remit for land use planning, affordable housing and property development in declared Urban Development Areas. It was disbanded by the Newman Government and replaced by EDQ.

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Chapter One

INTRODUCTION

Australian regions experience critical and complex sustainability pressures, such as population growth, infrastructure failure, natural disasters and climate change, which have implications for their infrastructure systems. As human settlements are sites of infrastructural intensity and agglomeration, they present both challenges and opportunities for sustainable development and addressing climate change. Infrastructures and systems not only provide utility and services, they also influence social dynamics and practices. In many cities and regions, the strategic, sustainability and spatial directions of infrastructure systems is established in regional and metropolitan plans. Sustainable transitions, as a discipline focussing on the sustainability of socio-technical systems, examines prospects for changing infrastructure systems, inclusive of institutional, social and technological interdependencies, to redirect towards sustainable pathways and futures. Planning at all spatial scales and levels of government aims to play a critical role in steering and coordinating the policy response to such pressures through management of regional resources and development. In the state of Queensland, regional plans are strategic and spatial policies for decision-making to meet medium to long-term goals including the development of infrastructure systems.

Regional planning crosses multiple governmental and policy arenas to address challenges such as spatial restructuring, population growth, regional competitiveness, growth management and infrastructure (Albrechts, 2004; Glasson and Marshall, 2007; Searle and Bunker, 2010; Thompson and Maginn, 2012). In Queensland, the Beattie government (Labor, 1998 - 2007) introduced statutory regional planning for SEQ in 2005, with the *SEQRP2005-2026*, as a framework for growth management (England, 2010; England and McInerney, 2019) and infrastructure development. In the State's reformed planning legislation – *Integrated Planning Act 1999*, *Sustainable Planning Act 2009* and *Planning Act 2016* – regional planning is grounded in ESD principles and sets a vision and framework for sustainable regional development in the medium term (England and McInerney, 2019). Focussing on the most populous SEQ region, three iterations of *SEQRP*, together with state and regional infrastructure and transport plans, form a policy mix shaping development and settlement in the region. As SEQ was experiencing significant population growth in the 1980s to 2000s, local and state governments recognised the multifaceted role of infrastructure in regions, particularly as a contributor to economic growth, job creation, competitiveness and liveability, as well as significant underinvestment in the state's

infrastructure systems and networks (Productivity Commission, 2014; Queensland Government, 2009a).

This thesis presents an explanatory case study of SEQ's regional planning, through which a policy mix has developed since 2005, to examine the interface of regional planning and infrastructure transition. Sustainable socio-technical transitions are long-term processes of socio-technical transformation predicated on radical structural, societal and systemic change that is fundamentally sustainable and co-evolutionary and through which social and technological dynamics are significantly altered (Grin et al., 2010; Kemp & Van Lente, 2011; Loorbach & Shiroyama, 2016; Markard, Raven, & Truffer, 2012). Such radical change is seen as a necessary to address the scale and complexity of problems, ranging from social inequality to climate change. In Queensland, regional planning is a core element of the planning and policy system and establishes vision and priorities for the state's regions over a 25-to-50-year timeframe. In SEQ, statutory regional plans triggered or responded to subsequent policy and planning for infrastructure and transport resulting in an evolving strategic policy mix shaping regional development. The release of the *Queensland Climate Transition Strategy* in 2017, which targets planning, infrastructure and transport policy as domains for transition, indicates a changing policy mix.

Regional and urban planning is critiqued as imposing rationality and power that is government led, top down and linear; this form of traditional planning, practiced worldwide, is criticised as static, functional, reactive and hierarchical (de Roo, 2007; Flyvbjerg, 2003; Hillier, 2007; Voß & Kemp, 2005). It is also critiqued as inhibiting the type of change in socio-technical systems - as comprised of social and technological relations and dynamics - or societal systems required to address mounting ecological, social and economic pressures. Such complex challenges are also signalling a crisis in planning and a search for renewal of planning (Kunzmann, 2016; Ponzini, 2016). Globally, this has prompted a search for new tools and methods to enhance planning practice and policy development, often involving more collaborative and relational approaches based on democratic, system innovation and deliberative processes that are aligned to sustainable development (Healey 2007a; Healey 1997; Grin, Rotmans, and Schot 2010). Sustainability and sustainable development have reframed planning practice, processes and outcomes and encouraged the development of new tools and theories to address long-term change. Sustainability-related socio-technical or systems innovation is addressed by a growing body of sustainable transitions theory and research that acknowledges the socio-ecological impact of large-scale systems such as transport, energy, water and waste. The sustainable transitions field recognises that without

significant and accelerated sustainable transition, options for sustainable development and futures are hampered (Schot & Kanger 2018).

As urban and infrastructure system transitions are essential for action on climate change as well as for social equality, ecological sustainability and economic prosperity, examination of the role of planning in the policy process can contribute to these large-scale processes of change. The Intergovernmental Panel on Climate Change (2018, p. 18) states that urban and infrastructure system transitions progressing inherently sustainable conditions face many obstacles in highly contingent conditions: "[e]conomic, institutional and socio-cultural barriers may inhibit these urban and infrastructure system transitions, depending on national, regional and local circumstances, capabilities and the availability of capital". International frameworks of which Australia is a signatory, such as the Sustainable Development Goals (SDGs) (United Nations General Assembly, 2015) and New Urban Agenda (UN-Habitat, 2017), stress the need for sustainable transition in cities and regions including rapid GHG emissions reduction. The Paris Agreement (United Nations, 2015) proposes limiting temperature increase to 1.5°C and acknowledges a strong risk of missing this target:

> Central to this Agreement is the aim of keeping a global temperature rise this century well below 2°C above preindustrial levels and to pursue efforts to limit the temperature increase to 1.5°C. The 1.5°C limit is an acknowledgement from nations that our climate is changing more rapidly and with greater and more damaging impacts than previously thought. This means emissions will have to be reduced more deeply and more rapidly (Steffen, Rice, Hughes, and Dean, 2018, p. 3)

Infrastructure planning in Queensland occurs at state and regional scales as primarily a responsibility of State Government yet involves all levels of government. As no constitutional or statutory regional governments exist in Australia, regional planning is multi-scalar and refers to local, state, national and global interests and networks. Planning and policy play a role in affirming development and socio-technical systems pathways which constrain infrastructure and other socio-technological systems within regions and cities (Bunker, 2012; Troy, 1999). Sustainable transitions analysis of current regional planning can inform the approach to socio-technical transitions and system innovation.

1.2 Research Problem

The regional conditions linking sustainability, society and infrastructure – as socio-technical systems – warrant examination as integral to the sustainable development of places. Planning

is a strategic policy response to sustainability challenges (Gleeson, 2003, 2012; Meadowcroft, 2000) aiming for spatial and infrastructural sustainability. The research problem pivots on the planning relationship and response to sustainable transitions to better understand transition dynamics and the role planning plays in infrastructure transitions and as part of socio-technical systems. For example, transport is a socio-technical system comprised of and reproduced by a range of institutional, cultural and market relations including planning and policy (exemplified in Figure 1). Regional plans are strategic and high-level policies for providing direction and guiding decisions across levels of government, stakeholder interests, infrastructure systems and geographic scales (Counsell and Haughton, 2003; Searle and Bunker, 2010). Planning is one component of policy systems and mixes envisioning socio-technological system development (Hodson and Marvin, 2010). In the sustainable transitions context, planning navigates a tension between system configuration and spatial configuration:

> Spatial configuration is primarily concerned with constructing spatially or contextually embedded priorities for change. These configurations can develop contingent priorities but the responses may be consistent with the low carbon transition, or they can potentially develop competing imaginaries of transition. System configuration is primarily concerned with the purposive vision of low carbon transitions and with ensuring that the public complies in playing their role as a delivery mechanism by adopting the new roles assigned to users (Hodson, Marvin, & Späth, 2016, p. 474).

In examining the interrelationship between infrastructure systems, socio-technological systems and infrastructure, Frantzeskaki and Loorbach (2010) define an infrastructure system, or infrasystem, as a type of socio-technological system and large technical system. Infrastructure systems are comprised of combined hardware and software, including material, institutional and social elements and relations. The hardware or material elements of the system are understood as infrastructure. As socio-technical systems, infrastructure systems are agglomerations of artefacts, cultural, social, technological and organisational infrastructures, investments, regulations and processes. Transitions occur through incremental and multi-dimensional momentum, including learning, experiment and system innovations, towards whole-of-system evolution and can be comprised of changes in technology, changes in society and changes in the interactions between them. (Geels, 2004a; Kemp and Loorbach, 2005; Smith et al., 2005). Infrastructure systems are shaped by their spatial context in complex webs of meaning, socio-technical relations and power. They are both large technical systems (Kaijser, 2005), due to their size and complexity, and socio-

technological systems that are woven into human lives, settlements and societies (Guy et al., 2012; McFarlane and Rutherford, 2008; Markard, 2011).

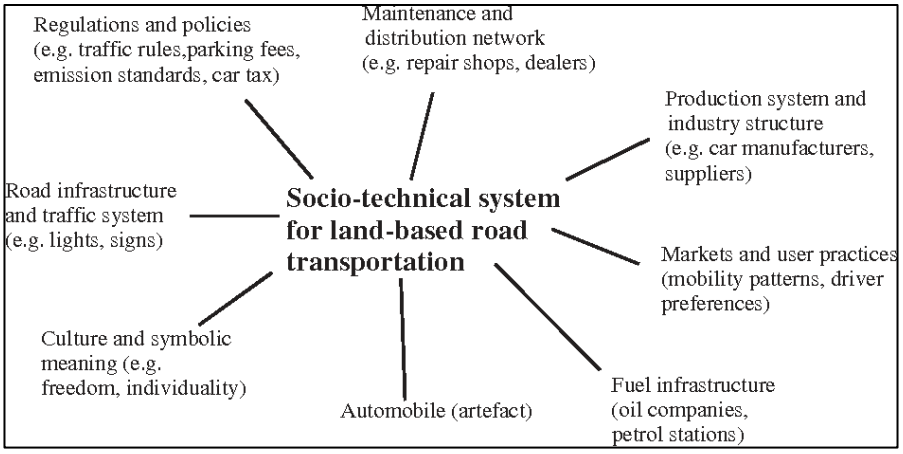


Figure 1: *Land-based road transportation as socio-technical system*
Source: Geels, 2005

Urban and regional development patterns have historically co-evolved with infrastructure development (Dodson, 2009; Monstadt, 2009). Urban and regional infrastructure systems enable settlements to function and are comprised of resource, technological and social flows (Hodson et al., 2012). Population centres, particularly cities, are sites of infrastructural intensity, assemblage and access, in which sustainability can be undermined by poorly integrated, path dependent or locked in, and resource intensive infrastructure systems (Moss et al., 2001; Low et al., 2005). As existing infrastructures represent significant investments and are long-lived, decision-making can favour optimisation or modernisation rather than transition (Monstadt, 2009; Maassen, 2012; Moss et al., 2001).

Due to population increase, anticipating growth from two million to 5.3 million people by 2041, SEQ faces transition and adaptive challenges in infrastructure, industry, demography and land use (Department of Infrastructure Local Government and Planning, 2017; Queensland Government, 2009a, 2009b). Infrastructure is both costly and enduring. It is used as a form of spatial intervention intended to address urban or regional solutions across diverse domains such as productivity and employment. Institutionalised planning processes can experience lag or inertia, and play an institutionalising role in spatial and socio-technical system configurations. Such institutions and institutional dynamics are also constitutive of socio-technical systems. The co-evolution of technology, society, and the relationships between them shapes socio-technical transitions pathways (Geels, 2005).

The intersection of the policy arenas of planning, infrastructure and transition has evolutionary implications and refers to how past conditions and decisions impact development trajectories including ossification of decision and policy making pathways (North, 1990). This colours how planning addresses socio-technical systems and is integral to the research problem. Path dependence and lock-in refer to inertia in systems that can prevent or resist adaptation and innovation, particularly system dynamics that can reinforce unsustainable socio-spatial development trajectories, such as policy processes and agendas, private vehicle and fossil fuel reliance (Frantzeskaki and Loorbach, 2010; Ulli-Beer, 2013). In relation to transport, automobility lock-in is evident in infrastructure typologies such as highways and carparking and pro-automobile policies and regulation. Planning can also experience path dependence which inhibits the pursuit of policy and development alternatives addressing sustainable development and socio-technical change (Bunker, 2012; Low and Astle, 2009). The capacity of planning for learning inflects in transition pathways. Regional and spatial responses to reshaping and unlocking unsustainable development pathways are integral to sustainable transitions. A focus on regional planning crosses the broadening scope of transitions processes and research: from socio-technical systems (infrastructure and industrial systems) to societal systems (regions and cities) to reflexive governance (sustainable development; transitions management) (Avelino, 2011).

A focus on regional planning acknowledges that it tends to be a government-led policy process affirming sustainable development, ecological protection, settlement pattern and growth management, and infrastructure coordination; these principles and processes intersect with sustainable transitions (Albrechts, 2012; Davidson and Arman, 2014; Searle and Bunker, 2010). Recent critiques of regional planning recognise its tendencies for linearity and lack of socio-technical systems perspective which can result in barriers to significant sustainable structural and systemic change (Bunker, 2012; Grin, Rotmans, and Schot, 2010a; Low and Astle, 2009). Propositions for renewed roles and aspirations for planning also emerge from research (Albrechts, 2008; Gleeson, 2012), implying learning and exploration in response to changing conditions rather than perpetuation of reactive and precautionary planning cultures (Birkeland, 2008; Malekpour et al., 2015). Such reflections on planning can provoke examination of the adequacy of planning to address the scale and magnitude of change and complexity in cities and regions.

Infrastructure systems are sites of political and policy contestation and convergence for both planning and sustainable transitions (McFarlane and Rutherford, 2008). Urban and regional planning are embedded in the governance and policy systems that can reproduce unsustainable development patterns (Cowell and Owens, 2006; Loorbach and Shiroyama,

2016). Both urban and regional planning and sustainable transitions adopt a long-term outlook that is articulated in policy contexts to promote sustainable development. Both address infrastructure systems as large-scale systems that are obdurate and resist change (Hodson et al., 2012; Monstadt, 2009). The introduction of transitions in policy mixes and policy narratives necessitates interrogating how planning and transitions are bridged for sustainable urban and regional futures. Policy narratives, which are examined in this thesis, refer to the stories that are embedded in policy and, like narratives convey plots, characters, morality. As such policy narratives are constructed strategically, granting them causality in relation to political action and belief (Jones, Shanahan, & McBeth, 2014). Examining the interface of sustainable transitions and planning and their convergence on infrastructure can enable greater reflexivity in planning and its role in infrastructure transitions (Grin et al., 2010).

The interface of planning and socio-technical system transition presents disciplinary boundaries to bridge in addressing sustainability as a regional objective. Urban (McCormick et al., 2013; Wittmayer et al., 2015), governance (Hodson et al., 2012; Smith et al., 2005; Tukker and Butter, 2007) and spatial contexts (Coenen et al., 2012; Hansen and Coenen, 2014; Truffer and Coenen, 2012) are a growing focus of sustainable transitions research. The interfaces and boundaries of urban and regional planning and sustainable transitions have not been widely researched and is an emerging theoretical and research focus, particularly in urban systems transition (Bush, Aye, Hes, and Murfitt, 2018; Doyon, 2018; Malekpour et al., 2015; Morrissey, Moloney, and Moore, 2018). Transitions methods offer urban and regional planning approaches and tools for transformative or non-linear change (de Roo et al., 2012).

Where planning tends to affirm stability, spatial management and incremental precautionary change (Birkeland, 2008; Malekpour et al., 2015; Steele and Ruming, 2012), sustainable transitions steers towards windows of opportunity for radical socio-technical alternatives and innovation over time (Loorbach and Shiroyama, 2016). Urban and regional environments are complex and multi-scalar; planning is not only situated within these contexts, it also shapes them (de Roo et al., 2012). This research contributes to this growing field by examining the case of SEQ focusing on the relationship between regional planning and infrastructure system transitions while drawing on sustainable transitions and socio-technical systems theory and frameworks. The SEQRP and SEQ have been extensively researched by planning and regional studies scholars who have examined diverse aspects of regional planning including collaborative and participatory planning (Abbott, 2001; Cameron, Grant-Smith, and Johnson, 2005), climate change adaptation and resilience (Abel et al., 2011; Matthews, 2013), growth management (Bajracharya and Hastings, 2018; Mayere and Dedekorkut-

Howes, 2012) and regulatory reform (Steele and Dodson, 2014). This research applies theory that has not been applied to regional planning and infrastructure in SEQ and introduces sustainable transitions as an analytical framework in planning research.

Despite the stated urgency of sustainability and its expression as a strategic policy goal, Hoogma et al (2002, p. 200) found that it does not drive policy reform and system innovation in isolation. Infrastructure bears significant fiscal and risk implications which translate as long-term commitments to specific spatial and socio-technical regimes. In Western democracies, including Australia, the prevailing planning regime lacks capacity to address and anticipate socio-technical system change, including avoidance of lock-in, sunk investments and maladaptation (Bush et al., 2018; Morrissey et al., 2018; Payo, Becker, Otto, Vervoort, and Kingsborough, 2015). Happaerts (2016) distils four key attributes of sustainable transitions: co-evolutionary dynamics; reflexivity and self-awareness; learning through experiment and innovation; and ongoing open-ended processes of societal innovation. These attributes indicate that sustainable transitions are characterised by nonlinearity, multi-level dynamics, co-evolution, emergence, and variation and selection. This has implications for planning as these attributes emphasise socio-technical systems particularly destabilisation of unsustainable systems. While not alien to planning theory, these four attributes are often not foundational in practice (Happaerts, 2016; Malekpour et al., 2015). Several planning theorists argue that current planning practices are not equipped or empowered for addressing current pressures and complexities due to their linear, hierarchical, incremental and static nature, and that relational approaches are better suited to address these challenges due to their flexibility, particularly participatory and adaptive capacity (Hillier 2007; Davoudi and Strange 2009; Tewdwr-Jones 2012; Albrechts 2012). Policy as usual, which can signal path dependence and power play, can inhibit necessary and radical change (Loorbach, 2010).

Development pathways are negotiated, established, and affirmed through regional planning and regional scale infrastructure planning, and their embedded consultative networks. As a policy process, regional planning involves actors drawn from diverse and networked policy domains and these can be understood as policy networks (Kickert, Klijn, and Koppenjan, 1997). The absence of regional governments in Australia has also enhanced multi-level and multi-scalar dynamics in regional development that encourages the formation of policy networks and the development of hybrid decision-making processes where networked actors are engaged in, and collaborate in, government led and hierarchical policy processes. By examining policy and planning narratives, this research identifies how regional planning influences selection environments, policy learning, and decision-making in relation to

sustainable development paths and socio-technological change over time. Sustainable transitions theorists and researchers warn of the need to expand policy tools due to the prevalence of wicked, persistent and complex problems and system failures, arguing that current policies are insufficient and restructuring is necessary (Grin, Rotmans, and Schot 2010, 108). Sustainable transitions-informed approaches are gaining traction in real world urban and regional policy environments. In the longer term, these methods aim to develop capacity to address fitness, selection, adaptation and transition of infrastructure systems in line with broader regional planning goals.

1.3 Research Overview, Aims, and Objectives

This research aims to examine how policy narratives that have developed over time have informed the regional planning approach to sustainable socio-technical transitions in infrastructure systems, particularly transport. The objectives of the research are to:

- Interpret and analyse policy narratives in regional planning and policy from a transitions perspective through a case study of infrastructure and transport in SEQ
- Examine how regional planning expresses and defines a relationship with socio-technical transitions in multiple iterations of the regional plan and related regional infrastructure planning and policy released from 2005 to 2017

The research question is elaborated in Figure 2 and directs towards inquiry about what is being done with planning and what planning is doing in relation to infrastructure system transition. Sub-questions also guide the inquiry and ensure the research trajectory is well developed as a case study while remaining focused. Bridging the disciplines of urban and regional planning and sustainable transitions, this research is situated as boundary work (Griesemer and Star, 1989). Narratives can be useful boundary objects or boundary concepts that enable blurring, affirming, and bridging disciplinary boundaries to enable exchange (Bevir, 2000; Gieryn, 1983). As disciplines, planning and transitions are not oppositional or antithetical, and both have bearing in the infrastructural, relational, and spatial domain of regional planning. They inform different ways of thinking and acting in policy making. For this research, SEQ regional planning was examined in detail and over time, since the introduction of the regional plan in 2005. This examination applied qualitative methods to collect data about infrastructure and transport policy narratives in the regional planning context. An interpretive policy analysis of policy documents and interviews with key stakeholders and policy makers was undertaken to identify narratives. The narratives act as

boundary objects that facilitate boundary work. A MLP analysis (Geels 2010), a method of analysis emerging from sustainable transitions theory and research, was applied to analyse the narratives and identify transition dynamics.

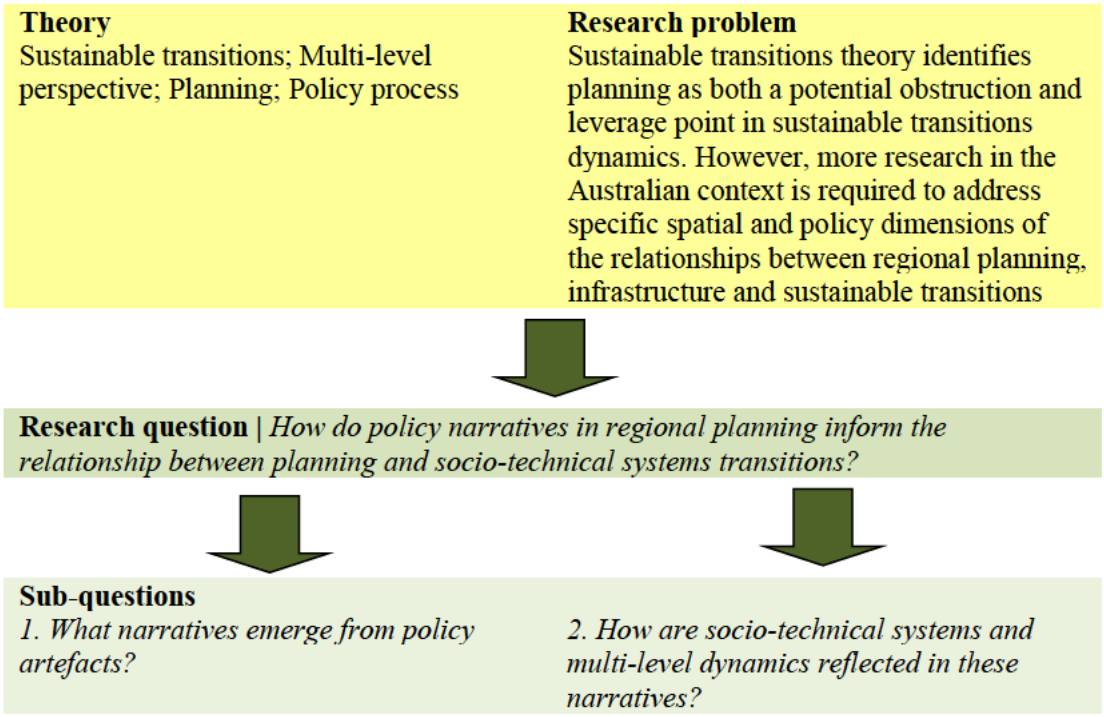


Figure 2. *Research questions*

These research questions underpin the research trajectory. They establish the relationship between socio-technical systems and sustainable transitions theory and research to the regional planning case study through sustainable transitions analytical approaches.

As a rapidly growing field, transitions studies has consolidated its academic presence and legitimacy, including higher education degrees and research centres, a Q1 journal, an annual international conference, early career researcher networks and meetings, and research agendas to develop the field (Köhler et al., 2017; Loorbach, Frantzeskaki, and Avelino, 2017; Horne, Moore, Haan, and Gleeson, 2018). Transition frameworks and theory have been applied to international contexts, such as energy policy in the Netherlands and other socio-technical systems and policy domains in European and Asian cities and regions (Köhler et al., 2017). Australian case studies and sustainable transitions research are growing and networked (Moore, de Haan, Horne, and Gleeson, 2018). The 2019 Congress of the Association of European Schools of Planning (AESOP) presented a focus on Planning for Transition indicating that the interest in cross-disciplinary exchange between sustainable transitions and urban and regional planning is developing (AESOP, 2019). This research contributes to this field of knowledge with insights relevant for planning theory, research,

and practice. Understanding the intersections of sustainable transitions and regional planning is crucial for identifying strategies that can facilitate transition paths and policy learning towards sustainable infrastructure systems in cities and regions. This study is the first study of SEQ that examines the regional planning framework and its relationship to infrastructure and transport from a sustainable transitions perspective. If planning is to be conducive for sustainable infrastructure transitions, examinations of multi-level and spatial dynamics, and conditions are required.

1.4 Structure of the Thesis

This thesis is comprised of eight chapters, including this introduction, to document the research trajectory of this PhD project. Chapters Two and Three comprise the literature review which surveys literature and research across four themes to trace their intersection and confluence in policy. In Chapter Two, sustainable transitions and infrastructure systems literature is examined to trace the development of sustainable transitions as a relatively recent field of research and theory. As the focus of sustainable transitions is socio-technical systems, infrastructure and transport literature and research is also investigated in this section. Chapter Three addresses literature related to the spatial aspects of transition and policy process. This chapter examines geographies of transition as well as planning and policy process theory. Planning theory has assumed complexity-based and post-structural postures and empirical work on policy mix has developed rapidly in the sustainable transitions field in recent years. Concluding comments draw these four threads together to establish a rationale for examining the intersection of regional planning and sustainable transitions through policy narratives.

Because the case study refers to the specific territorial context of SEQ, Chapter Four provides historical and background information about the region, the regional planning process, changing policy mix and political dynamics. This section also establishes the critical juncture or policy window which resulted in the introduction of statutory regional planning in Queensland and the *Queensland Climate Transition Strategy* which delineate the temporal frame of this research.

Chapter Five outlines research methodology and the rationale for the research design. The methodology is grounded in interpretivism. It applies Interpretive Policy Analysis (Yanow, 2000, 2007b) and sustainable transitions analysis (Geels and Kemp, 2012) in the SEQ case study based in qualitative interviews and policy review. The methodology is also designed as

boundary work, where the fields of sustainable transition and regional planning interact, to develop narrative explanation of socio-technical transitions dynamics in the planning context. The research was undertaken in two distinct stages. An interpretive policy analysis is first undertaken through which policy narratives and sub-narratives are identified. As boundary objects, the policy narratives and sub-narratives are examined and discussed through application of the MLP, a sustainable transitions framework or heuristic for analysing socio-technical system dynamics and transition pathways. This approach performs boundary work and boundary bridging by recognising that meaning is fluid and porous, and that the planning context is not an exclusive domain of interpretation and meaning making. That is, the narratives that emerge from policy interpretation present specific implications and challenges for socio-technical systems and transition pathways, especially when examined as part of an evolving and dynamic policy mix.

Chapter Six presents the findings of the policy review and interviews. These are presented as three narratives, each with four sub-narratives, which have emerged from the data collection with reference to specific expressions from interviewees and policy documents. The first narrative provides an account of changing planning at, and since, 2005 when statutory regional planning was introduced. The second narrative, limitations of planning, acknowledges that planning is a constrained and constraining policy domain and process. Such constraints are implicit in the policy documents in that all policies are bounded, and interviewees expound other organisational and political limitations. The third narrative traces the emergence of transitions discourse and opportunities with reference to the development of state climate transition policy and a changing policy mix.

In Chapter Seven, these narratives are analysed and discussed, flexibly applying the MLP framework. This analysis traces the landscape, regime and niche dynamics and implications of the regional planning narratives to explain how infrastructure transitions pathways are developing. The narratives identify the structure of transition dynamics and pathways, in which regime relations take precedence. The MLP enables a more reflexive and phronetic policy narrative interpretation and discussion that enables boundary bridging and through which ancillary questions can emerge.

As the concluding chapter, Chapter Eight distils the response to the research questions as elaborations of the MLP explanation and narratives in relation to the findings. It concludes by framing a transformative challenge for regional planning – and planning more generally – that seeks a reflexive response to sustainable transition. It also identifies areas for further research.

1.5 Conclusion

This research acknowledges that the scale and scope of complex social, ecological and economic problems are not readily countered by existing policy and governance arrangements. Such institutional arrangements are heavily implicated and vested in the perpetuation of these complex problems, despite their dire ramifications for socio-ecological systems. Large-scale infrastructure systems are necessary for cities and regions but are also significant generators of socio-ecological degradation. Attention on the regional scale and regional policies seeks to elaborate the scalar and spatial dimensions of sustainable transitions, and how the regional scale contributes to transition through multi-scalar interactions and interdependencies. The regional, in the Queensland planning context, is dependent on multi-scalar spatial and government relations.

This research traces and interrogates policy narratives that emerge from qualitative and interpretive examination of policy artefacts, including documents and interviews, to identify how regional planning in SEQ conditions socio-technical transitions relations and dynamics. Socio-technical systems refer to the intrinsic social and technological relations of many urban and regional infrastructure systems, many of which are connected to larger national and global infrastructure networks. The research applies methods that first identify policy and planning narratives outlining the relations of region, infrastructure and transport, and then analyses those narratives in terms of what they mean for sustainable socio-technical (infrastructure) systems. The research is positioned as boundary work and proposes that this is necessary for bridging, crossing and acknowledging the boundaries between the disciplines of planning and sustainable transitions. As sustainable transitions are envisioned to occur at regional and urban scales and involve reconfiguration of spatial and system arrangements, it is necessary to examine the policy processes that are already shaping those relations and steering sustainable transition and sustainable development pathways.

As the first of two literature review chapters, the next chapter examines the central concepts of sustainable transitions and infrastructure systems and the relationships between them as foundational to understanding the socio-technical systems context which planning addresses.

Chapter Two

SUSTAINABLE TRANSITIONS AND INFRASTRUCTURE SYSTEMS

Urban and regional planning plays a role in shaping the sustainability and development paths of cities and regions. Planners and planning use infrastructure to intervene on spatial relations. As the pressures of climate change, social inequality, and environmental degradation impact the liveability of places, the ways in which socio-technical systems are planned are integral to sustainable development. The emergence of international agreements in relation to sustainable development, such as the Sustainable Development Goals (United Nations General Assembly, 2015), and climate change action, such as the Paris Agreement (United Nations, 2015), are indicative of a widespread acceptance of the need for change. As signatories to these agreements, nation-states are entreated to commit to sustainable development.

The literature review is presented in two chapters addressing four thematic sections - two per chapter - with the purpose of elaborating the relationship between regional planning and sustainable infrastructure transitions. In this chapter, sustainable transitions and infrastructure systems literatures are examined to trace the understanding of infrastructure systems as socio-technical systems. Sustainable transitions theory and research are examined to reveal how the transitions field relates to sustainability, socio-technical systems and system innovation to shape transition pathways. Infrastructure systems are both socio-technical, being comprised of social and technological relations, and large technical systems, being of significant size and complexity. Because socio-technical regimes tend to rely on dominant technologies and reinforce path dependence, political and policy actors are sensitive to potential disruption and stranded assets (Loorbach et al., 2017). Unruh and Río (Unruh & Río, 2012, p. 231) refer to large locked-in infrastructure systems as “techno-institutional complexes” to reflect their “combination of large technological systems, governing public and commercial institutions and social practices”. Understandings and practices of infrastructure and infrastructure planning are intrinsic to infrastructure system (infrasystem) transitions research and theory. Given the magnitude of infrastructure systems, their significant socio-ecological impacts, and their propensity for path dependence and lock-

in, sustainable transitions research recognises the need to transition them to more sustainable or fundamentally sustainable conditions.

Cities and regions face adaptive challenges as infrastructure systems are dependent on diverse land uses, market dynamics and urban forms which are also difficult to change. Such challenges can fall to regional and urban planning to navigate, often coordinating and linking across diverse and disparate policy priorities in a system of multi-level governance, as is the case in Australia. Infrastructure systems have experienced widespread policy reforms including privatisation, market shocks and deregulation that impact sustainability, planning and delivery. While planning is equipped to address spatial problems, it is not well equipped to address technological system dynamics with a tendency towards 'taken-for-grantedness' in infrastructure planning as an engineered object occupying or intervening in space rather than encompassing a broad range of social, technological, economic, governance and ecological relationships (Rutherford, 2020). Socio-technical systems analysis found planning methods for infrastructure can inhibit infrastructure system transition.

2.1 Sustainable Transitions

Transition theory is an emerging area of research which envelops systems, evolutionary economics, governance, innovation, and complexity theories (Markard, Raven, and Truffer 2012; Geels, Elzen, and Green 2004; Truffer 2008). Sustainable transitions are understood as long-term processes of change involving radical structural, societal, and systemic change for sustainable development. Sustainable transitions occur with both incremental and multi-dimensional momentum involving learning and experiment. System innovations are also a prominent aspect of sustainable transitions as they can trigger whole-of-system changes, not just system improvements and optimisation which are prioritised in urban and regional planning (Smith, Stirling, and Berkhout 2005; Geels 2004a; Kemp and Loorbach 2005). Sustainable transitions are attentive to path development and transition pathways (Kemp and Loorbach, 2005, p. 5). As an evolutionary concept, paths are embedded in transitions, imbuing a processual dynamic and metaphor that in urban and regional contexts must address spatial and scalar perspectives. In addressing sustainable transitions, this section of the literature review examines the relationship between sustainability, sustainable development, and sustainable transitions to clarify the opportunity that transitions approaches address. The relationship between socio-technical systems and transitions, with emphasis on infrastructure systems, is discussed. The relationship between sustainable transitions, regional planning, and transition pathways is examined. System innovation, as a

necessary condition for sustainable transitions is also discussed. The MLP as a framework for analysing socio-technical systems and system innovation is introduced.

2.1.1 Sustainability and Transitions

Sustainable transitions aim to redirect societies, economies and industries to sustainable practices and processes over a long-term trajectory of social and system innovation. Sustainable transitions engage with the social, ecological and economic dimensions of society, including political and technological arenas, as interrelated and interdependent domains. Sustainability is a normative concept that is global in scale and grounded in constructs of intergenerational equity and ecological limits. Rooted in the findings of the Brundtland Commission (WCED, 1987), that advocated for intergenerational equity, and the Club of Rome Report (Meadows, Meadows, Randers, and Behrens III, 1972), that postulated bounded carrying capacity of the planet, sustainable development makes links between environmental management, human and social progress, and economic prosperity (Norman, 2018). While sustainability is difficult to define, considerable critical attention has been directed to the development and application of these founding development principles to extrapolate sustainability frameworks for diverse social actions. As well as intergenerational and intragenerational equity and respect for environmental limits to growth, sustainability principles, which inform sustainable development, include reduction of poverty, public participatory decision-making, and orientation towards environmental considerations in policy making (Baker, 2006; Jordan, 2008).

Sustainability is a "multi-interpretable notion", and efforts to operationalise it as sustainable development are subject to a range of normative, ideological and practical considerations, including risk and uncertainty (Costanza and Cornwell, 1992; Tukker, 2008, p. 14ff). Consequently, the imprecision of sustainability endows it with conceptual and discursive ambivalence, indicating that some practices can be presented as sustainable, transitional and developmental, for example nuclear energy in the UK, when the risks associated with such technologies are not fully understood and can result in maladaptation of socio-technical systems (Shove and Walker, 2007). A similar example is the rise of coal seam gas in Australia, that was introduced as a transitional and lower emissions energy source and is a non-renewable fossil fuel energy source. Australian greenhouse gas emissions are increasing and over-reliance on gas is reducing energy choice (Foster et al., 2013). Sustainability and many related terms, like environment and nature, are critiqued as empty or floating signifiers, including terms like 'low carbon' which is assumed to be interchangeable with sustainable. These can weigh on infrastructure and transitions decision-making and policy by

masking political motives through slippery discourse games intended to de-politicise or obfuscate (Swyngedouw, 2010). For example, a policy and governance focus on carbon emissions reduction is not tantamount to sustainable transition in systems such as transport and energy. Sustainability and sustainable development are not commensurate ideas as sustainable development is a construct of sustainability and a framework for operationalising sustainability. Both concepts are highly ambiguous and politically malleable, resulting in mixed and inconsistent decision and policy making. Sustainability discourses, stories and narratives are integral to the development of policy.

The concept of sustainable development recognises the interdependency of social and ecological systems stressing that the wellbeing of ecological systems is integral to the wellbeing of societies (Holling, 2001). However, it has been critiqued as anthropocentric and utilitarian in its perspective and values (Luke, 2005). Sustainable development is a reflection of "social consensus about what is unsustainable and what constitutes improvement, and therefore cannot be translated into a blueprint or a defined end state outlining specific criteria and calling for unambiguous decisions" (Voß and Kemp, 2005, p. 12). The Brundtland Commission report (WCED, 1987) recognised that sustainable development could not be blueprinted and the report proposed guiding principles that are difficult to reconcile in application (Jordan, 2008). Kates, Parris and Leisorowitz (2005, p. 20) describe this as 'creative tension', which imbues openness, risk assessment and interpretive flexibility dependent on context. Yet prevailing approaches to sustainable development can tend to operate as "enlightened self-interest" that encourages incrementalism and arbitrariness rather than triggering radical restructuring to promote planetary and intergenerational futures and equity (Christen and Schmidt, 2012; Imran, Alam, and Beaumont, 2014, p. 136). With the application of complexity theory to sustainability and the emergence of complex adaptive systems and socio-ecological perspectives, approaches to sustainability have shifted from an equilibrium perspective for balancing a set of principles to recognition that the principles are a complex system.

Sustainability and sustainable development can be understood as involving contingent and circumstantial pathways (Christen and Schmidt, 2012). Rather than prioritise settled system states, an approach that charts trajectories and connections encourages an appreciation of sustainability as and through dynamic relations (Christen and Schmidt, 2012; Harris, 2007; Holling, 2001). Sustainability and sustainable development entail relationships between humans, social systems and ecological systems globally, and at all scales, which comprise complex adaptive systems (Harris, 2007; Holling, 2001). However, Christen and Schmidt (2012) found that understandings and applications of sustainability can tend to suffer from

arbitrariness in decision-making, that can limit its power to guide action. Consequently, they identify the need to "reinforce its action-guiding power" by conceptualising sustainability through systematic theories and meta-approaches (Christen and Schmidt, 2012, p. 401). Sustainable transitions theory aims to achieve this kind of framing, search for new value systems, and guide with a long-term and systems oriented outlook (Grin, Rotmans, and Schot 2010).

Sustainability and sustainable development gain urgency in policy and governance with growing knowledge and awareness of the interconnectedness of social and ecological systems (Holling, 2001) and the impact of global environmental degradation, such as accelerating climate change, pressured ecological systems, biodiversity loss, and diminishing resources (Harris, 2007; IPCC, 2018; Steffen et al., 2005), on life support systems as well as human societies and settlements. Sustainable development also acknowledges social equity, including the elimination of poverty, as a core principle. As these complex and interlocking challenges gather momentum, the present period until the middle of the 21st century is critical for maintaining an inhabitable world and the development of transition paths that address sustainability (Harris, 2007). Contestation over definitions and intent of sustainable development, or multi-interpretability, can problematise the ideological drive of capitalism and neoliberalism in promoting growth, consumption and competitiveness in lieu of development or progress. Sustainability involves global phenomena that are reflected unevenly in local and regional scales and decisions. However, local, regional, and individual actions are important for addressing sustainability and triggering larger-scale and global outcomes and positive tipping points (Harris, 2007, p. 4; Opp, 2008; Tabara et al., 2018). By stressing interdependencies between economic, social and environmental domains and between geographic scales, 'positive-sum' ideas of progress and wellbeing are reconfigured (Albrechts, Healey, and Kunzmann 2003; Meadowcroft 2000). In highlighting interdependency and other ambiguities, the figuring of a more reflexive engagement with sustainability has supported a transitioning perspective (Rumpala, 2013; Torgerson, 2013) and socio-environmental ethics (Imran et al., 2014). Such a perspective and ethics proposes that alternative or innovative developmental and planning pathways and value systems are possible (Kenny and Meadowcroft 1999; Rydin 2013; Grin, Rotmans, and Schot 2010).

Governments face the challenge of pursuing more "effective, efficient and legitimate problem solving approaches" (van Buuren and Loorbach, 2009, p. 376). Sustainability, as a multi-scalar, multi-interpretable and complex challenge, infers capabilities and capacities. It implies the ability to be sustained within ecological limits, and intergenerational equity in relation to the integrated dimensions of society, environment, and economy. The multi-

interpretability of sustainable development and sustainability, particularly in relation to growth, present political and governance challenges (Cowell and Owens 2006; De Roo and Porter 2007; Kemp and Martens 2007). This can result in appropriation and manipulation that redirects the intention of sustainable development to what Fry (2009, 53) describes as "sustaining the unsustainable". This is evident in rhetorical prescriptions of capitalist expansion and growth dependence such as "sustainable growth" and ecological modernisation which fail to realistically address ecological limits, social inequity and looming socio-ecological crises (Blowers, Boersema, and Martin 2012; Rydin 2013; Opp 2008).

Sustainability is held as a politically weak but necessary driver of innovative and complex problem-solving in relation to these dimensions, and a context for re-framing and re-thinking socio-spatial relations (Voß, Smith, and Grin 2009; Healey 2007b; Albrechts 2012; Counsell and Haughton 2006). Sustainability itself is not 'a' or 'the' problem or an end-state, yet planning efforts seek to redress its lack and offer sustainability and sustainable development as both vision and method (Gunder and Hillier, 2009). That is, sustainable development supports sustainability (Conroy and Berke, 2004) which, in turn, prompts a different way of thinking or imagining the future (Torgerson, 2013). In thinking about the future differently, or a different future, there may also be a need to plan differently for the future. This can include addressing the reciprocity of urban and regional, socio-technological and socio-ecological transitions and what those interactions mean for and in regional governance (Monstadt, 2009; Swilling and Annecke, 2012).

In a study of Fredericia in Denmark's Triangle region, Vogel (2015) highlights the sustainability challenges for policy and planning arising from the ambivalence and ambiguity of sustainability. Vogel (2015, p. 39) found that a failure to address the contradictory logics of growth and sustainability results in cross-currents in planning that inhibit sustainable transitions, a situation described as "sustainability hypocrisy". The language games of policy and planning arising from ideological prescriptions such as neo-liberalism trigger a type of duplicity where policy-makers and planners believe they are shaping sustainability or climate-awareness, but are acting counter to it and reinforcing a market-led approach to planning (Vogel, 2015, p. 6). Through their interpretations of planning goals in relation to mobility, Vogel reveals significant inconsistencies that have resulted in "inefficient and ambivalent planning" in Fredericia (Vogel, 2015, p. 15). This is an important issue in relation to the greater conundrum of operationalising and planning for sustainability which can be difficult to translate into practice due to 'fuzzy' meanings and definitions (Tukker, 2008). De Roo and Porter (2007, p. 8) propose that sustainability is not a goal with a fixed

end-state, but “a way of looking at policy making”. Consequently, it “derives meaning by what people – actors – expect from it” and is therefore contextual and relational in interpretation and application (De Roo and Porter 2007, 8).

Sustainable development can also be addressed as a way of cultivating governance involving multiple levels and actors making normative decisions (van Zeijl-Rozema, Cörvers, Kemp, and Martens, 2008, p. 411). Therefore, sustainability is also a way of doing policy. Like Meadowcroft, de Roo and Porter propose a more open-ended approach to sustainability and sustainable development that reflects how groups of stakeholders interpret and apply these concepts based on their beliefs and values as well as change over time. The collaborative nature of sustainability decision-making is emphasised by Van Lente and Kemp (2011) who propose that sustainability criteria also needs to be collaboratively devised. Drawing on sustainability and sustainable development theory, transitions theory has been seeded in sustainability-based innovation such as eco-efficiency, decoupling materiality and environmental impact, eco-innovation and eco-modernisation schools of thought (Ravetz 2000; Hajer 1995; Newton and Bai 2008; Brown 2014; Swilling et al. 2013), and is developing in ways that engage other arenas of practice and policy, such as social, institutional and relational innovations, to address fair and inclusive transitions (Swilling and Annecke, 2012). The field has seen significant growth – a search of the topic “sustainable transitions” in the academic database, ScienceDirect, reveals less than 10 published research articles per year from 1996 to 2006 growing to 398 published research articles in 2019. A sustainable transitions research profile is developing in Australia particularly in relation to low carbon development, system innovation, nature-based solutions and eco-innovation and emerging from fields such as spatial planning, infrastructure, eco-system services and water management, and asset management (Brown, Furneaux, and Gudmundsson, 2012; Brown, Farrelly, and Loorbach, 2013; Farrelly and Brown, 2011; Moloney and Horne, 2015a; P. Newton and Bai, 2008; Ryan, 2008; Twomey and Gaziulusoy, 2014; Twomey and Ryan, 2013; Weller, 2012).

Transition theory offers an “open framework for searching sustainable development pathways in various sectors of society” highlighting process dynamics and structural change (Voß et al., 2009). The Netherlands introduced transition policy in 2001 to enhance other sustainability and sustainable development policies, including spatial planning policies (Hendriks and Grin, 2007; Kemp and Loorbach, 2005; Kemp, Rotmans, and Loorbach, 2007). The address of innovation in functional systems includes policy making as it is shaped by and shapes those systems (Kemp and Loorbach, 2005; Smith and Kern, 2009). In the Netherlands, the “policy language promotes sustainable reconfigurations of entire socio-

technical systems of provision for energy, housing, agriculture, transport and so on" (Smith and Kern, 2009, p. 78). Such reconfigurations also have bearing on urban and regional planning and a shifting infrastructure geography. While these initiatives are partly based on normative and prescriptive principles such as participation and equity and geared towards eco-efficiency and eco-modernisation, this openness allows for governance and policy innovation to test path creation and facilitate learning through experimentation. However, transition pathways in Europe have been undertaken over long periods of time in part because they require deep cultural change. A "quest for new value systems" is at the core of sustainable transitions (Grin, Rotmans, and Schot 2010, 3). This indicates that the policy process and timelines for transitions are under constant and complex negotiation necessitating more adaptive forms of governance (Loorbach, 2010; Rotmans and Loorbach, 2009).

In its policy articulation, transitions is an innovation that extends earlier policy initiatives aiming to decouple economic activity and socio-ecological decline (Smith and Kern, 2009). Existing policy paths in The Netherlands and Germany were seen as ineffective in their address of sustainability while the long-term transitions commitment signalled that policy, in both its presence and absence, matters in responding to sustainability and sustainable development (Kemp and Loorbach, 2005). Smith and Kern (2009) found that the transitions storyline has not resulted in significant structural change, although change has occurred in the policy environment, including the introduction of a policy discourse advocating acceleration of system change.

At present the speed of change in obdurate systems is slow and hindered by vested interests, power elites and organisational cultures in which policy alternatives may be locked out. Since its instigation in the Netherlands, transitions policy methods and theory have migrated into policy and research in European nations and regions (Corvellec, Campos, and Zapata, 2013; Schneidewind, Augenstein, and Scheck, 2013; Späth and Rohracher, 2010) and Asia (Bai, Roberts, and Chen, 2010; Bai, Wieczorek, Kaneko, Lisson, and Contreras, 2009; Berkhout et al., 2010), addressing both regional and sectoral contexts and the prospects for transitions approaches. As a "long-term meta-objective" by which to develop policy, sustainable development is catalysing diverse paradigms and patterns of development addressing scale, policy, and governance (Baker 2006, 47; Meadowcroft 2009, 2000; Bulkeley 2005). The politico-administrative uptake and address of sustainable development for over three decades has been undertaken with mixed levels of caution and success (Meadowcroft, 2000). Sustainable transitions and sustainable development operationalise

sustainability in ways that can engage with complex systems and dynamics to trace alternative pathways for system change and human development.

2.1.2 Socio-Technological Systems and Transitions

Sustainable transitions theory and research are particularly concerned with large technical systems or socio-technological systems, which are formed through the interdependence and interaction of society and technologies, often as a system of systems (Kaijser, 2005). Technology does not exist in isolation from society, social behaviours, and social institutions – it both shapes society and is shaped by society (Hughes, 1987). Systemic and network relationships co-evolve with society and technology, including policy and institutional change (Geels 2002; Hughes 1987; Markard 2011). In distinguishing the differences between infrastructure systems, socio-technological systems, and infrastructure, Frantzeskaki and Loorbach (2010) propose that infrastructure systems are a type of socio-technological system or large technical system and, given their networked and complex nature, are better described as 'infrasystems', drawing on Jonsson's (2000) and Kaijser's (2005) analysis of the term. Infrastructure refers to the hardware, the material elements of infrastructure systems, and infrasystems refers to both the hardware and software of the infrastructure system comprised of material, institutional and social elements and relations. This distinction is reflected in research addressing diverse infrastructure systems, such as airports. Keast, Baker and Brown (2010), for example, stress the need for integrating the social dynamics of infrastructure systems for sustainability in airport development. The socio-technical is comprised of social and technological interactions and relations which are co-evolutionary.

In his study of energy transition in suburbia from a socio-technical perspective, Dodson (2014) identified suburbia as a multi-dimensional assemblage that is distinct from other urban assemblages or formations rather than enveloped by them. While Dodson's analysis draws out the challenges for social science in addressing suburban energy transition, it further stresses the need for socio-technical perspectives in analysing socio-spatial and socio-technical problems. It also recognises that cities, like regions, are comprised of diverse types of spaces in which socio-technical systems act differently and serve different roles. Further, as Hodson and Marvin (2009, 2010) argue, transitions research should address the importance of places in infrastructure system transitions. Therefore, the dynamics of sustainable transitions are contingent on multi-scalar, spatial, and place-based conditions.

Socio-technical systems, particularly large technical systems like infrastructure, exert significant force in socio-technical relations. They often anchor systems through stability and

predictability. Infrastructure systems are not homogenous and demonstrate significant variation and impacts across sectors. Based on Jonsson (2006), Frantzeskaki and Loorbach (2010, p. 1295) affirm three main patterns in infrastructure systems: distributive (from central node to user), accumulative (from users to central node) and communicative (multidirectional network flows). Consequently sector specific factors, beyond optimisation, must be addressed for transitions including significant reconfiguration such as decentralisation of energy networks and alternative designs of other infrastructures (Frantzeskaki and Loorbach, 2010; Markard, 2010).

Attention to redesign of infrastructure systems indicates that a radical change or transformative transition pathway is needed. Differing sectors display contextual tendencies and preferences depending on such factors as regulation, ownership, governance, intermediation, and fragmentation (Hodson and Marvin, 2009; Markard, 2010). This is important for spatial planning as all infrasystems have spatial and scalar implications. Despite their unbundling and fragmentation, they are often planned in ways that address their spatial context and address multi-scalar flows (Hodson and Marvin 2009; Hodson and Marvin 2010). Naess and Vogel (2012, p. 37) stress that *spatiality*, understood as "the spatial extension and internal spatial structure of cities/metropolitan areas", is the *object* of transitions. Urban and regional planning is the means by which spatiality is managed. As Fry (2017, p. 139) proposes, "there can be no remaking of cities without a remaking of planning". Urban and regional transitions are focused on "changes in the ways in which urban structures change" (Næss and Vogel, 2012, p. 40). As socio-technological systems, particularly infrastructure systems, demonstrate obduracy, socio-technological transitions involve socio-cultural, political, ontological, spatial and institutional shifts as well as technological shifts.

2.1.3 Towards Transition Pathways

Socio-technological transitions involve examination of the interplay of path dependence and system innovation as well as the co-evolution of infrastructures and their socio-spatial context (Corvellec et al., 2013; Frantzeskaki and Loorbach, 2010; Tukker and Butter, 2007). Sustainable transitions addresses socio-technical system change as transition pathways and recognises that these pathways are non-linear and co-evolutionary. The pathways metaphor not only recognises that paths can be shaped, emergent and changeable, but also locked in and fixed. Transitions may need to negotiate the complex circumstances of path dependence as they proceed. Path dependence, which includes lock-in, in socio-technical regimes has been identified as an issue facing nations, regions and cities (Hensley, Mateo-Babiano, and

Minnery 2014; Martin and Sunley 2006; Dooms, Verbeke, and Haezendonck 2013; Driscoll 2014; Payo et al. 2015). Path dependence is extrapolated in economic, geographic and political theory to explain the emergence and stability of trajectories of industrial and technological development, particularly in regions as influenced by historic and place-based conditions.

Key proponents of path dependence are David (1986) and Arthur (1994), who have developed what Martin (2007) describes as a 'canonical model' in relation to economies, technologies, socio-technological relations and selection. Critiques of this model suggest that while path dependence and lock-in can create a sense of stability and continuity, they do not account sufficiently for change and the place dependence of path dependence, which an evolutionary perspective enables (Martin 2007; Martin and Sunley 2006). Despite several criticisms of the concept of path dependence, including the difficulty of empirically measuring and diagnosing it, Kay (2005) finds that the concept has utility for policy studies provided researchers are clear about their intention in using this concept especially if they are accounting for the temporality of policy decisions and other historical dynamics. Pierson (2000b, 2000a) and North (1990) examine the policy attributes of path dependence, and identify the persistence of some policy and organisational processes. Technological path dependence, according to North (1990), is attributable to, and better understood, as competition between those organisations in which technologies have become embodied rather than direct competition between the technologies. As path dependence results in narrowing choices due to past decisions (Kay, 2005; North, 1990), it can result in incumbent benefits and stability for both those organisations and society as a whole.

Developing the work of Vergne and Durand (2010), Pierson (2000b) argues path dependence cannot be assumed to be a permanent state as it involves three stages. The first stage involves a 'critical juncture' where circumstances and contingency trigger an opportunity for, or movement to, a new path. The second stage involves affirmation of the path through positive feedback and increasing returns which establish and embed the path. The final stage sees the dislodgement of the path through disruptive conditions and contingencies. While paths are not fixed, they are difficult to dislodge, even when they cause decline, due to their systemic entanglement and self-reinforcement. Path dependence is a useful concept for both planning and transitions research as it qualifies the boundedness of rationality and choice in relation to policy processes that influence prospects for a sustainable future. It is used in this research in tandem with sustainable transitions to identify defining aspects of planning and plan making for infrastructure pathways over time that account for both stability and change.

Drawing on complexity theory, evolutionary economists and economic geographers examined path dependence to account for transition, heterogeneity and self-organisation. From a transitions perspective, path dependence can refer to inertia or obduracy (Geels 2002; Maassen 2012; Smith and Stirling 2008) in systems that prevent or resist adaptation and innovation, particularly system and institutional dynamics that reinforce unsustainable socio-spatial development trajectories, such as private vehicle and fossil fuel reliance (Frantzeskaki and Loorbach, 2010; Maassen, 2012; Ulli-Beer, 2013). The stability conferred by path dependence plays a vital role in society and in settlements by enabling access to services and goods in an acceptably efficient manner that justifies high levels of expenditure and investment (Frantzeskaki and Loorbach, 2010). These relatively stable networks and configurations are under pressure to transition from unsustainable conditions. These pressures can manifest as policy and politics as well as niche innovations, such as electric and hybrid cars and ridesharing, and affect system and social behaviour. Rydin (2013) argues that path dependence, which produces unsustainable development and socio-technological lock-in, is the result of other forms of dependence which are constitutively ideological, such as "growth dependence". These privilege corporate interests and market logic in planning and development decision-making.

In the eco-innovation field, significant attention has been directed to decoupling growth and unsustainable development through material and social practices (Robinson, 2011; Swilling et al., 2013). Opp (2008) further identifies the need to reframe and unhinge 'economic growth' and 'economic development' in policy to engender sustainable development, and this is reflected in socio-technological transitions research and theory. The privileging of growth can entrench other technological, institutional and behavioural patterns of path dependence, which can compound inefficiencies and inequality. System and structural conditions and paths are mutually reinforcing and embed interrelated technological, organisational, institutional and social processes. These dynamics are co-evolutionary and non-linear in that institutions, enterprises and regions co-evolve to create and affirm development paths, and explicable through evolutionary economics and other forms of evolutionary thought (Cecere et al. 2014; Martin 2007; Boschma 2015; Drahokoupil 2012). Given its co-evolutionary and capitalist dynamics, concepts and theories of power, opportunism and politics are also at issue in the making of path dependencies (Martin 2012; Pierson 2000a; Beyer 2010).

Path dependence is a phenomenon that has been examined in evolutionary economics, economic geography and innovation studies, from which sustainability transitions and transitions theory draws, as well as planning theory and research. However, Page (2006) has

argued that the concept of path dependence, while serving as a useful metaphor, lacks "analytical value" because it has been popularised across disciplines. Page is concerned about the loss of leverage that results from broadening path dependence to account for historical causality and finds that not all path dependencies are the same and highlights the need to avoid blanketing socio-technical processes and dynamics. There is a growing body of research addressing path dependence and lock-in of urban and regional planning and infrastructural contexts, which recognise path dependence as a highly contingent and systemic condition.

Systems experiencing path dependence tend to resist change and reinforce systemic and structural conditions that support pre-existing development or growth paths. This can manifest as unsustainable impacts that are especially pernicious in relation to socio-technological systems and infrastructure (Dodson, 2009; Frantzeskaki and Loorbach, 2010; Störmer et al., 2009), and spatial-economic development (Hartman and de Roo, 2013) resulting from the inertia of socio-technical regimes (Grin, Rotmans, and Schot 2010). Governance and planning both perpetuate and experience path dependency due to their embeddedness in social, institutional and technological system dynamics (Bunker, 2012; North, 1990; Pierson, 2000a).

Path dependence is complex and shaped by institutional, technical, cultural, and material logics (Unruh, 2000) or forces (Corvellec et al., 2013). In relation to urban environments, Low and Astle (2009) identify three types of path dependence: technical, institutional, and discursive. Technical path dependence refers to the physical and technical forms of the urban and regional environment, such as roads, infrastructure and street layouts. Institutional path dependence occurs through governing, governance and policy making agents and organisations, including the policies and plans that shape physical environments. Discursive path dependence is predicated on storylines in planning issues and problems, and such storylines can affirm development and socio-technological trajectories. Researching path dependence in policy over time from a socio-technical perspective can identify inhibitors for adaptation as well as windows of opportunity for sustainable transition (Malekpour et al., 2015).

Planning plays an explicit role in urban and regional path dependence given the nature of planning and policy cycles through which plans are updated and establish programs of public works and property markets over time. Several studies using diverse methods have identified notable relationships between path dependence and planning. Truffer et al. (2010) critique current strategic planning approaches in a case study of the Swiss sanitation sector as

affirming existing infrastructure configurations and investments, finding a preference in planning for incremental improvements to the existing socio-technical system with little sensitivity to context uncertainties. Applying an exploratory method called 'Regional Infrastructure Foresight', Truffer et al. (2010) found that stakeholders qualitatively assessed existing configuration enhancements as less desirable than options addressing system alternatives, yet planning practices tend to privilege the existing configurations and path. The authors acknowledge that more empirical research is required to further validate this finding. In applying a historical method, Malekpour, Brown and de Haan (2015) also revealed the relationship between planning and path dependence that inhibits sustainable infrastructure development. Their historical study spanning more than a century of strategic planning for public infrastructure also found that modes of practice were path dependent. These studies affirmed that planning focuses on incremental development to achieve an end-state, while transitions theory and research focus on paths, with greater attention directed towards path shaping, experimentation and radical change (Kemp, 2015).

The incrementalism and assumptions of planning and the lack of a strong exploratory approach has been found to inhibit sustainable transitions and radical change in infrastructural and other planning domains (Malekpour, Brown, and de Haan 2015; Störmer et al. 2009). In another example, CSIRO research (Abel et al., 2011) into sea level rise and planned coastal retreat in south east Queensland found that regional planning has tended to ignore path dependence and cumulative impacts, while amplifying the importance of sunk investments, in addressing climate change. Abel et al. warn that the current regional plan may result in paths emphasising built coastal defence (infrastructural), rather than natural defences (eco-system services) or planned retreat, due to development path dependencies. The planning attitude to, and address of, path dependence and socio-technical transitions for sustainable development in the Australian context warrants further attention as the research indicates that infrastructure planning is not only contributing to infrasystem path dependence but discounting future options. Dodson (2009) and Bunker (2012; Searle and Bunker, 2010) have alerted researchers to endemic and systemic issues in Australian planning that reflects international findings in relation to path dependence. A decade earlier, Troy (1999) warned of the need to break planning path dependency, highlighting its negative impacts on urban efficiency and equity given a propensity to assume continuation of urban and regional conditions despite technological, ecological and social change.

Path dependency is a recurring theme in planning research and theory in relation to the plan, the planning process and the planned environment. Path dependence in the Australian regional and urban planning context has been researched, problematised and critiqued in

relation to a range of pressures, wicked problems and socio-technical regimes, such as urban land use and structure (Troy, 2004), transport planning and policy (Low and Astle, 2009; Low et al., 2005), automobility and carbon lock-in (Newton and Bai, 2008), active transport and healthy places (Hensley et al., 2014), and water management (Farrelly and Brown, 2011). Internationally, connections between strategic spatial planning, sustainable transitions and socio-technical systems are under investigation with particular focus on the relationship between path dependence and planning. This literature repeatedly finds that planning contributes to the path dependence and lock-in in cities and infrastructure systems. Many of these studies and critiques conclude with an emphasis on reflexive, exploratory, participatory and discursive tools, processes, and paths that would represent a change in planning processes and stakeholder relations (Truffer et al. 2010b; Malekpour, Brown, and de Haan 2015; Störmer et al. 2009; Dooms, Verbeke, and Haezendonck 2013).

Mobility systems are often evoked to demonstrate how incumbent regimes display complex path dependence (Hodson and Marvin 2009; Loorbach 2010; Smith, Voß, and Grin 2010; Geels 2002). The regime of 'automobility' (Urry, 2004), characterised by private vehicle and fossil fuel dependence, for example, has resulted in reliance on rigid spatial and infrastructure assemblages, such as low density suburbs and highway investments (Newman and Kenworth 1996; Dodson 2014). While fossil fuel reliance experienced increasing returns in powering industrialisation and urbanisation leading to lock-in, it is experiencing diminishing returns due to resource scarcity and peak oil (Newman, Beatley, and Boyer 2009), climate change, carbon lock-in, and greenhouse gas emissions (Driscoll, 2014; Maassen, 2012; Unruh, 2000, 2002), environmental and human health, and sunk infrastructure development and maintenance costs in supplying and maintaining infrastructure to support sparse and sprawling settlement (Van Der Vooren, Alkemade, and Hekkert, 2012). In planning and transitions discourses, these co-evolutionary dependencies are characterised as inertia – stable and continuous rather than transitioning (Filion et al. 2015, 204; Geels 2002). Driscoll's (2014) examination of carbon lock-in in Copenhagen, Denmark and Portland, USA found that major infrastructure transport projects, specifically motorways, as planned solutions did not offer significant response to path dependence and carbon lock-in, raising questions about how planners and planning address transitions. Driscoll identifies signs of shift in transport planning in which the appeal, or returns, of motorways is significantly reduced due to factors such as environmental impact, austerity-induced restraint and a changing mood in relation to traffic management through road building. This is interpreted as signs of instability which may present windows of opportunity for planners and planning to disrupt path dependence and the 'automobility' hegemony.

Sustainable transitions perspectives integrate innovation studies and sustainable development with a view to elaborating structural change and large-scale system innovation that disrupts path dependence with windows of opportunity for alternate paths and creation of new pathways. The development and introduction of transitions thinking into Dutch policy can be interpreted as path creation in policy making and governance, arising from a policy niche, that undertakes to pursue path creation. With reference to complex adaptive systems, Garud, Kumaraswamy and Karnøe (2010) propose a theoretical perspective where path creation accounts for the ways in which conditions and boundaries are reflexively created by actors rather than historically given. In this framing of path creation, paths and agency are emergent and rely on sense-making, narrative and visioning. Instead of lock-in, Schumpeter's concept of creative destruction is evoked by the authors to articulate processes of renewal and revitalisation and generating options. Garud, Kumaraswamy and Karnøe (2010) clarify that path creation and path dependence are neither oppositional nor complementary, but play different roles in decision-making and policy processes as resources, actors and needs arise. The path creation perspective is useful for strategically and deliberately drawing out emergent phenomena. Paths are complex phenomena and path constitution is a complex process which can benefit from protective spaces for experiment and exploration (Meyer and Schubert, 2007; Smith and Raven, 2012).

Sustainable transitions emphasises socio-technical systems and transformation through interrelated and responsive social and technological dynamics (Rip and Kemp, 1998). This presents significant public policy and governance implications through the expression of transition visions and system innovations (Kemp et al., 2007) as well as anticipatory capacity and lock-in avoidance (Payo et al., 2015). Complexity in socio-technical systems and associated spatial dynamics results in complex and multi-level problems. Consequently, path dependence is not a simple end point of development trajectories or teleological events that can be readily corrected or reversed. Fossil fuel reliance, for example, is made possible and strengthened by a range of regulatory, industrial, organisational, social, market and technological practices and processes. The relationships are probabilistic and non-linear, as well as historical (Wimmer and Kössler, 2006). Path dependency can result in the inhibition of both innovation and vision for progressing the kind of radical change or path breaking that can drive sustainability transitions (Geels 2002; Foxon 2002; Garud, Kumaraswamy, and Karnøe 2010). Evolutionary processes are complex and emergent and Bristow et al. (2012) proposes 'path interdependence' to account for the recombinant and emergent potential of innovation, institutions and industries. Meyer and Schubert (2007) propose addressing a spectrum of path constitution because paths are neither linear nor destiny. Dependency is not

solely responsible for inhibiting transition and the dynamics of change and selection in complex systems requires further examination (Boschma, 2015). For example, protected spaces for innovation and windows of opportunity play an important role in enabling selection and innovation to breakthrough to act in pathways and shift them away from incumbent trajectories (Geels, 2005; Rip and Kemp, 1998). Research in institutional processes and matrices, such as governance and policy, has addressed sustainability transitions and co-evolutionary processes of socio-economic and socio-technical systems and change (Geels 2014; Geels 2002; Kemp and Loorbach 2005). This is significant for infrastructure systems and entities as government plays a central role in policy making, planning, implementing and managing for infrastructure in cities and regions (Barnes, Durrant, Kern, and MacKerron, 2018; Johnstone and Newell, 2018; O'Neill, 2010).

2.1.4 System Innovation

Sustainability transitions research examines system innovation, a concept drawn from innovation studies, and has developed several frameworks for problem framing, governance, sustainable development, and mitigating socio-ecological degradation. These are developed from its interdisciplinary foundations to support governance and policy analysis. Instead of framing sustainable development in terms of balance or equilibrium, evolutionary and complexity thinking addresses learning to support emergent paths, create developmental paths, and reflexively reform structures and institutions predicated on sustainability (Boschma 2015; Castán Broto et al. 2013; Voß and Kemp 2005). System innovation refers to fundamental changes in systems that address sustainability and address the aggregated and interrelated dimensions of social, environmental and economic development. For sustainability transitions in socio-technological systems, this means radical movement away from established inequitable, polluting, and wasteful regimes to more sustainable, inherently sustainable and equitable regimes. Policy that is directed towards systemic change can support system innovation (Andersen, 2008, p. 331), as policy is enmeshed and acts in those systems. Through experiments and learning, system innovation can be directed to meet transition goals (Geels 2004a). While the terms transitions and system innovation are applied interchangeably in some literature, for Kemp and Rotmans (2005) transitions directs attention to the 'new state' arising from changes in a socio-technological system including policy and governance. Radical changes, however, are particularly significant in transitions because of a vision for whole-of-system change (Elzen and Wieczorek, 2005; Newton and Bai, 2008). Sustainability and sustainable development can challenge existing governance and decision-making arrangements and transitions must also account for political and policy processes and institutions (Shove and Walker, 2010; Smith and Stirling, 2008, p. 13).

The Netherlands provides an extensive and long-term application of sustainable transitions in policy having established transitions arenas in major socio-technological or infrastructural domains such as energy, transport, agriculture and waste management (Hendriks and Grin, 2007; Kemp et al., 2007). In their evaluation of the Netherlands' approach to energy transitions, Kemp, Rotmans and Loorbach (2007) describe the movement of the energy transition agenda which grew from a niche project and policy experiment linking vision and path, and includes explorations of multiple possible scenarios and paths. While the outcome of this experiment is not fully evaluated, the transitions approach was found to reflexively address uncertainties associated with sustainable development such as ambiguity, ambivalence, experimentation, and distributed decision-making.

Significant change has not ensued, other than change in the policy context itself, indicating that institutional learning and cultural change is underway and potentially longer term than anticipated due to softer forms of policy and organisational lock-in or path dependence. Generally, the issues addressed by the Dutch energy transition were principally institutional, specifically in relation to governance and orientation towards sustainability. Kemp, Rotmans and Loorbach (2007, p. 328) concluded that the transitions approach, which has survived changes of government, can inform innovations in policy and planning for developing direction and vision. In researching infrasystems, Frantzeskaki and Loorbach (2010) recommend guidelines for infrasystem planners, proposing that transitions theory and methods can be applied in planning. A particular priority for infrasystem planners is the introduction of "practical experimentation and policy innovation" (Frantzeskaki and Loorbach, 2010, p. 1299). Regional and urban planning is situated to create linkages across policy and transition arenas through spatial and scalar process of intermediation and coordination (Medd and Marvin, 2007).

Experiments and niches are an essential aspect of socio-technical transitions. Quitzau et al. (2013) challenges the niche-driven approach to urban transitions and innovation by applying a flow-oriented perspective to urban regime dynamics drawing on Actor Network Theory to demonstrate how incumbents can catalyse regime change at the urban scale. The examination of endogenous conditions of regimes and the actions of incumbent regime actors reveals a more 'fluid' dynamic that can produce change. However, some regime and landscape dynamics such as planning regulation and practice inhibit transition. Williams (2016) investigates the role of low carbon city experiments in transforming the development regime through broadening, transferability and scaling-up. Like Berkhout et al. (2010) and Quitzau et al. (2012), Williams (2016) emphasises the role of experiments in catalysing

learning and knowledge to influence regimes, and for triggering momentum. Often such interactions are contextual, contingent and not readily transferable. There is a risk that niche-regime interactions can continue to expand without momentum or triggering transition emergence. Moloney and Horne's (2015b) findings also identify dispersed experiments that progress at different speeds, sometimes reversing, that may not cumulatively shape a transition even though some gains are made. They find that many transitions experiments, which can occur under the rubric of planning, do not usually agglomerate to form transition or momentum. Low carbon experiments progress slowly and can stall or reverse as a result of actor, policy and governance processes. A need for more coherent policy, including planning, is identified. As the objective of sustainable transitions is radical change through dynamic process, then further longitudinal investigation is needed.

Guiding transition and system innovation is a governance and policy task that is co-evolutionary in nature and "beyond the capability of existing governments and individual actors" (Kemp and Van Lente, 2011, p. 121). Shove and Walker (2007) argue the complexity of system innovation and transitions requires an approach that is reflexively attuned to system dynamics. It is not a matter of pursuing a prescriptive process but rather understanding and flowing with the limitations and opportunities presented in policy systems. Policy support is needed for socio-technical transitions that "destabilises incumbent regimes, promote[s] radical niches and promote[s] processes to bring these niches into the mainstream" (Kern, 2012, p. 308). That is, agents of change, who can identify transitions arenas and facilitate learning, are needed in policy systems (Shove and Walker, 2007). Based on a case study of the UK's Carbon Trust and action to transition to a low-carbon economy, Kern argues that 'policy learning', as a form of social learning and innovation, is a vital for transition approaches. Learning is a form of change. Policy learning and experimentation are integral to system innovation due to the fuzzy nature of problem framing and adaptive adjustment required in multi-level and multi-stakeholder contexts. This includes experimental actions that enable learning about system attributes. Empirical research involving case studies, such as Späth and Rohracher's (2010) study of an Austrian energy region indicate that coordinated transitions and visioning can result in alternate development paths based on evolutionary processes such as guided variation and selection rather than prescribed end-states (Kemp, 2015). This problem framing links sustainable transitions, social institutions. and system innovation in learning, reflexivity and deliberation to establish a larger-scale normative direction for sustainable development (Smith et al., 2010; van Zeijl-Rozema et al., 2008).

2.2 Infrastructure Systems in Transition

Infrastructure systems are integral to urban and regional flows and anchor urban centres in regional contexts. They not only underpin the formation and functioning of these territories, they enable connections and integration beyond their physical borders. This section of the literature review examines infrastructure systems in transition to trace the relationship between regional and infrastructure planning, as a multi-scalar, multi-level and multi-actor policy system, and sustainable transitions of infrasystems (Haughton and Counsell, 2004; MacCallum, 2009). Sustainable transitions as large-scale processes create a context as well as a spatial and practice issue for regional planning. Transitions are already underway and strategic spatial planning is a policy arena that can both support and inhibit transitions. Transitions research tends to direct greater attention to urban infrastructure systems as greater agglomerations of infrastructure systems occur in cities (Wolfram, 2016a). Regional patterns of infrastructure development recognise urban intensities, power dynamics and spatial splintering while also recognising the relationship between settlements and non-urban environments in regions (Graham and Marvin, 2001; O'Neill, 2010). Because of their size, city-scale analyses are comparable to regional analyses and many regions are urban regions. Amin (2004, p. 34) commends the value of:

> a relational reading of place that works with the ontology of flow, connectivity and multiple geographical expression, to imagine the geography of cities and regions through their plural spatial connections.

Infrastructure is also understood in terms of networks, hierarchies and 'systemness', especially in support of global trade links and other connectivities (Graham and Marvin, 2001; Markard, 2010). The relationship between planning and infrastructure systems is inherent. A significant body of work has investigated historic patterns of socio-technical transitions to learn from them and in recognition that transitions have not historically been directly or intentionally steered (Elzen, Geels, & Green, 2004; Geels, 2002; Geels, 2007; Rip & Kemp, 1998). Planning addresses the spatiality and territoriality of infrastructure systems and, as such, can propose configurations of socio-technical systems in relation to land use and settlement pattern. Configurations of infrastructure are imbued with political, economic, environmental and social conflict and can confer benefits to some at the expense of others in their spatial and locational interaction (Graham and Marvin, 2001). Where planning has historically privileged existing infrastructure systems and relied on reproducing specific

technologies, and where markets have resulted in significant fragmentation of infrastructure systems, greater pressures are now evident for these systems to transition to more sustainable and integrated configurations (Brown, 2014).

2.2.1 Infrastructure Systems

Infrastructure attracts multidisciplinary analysis and is increasingly researched and addressed in terms of its socio-economic, socio-political, socio-cultural, and socio-ecological roles, impacts and contexts (Easterling, 2014; McFarlane and Rutherford, 2008; Moss et al., 2001). No longer exclusive to engineering and other technical disciplines, infrastructure in this research is examined as a socio-technological construct that is woven into, and shapes, human lives, settlements and societies (Graham and McFarlane, 2015; Guy et al., 2012; Markard, 2010; McFarlane and Rutherford, 2008). Infrastructure supports the workings of cities and regions both by providing services and access to services, and enabling processes of exchange and interaction (Larkin, 2013). Infrastructure is not just an architectural or engineered object as it acts, as a non-human actor, in socio-technological and socio-spatial contexts (Monstadt, 2009). It both shapes those environments and societies and is shaped by them in complex webs of meaning and power. For Carse (2016, p. 28) infrastructure is the collective that:

> refers to the subordinate parts of many projects, from the built systems that move water, sewage, people, and power to components assembled under the rubrics of security, information, health, finance, political mobilization, and environmental management.

Wiig and Silver (2019, p. 2) propose that infrastructure is active and involves "the making, maintaining, and use of infrastructure in the reordering of world economy and city-regions." Societies are highly dependent on infrastructures to meet everyday needs, yet infrastructures are not solely substrata for human action; they are relational and exist in relation to social practices (Star and Ruhleder, 1996). The relational and networked dimensions of infrastructure as progress oriented and society shaping affirms evolutionary thinking about infrastructure systems (Larkin, 2013). As infrastructures developed over long timeframes, they have symbolic, historical and material force through which citizens and nations can imagine possible futures. Even though infrastructure is significantly settled and stable, O'Neill (2010) proposes that its meaning and purpose in a city or region requires rethinking, particularly in relation to form, decision-making criteria, and financial and operational arrangements.

A focus on infrastructure is aligned to social studies of technology recognising that technologies like infrastructures are socially shaped or constructed (Hughes, 1987; Williams and Edge, 1996) and that infrastructures are constitutive of large technical systems (Oliver Coutard, 1999; Hughes, 1987; Summerton, 1994). Large technical systems theory and studies refers to extensive, complex and massive systems of technology or 'big technology', such as infrastructure, which is ordinarily suggestive of networks (Joerges, 1988; Kaijser, 2005). Such large systems are agglomerations of cultural, social, technological and organisational infrastructures and processes. Their 'bigness' also means that they involve high-level decisions and negotiations on multiple social and spatial scales (Hughes, 1987; Joerges, 1988). The literature on large technical systems recognises that an assemblage of diverse elements comprise an interacting system that enables a society to function (Mayntz and Hughes, 1988). While large technical systems theory has addressed the stability and momentum of these large systems, it has not significantly addressed how these are unlocked and how they change (Summerton, 1994).

Drawing on the large technical systems approach, Willems et al (2016) identify four stages of infrastructure development: establishment, expansion, maturity, and renewal. They argue that much infrastructure in the world, particularly that built in the first half of the 20th century, is reaching the renewal stage. This stage also features 'reconsideration' and provides windows of opportunity to address societal and environmental issues, engage with niche innovations and explore new pathways (Tongur and Engwall, 2017). A risk is that policies and the condition of the infrastructure system are not aligned, while neoliberalism and market fragmentation are also impacting. This is evident in Australia in relation to coal fired power stations at the end of their life where renewable energy is emerging as a viable replacement but policy is failing to respond sufficiently (Climate Council, 2018).

Tensions also emerge during disruptive dynamics, as is currently underway as smart technology interfaces with analogue technologies resulting in different types and configurations of services such as rideshare and 'Mobility as a Service' (MaaS). While MaaS offers user-centred services, it has been proposed this may negatively impact on public transport provision and may not mitigate congestion by reducing the number of vehicles on roads or reducing the space required for cars on roads (Hensher, 2017; Smith, Sochor, and Karlsson, 2018). Infrastructure systems involve non-linear processes of significant variability and uncertainty. They are comprised of diverse relationships including intersection, where infrastructures interact, shape each other and are interwoven by diverse social practices (Cass, Schwanen, and Shove, 2018). Markard (2010, p. 14) proposes that infrastructure

sectors display six characteristics: “a high degree of capital intensity, long lifetimes of physical assets, an often dominant role of public utilities, intensive [and] sector-specific regulation and a high degree of systemness”. Infrastructure systems are anchored in modernist and capitalist progress and growth narratives where they also play a significant role in globalisation (Easterling, 2014; Jones and MacLeod, 2004). Infrastructures act in networked, political and urban environments and are enmeshed in the construction and transformation of cities, regions and nation states (McFarlane and Rutherford, 2008). Because of the power they exert, their socio-ecological impacts and relationships attract significant policy attention.

The large technical systems perspective acknowledges the burden infrastructure places on the environment and the issues it poses for sustainability and sustainable development. The expansion of infrastructure systems results in “ever deeper ecological penetration” and adverse effects on ecological metabolism and natural systems (Joerges, 1988). Monstadt (2009) describes networked infrastructure systems as ‘ambivalent’ bearing both causes and solutions to environmental issues and resource scarcity. While environmental impact assessments and the like are integrated in infrastructure procurement and delivery processes, these do not provide the basis for deeper consideration of the interrelationship between infrastructures and environment that can lead to enhanced consideration of ecological and metabolic impacts and new evolutionary paths for large technical systems (Brown, 2014; Hodson et al., 2012; Joerges, 1988). The planning and design choices made in developing infrasystems are comprised of, and formative of, relationships that shape developmental and spatial pathways. Because of the material, relational, political, and socio-ecological role they play in industrial or urban metabolism, Monstadt (2009, p. 1926) proposes that major socio-ecological threats “can only be tackled through the transition of existing infrastructures”. Without transitioning infrastructure systems, the socio-ecological problems in which they are implicated, and of which they are catalytic, will not only be ongoing but also escalate.

Transport systems are one of several infrastructure sectors that operate as a networked system within urban and regional spatial configurations, often shaping heterogeneous scalar and spatial relations. In cities and regions the infrastructural dimensions of these heterogeneous spaces engender specific plays of infrastructural politics and conferral of amenity (Johnson, Andrews, and Warner, 2016). With attention to suburban and ‘in-between’ cities, Young and Keil (2010, p. 80) argue that “[t]he politics that produced the (public) modern infrastructural ideal for the centres and the (privatized) modern infrastructural ideals for the peripheries, largely treated the in-between cities of our metropolitan regions as residual spaces to be filled by thruways and bypasses”. Geels (2007)

examined the development of the highway as an infrastructure necessitated by automobility and suburbanisation; innovations in traffic management have supported the regime while abating demand for road and highway building. Issues such as 'splintering urbanism' where urban space and experience is fragmented by infrastructures are highlighted (Graham and Marvin, 2001). While infrastructure networks shape cities and regions, they also extend beyond their boundaries. Medd and Marvin (2007, p. 319) argue socio-technical networks or network space are not commensurate with urban or regional space. They argue an important distinction:

> regional space refers to territorially proximate and bounded clusters of activities, while network space refers to the socio-technical networks that can simultaneously both enable the occupation of regional space and also cut across that space, 'bypassing' users and spaces.

Infrastructures are facing adaptive and transition challenges due to pressures arising from environmental stresses, socio-demographic change and technological change. While socio-technological systems are bound to particular infrastructures, Foxon (2002) argues that "infrastructures develop based on the attributes of existing technologies, creating a barrier to the adoption of a more sustainable technology with different attributes". Reliance on particular technologies and configurations can lead to inertia, even resistance to change, in infrastructure systems that have co-evolved with regulatory, social, institutional and vested interests (Unruh, 2000). Due to their embeddedness, infrastructure systems can fail to adapt to changing conditions or respond to their negative impacts such as congestion, peak oil and air pollution in the transport regime, or energy poverty in the energy regime. These can be variously interpreted as system failures - from their complete collapse, such as in response to a shock, to their failure to deliver equitable, sustainable and reliable services to users (Markard et al., 2012). Such path dependence also results in incremental change, such as efficiency and optimisation gains in response to sustainability and climate change challenges, in a predictable direction with innovation directed towards protecting sunk costs and retaining dominance (Cecere et al., 2014). Fear of stranded assets plays a significant role in shaping the decisions of incumbents and vested interests (Kemp-Benedict, 2014; Roberts et al., 2018; Rowson, 2013). This not only means acting in ways that protect sunk costs, but also in ways that protect against societal shifts such as divestment from fossil fuel and other climate impacting industries. Both endogenous and exogenous problems are evident in infrastructure systems and cause different actors to perceive different types of failure, effectiveness and relevance. Frantzeskaki and Loorbach (2010, p. 1294) describe the

dynamic of landscape pressures on infrastructure systems from the perspective of the user and the planner:

> Existing persistent problems such as resource depletion, congestion and urban pollution, create pressure on existing infrasystems and (may) result in loss of amenity for societal actors. From the viewpoint of an infrasystem user, persistent problems are signs of deficiencies or in broader terms, pathologies of existing infrasystems; that in turn result in questioning their performance and capacity to accommodate (changing) societal demands. From the standpoint of an infrasystem planner, persistent problems are signals of either outdating of the design (societies change, demands change) or ineffectiveness (cannot serve the demand) or incompatibility (use changes, cannot function in present form).

This raises important considerations, particularly in relation to planner capacity to appraise design, effectiveness and compatibility of infrastructure systems, the need for community or user engagement, and the types of innovation that are required to respond. It raises the question of how planning initiates change in infrastructure systems in response to sustainability pressures.

2.2.2 Infrastructure and Planning

In Australia, governments are centrally positioned in decision-making and planning for infrastructures. Infrastructure planning at the regional scale draws attention to socio-spatial and scalar relations and systems. Because infrastructure decision-making can result in sustainability impacts, "[s]trategic planning processes are a key for determining the appropriateness, performance and sustainability impacts of infrastructures over their long life time" (Störmer et al. 2009, 1152). In policy, the centrality of government in infrastructure decision-making has raised issues such as governance, transparency and risk (Productivity Commission, 2014). The nature of Australia's Federation and distribution of revenue results in multi-level governance and intergovernmental arrangements for the planning and delivery of infrastructure. Structural and systemic shifts, including managerialism, entrepreneurialism, and neo-liberalism, have impacted on infrastructure systems (Dodson, 2009; Gleeson, Dodson, and Sipe, 2010; Graham and Marvin, 2001). These shifts, which manifest as 'unbundling', deregulation and privatisation of infrastructure (Graham and Marvin, 2001), are reflected in the major policy reforms of the last two decades in relation to infrastructure planning and delivery at principally the Federal and State levels (Steele and Dodson, 2014). Additionally, Federal and State Governments have often turned to

infrastructure maintenance and provision during economic downturn to stimulate investment and employment opportunities, rather than pursue environmental and equity objectives (Jonas, Goetz, and Bhattacharjee, 2013; Legacy, 2017; O'Neill, 2010).

Changing dimensions and priorities of infrastructure and its relationship to strategic planning are observed globally and in response to crises like the Global Financial Crisis in 2007 (Legacy, 2017). In Europe, Störmer et al (2009, p. 1150) observe strategic planning exerting constraints in infrastructure sectors and failing to introduce new methods, noting that it was "mostly focused on narrowing down context uncertainties, value considerations and system configurations to reduce complexity and ease implementation". In the UK, Neuman (2014) observes a long infrastructure emergency, extending internationally, where planning is not only disconnected from the development and delivery of infrastructure, but unable to solve problems associated with complex and changing conditions including those which necessitate the consideration of system alternatives to steer towards sustainable transitions. These complexities are global and Störmer et al (2009, p. 1152) propose "a more elaborate and open approach to strategic planning" to achieve more sustainable socio-technical systems. The investment of time and resources into a more exploratory planning approach is in tension with proposals for faster or more streamlined infrastructure approval and development processes (Ericson, 2008; Regan, 2010; Steele and Dodson, 2014). As occurs in Australia, the dynamics of decision-making are further politicised through perceptions and claims of chronic infrastructure gaps or bottlenecks, which are ultimately regarded as policy failures requiring urgent address including through flows of global private capital (Ericson, 2008; Legacy, 2017; O'Neill, 2010). This has implications for sustainable development, where the concept is not deeply and culturally embedded, as sustainability is traded off through 'technocratic' organisational dynamics, procurement and delivery (Shibata and Sanders, 2010). These descriptions of constrained and inflexible approaches to infrastructure planning also carry warnings of risks for cities especially in relation to socio-spatial equity and access to socio-technical services (O'Neill, 2010).

Infrastructure planning benefits from a long-term spatial and strategic approach that, in Queensland, has most recently been partly framed by regional planning. As a form of spatial strategic planning, regional plans play a significant role in policy integration and coordination (Ziafati Bafarasat, 2014). Different government departments and agencies also play a role in these processes as separate departments and agencies assume responsibility for planning, transport, infrastructure, energy, water and other infrastructure systems. At the regional scale, infrastructure and spatial planning connects urban areas and their surrounding hinterlands or conurbations in functional ways including expediting the exchange of goods

and services, including infrastructural services and goods (Heywood, 2010). Dodson (2009) identifies an 'infrastructure turn' in Australian planning resulting from the spatial restructuring which has triggered urban splintering (Graham and Marvin, 2001) as well as connection (Neal 2013) or network (Castells 1996). Urban and regional institutional arrangements and environments can splinter when infrastructure is unbundled and extracted from spatial planning and urban policy processes to meet disparate policy priorities (Dodson, 2009; Graham and Marvin, 2001). While network perspectives prevail, infrastructure planning narratives focus on projects and megaprojects, contributing to the sense of fragmented spatial and governance coherence and unbundling of services (Dimitriou, Ward, and Wright 2012; Flyvbjerg 2005).

Planning also works through specific spatial forms of agglomeration such as corridors in which multiple infrastructures are co-located but do not necessarily integrate (Jonsson, 2000; Willems et al., 2016). Dodson (2009, p. 110) refers to these dynamics as the making of the city-region as a "constellate infrastructure 'giga-project'" with significant implications for spatial strategy that supports sustainable development. Dodson's examination of the Melbourne Metropolitan Plan and SEQRPs found that through this 'infrastructure turn', spatial planning and infrastructure planning have become disconnected, and infrastructure has become the preferred means by which spatial arrangements are altered. That is, infrastructuralism (Marshall, 2011) and infrastructural regionalism (Glass, Addie, and Nelles, 2019) has emerged. Rather than being integrated in spatial planning, infrastructure and infrastructure plans are extricated and prioritised by politics, budgetary processes and processes external to planning (Bunker, 2012). Consequently, planning occurs in response to or for the infrastructural intervention. Infrastructure, particularly when regarded as project rather than system, is imposed rather than integrated, with infrastructure decisions steering land use decisions. Governments have retreated from infrastructure provision in favour of procurement resulting in greater influence by the private sector in infrastructure planning, project selection, and project assessment (Legacy, 2017; O'Neill, 2010). The implications are that the private sector, as an incumbent and vested interest, can play a role in securing particular pathways, black boxing and inhibiting change at a time when sustainable transitions are attracting more research and policy attention (Bosman, Loorbach, Frantzeskaki, and Pistorius, 2014).

Planning can rely on seemingly given and mobile technical constructs, such as infrastructural and policy concepts, to address development priorities. These can be understood as 'black boxes' which simplify complex and networked dynamics (Rice, 2011; Rip and Kemp, 1998; Rydin, 2012). With increasing complexity, planning relies on tools, networks and processes

– a ‘black box’ – which can seem limited, invisible and constrained (Latour 1994; Rydin 2012; Lord 2012; Rosenberg 1982). Unpacking the black boxes of planning draws attention to the limitations of decision-making and the social construction of technologies and socio-technological systems and other regional and urban assemblages (Castán Broto et al., 2013; McFarlane and Rutherford, 2008). Arising from actor network theory (Latour, 1994) and adopted in socio-technical systems literature, the role of the black box is useful for exploring relationships between regional planning and infrastructure as regional planning can seem to lack a socio-technological systems perspective, even though planning is implicated in the regulatory, cognitive and normative rules of socio-technical regimes (Grin, Rotmans, and Schot 2010).

Both regional planning and infrastructure systems can rely on black boxes – each comprised of networks, techniques, technical components and knowledge – which mask those complex socio-technical relationships. Due to assumed knowledge, only the inputs and outputs of the black box are addressed in the policy process (Callon, 1991; Latour, 1994; A. Smith et al., 2010). Sustainable transitions acknowledges the leakiness of black boxes as alternative or competing ideas arise (Callon and Latour, 1981). It addresses the ‘taken for grantedness’ of stakeholder relations, technological systems and policy process by acknowledging that black boxes can be opened and challenged (Rydin 2012; Latour 1994). Sustainable transitions involve opening and unpacking black boxes in order to script change in socio-technical systems. These tendencies are not unique in Australia and, globally, have resulted in fragmentation in urban and regional contexts where projects, such as renewal and infrastructure initiatives, have assumed precedence over strategic spatial planning (Albrechts, Healey, and Kunzmann 2003; Marshall 2011).

In Queensland infrastructure planning has been integrated into regional planning, indicating that from governance and policy perspectives the region is seen as an appropriate spatial scale for identifying and responding to strategic infrastructure needs in relation to regional population and economic dynamics. This results in the linkage of infrastructure planning to strategic spatial objectives articulated by the regional plans (Regan, 2010). However this linkage has been described as weak, with Australian regions subject to technocratic ‘spatial engineering’ through highly politicised infrastructure decision-making (Dodson, 2009). Legacy’s (2017) and O’Neill’s (2010) findings about the changing nature of infrastructure planning indicates that the linkages are continuing to weaken as private interests dominate infrastructure planning. Infrastructure proposals and assessments do not just occur in and through government and planning as other outsourced and intermediary dynamics draw attention to regional infrastructure demands (Guy et al., 2012; McFarlane and Rutherford,

2008). These changes have regime effects as vested interests can resist change and jostle for dominance to assert a reproduction path. For Frantzeskaki and Loorbach (2010) change in infrastructure systems is significantly led and felt by regime actors and by necessity involves "change in planning and regulating cultures and practices, change in operating practices and change in the physical dimension of infrasystems by either expanding or developing new designs as well as change in use patterns and preferences". Brown and Bellamy's (2009) case study of Central Western Queensland found coalitions and networks form to advocate and lobby for infrastructure, such as an airport. This indicates that while regional planning plays a role in infrastructure, regional governance and policy networks, intermediaries (such as private sector stakeholders) and institutional agency can pre-empt or override it (Guy et al., 2012). In this case study, regional planning played a coordinating or mediating role through which regional actors articulated and negotiated claims (Bellamy and Brown, 2009).

Issues of financing, procurement, privatisation and partnering have assumed prominence in the discussions and contributed to the sectioning of infrastructure from spatial planning (Legacy, 2017; O'Neill, 2010; Productivity Commission, 2014). As a correction, Dodson (2009) proposes the "re-assertion of spatial planning as a strategic practice of intervention, management and coordination within urban regions" and examination of the "intersection of spatial planning, spatial strategy and infrastructure". The connection between strategic regional planning and infrastructure planning requires reassessment and improvement given the degree of political and spatial conflict it evokes including tensions between land use led and infrastructure led development (Monstadt, 2009; Neuman, 2011; SMART Infrastructure Facility, 2014; Todes, 2012). Enhanced connectivity between spatial and infrastructure planning can be directed to integration and spatio-technical problem-solving including, as O'Neill (2010, p. 11) proposes "[a] major re-think of what infrastructure is and how it should be delivered" including governance and financial arrangements while remaining faithful to visions of urban cohesion and sustainability. From a sustainable transitions perspective, this involves ensuring that the priority for transition is integrated with land use and spatial planning, as well as embedded in policy, regulation and procurement.

One example of specific attention to infrastructure system planning at the regional scale is SEQ's transport plan, *ConnectingSEQ 2031: An Integrated Regional Transport Plan for South East Queensland*, introduced by the State Government under the provisions of the *South East Queensland Regional Plan* and *South East Queensland Infrastructure Plan and Program 2008–2026* (Department of Transport and Main Roads, 2011). In order to develop strategic spatial strategy addressing mobility systems, there is a need for integration of land use and transport as well as integration between regional and local scales (Hale, 2011; Mees,

2010). This long-term transport strategy, which advocates sustainability, identifies potential projects without feasibility and financial assessment, indicating that each project will need to be addressed and assessed individually and secured through changing infrastructure procurement directives. While the plan proposes a comprehensive and systems-oriented approach, it remains tied to project-based or hardware-based implementation (Flyvbjerg 2005).

Many urban systems seek to optimise existing socio-technical processes rather than seek new or radical alternatives (Wittmayer and Loorbach, 2016). Bunker (2012) has found that infrastructure and transport plans can take precedence over metropolitan plans where infrastructure and transport proposals drive land use. Hale (2011, p. 174) also found that many planning initiatives are reliant on a 'predict and provide' approach which fails to identify and respond to the strategic importance of projects in relation to system performance and change. Sustainable transitions research that addresses transport systems acknowledges that transitions shares commonalities with planning. In Copenhagen and Portland, Driscoll (2014) found major project planning can fail to address both sustainability at the system level and regime change and system innovation, which are integral to sustainable transitions. Dimitriou, Ward and Wright (2012) also found that internationally mega-transport projects can lack means for addressing sustainable visions. Enhanced linkages of regional planning and infrastructure planning – or improved regional infrastructure system planning – can shape the relationship between regions and infrastructure, in terms of its multiscalar sustainability and system impact (Corvellec et al., 2013; Neuman, 2011) as well as its ethical and social significance (Heywood, 2010).

Significant deficits, gaps and inertia are evident at the system level, including in planning and infrastructure procurement, which are inhibiting orientation and problem solving towards sustainable transition pathways. In part this is attributed to the approach to integration of land use and infrastructure planning, potentially based on dominant policies for performance of infrastructure systems in previous development stages oriented to the short-term and systems components (Willems et al., 2016). In Cass et al's (2018, p. 106) examination of infrastructure intersections, they find success where planners have responded to infrastructure-practice relations, particularly at points of conflict, by "understanding and navigating through unique, situation-specific and shifting opportunities – defined by the infrastructures in question as well as their interconnections and interactions with other interests and actors, both living and dead". These navigations have enabled interventions such as electric vehicle charging stations in a built form determined more than a century ago, and spaces and paths for cycling arising from interactions between drivers and cyclists (Cass

et al., 2018). Such a perspective – which is inherently place-based, opportunistic, and reflexive – can inform a possible planning and sustainable transitions nexus. There is recognition that infrastructure regimes have become more complex, more resistant, more political and more privatised, while mounting landscape pressures are signalling the need for radical changes to occur.

2.2.3 Infrasystems in Transition

Examination of the role of cities in infrastructure transition and sustainability has gained significant attention (Hodson et al., 2012; Loorbach and Shiroyama, 2016; Moore et al., 2018). The networked and multi-scalar nature of infrastructure that facilitates flows between metropolitan and non-metropolitan localities also means that regions are significant locations of socio-technical systems (Heywood, 2010). Urban infrastructure is not isolated from regional and global processes and flows. Historically, infrastructure has been used as "a lever between increased resource consumption and urban sprawl" (Jonsson, 2000, p. 102). In urban and regional governance and planning, Hodson et al. (2012, p. 795) stress the importance of three considerations in relation to transition: "the degree of regime change required, the capability to enact such changes, and the ways in which there would be common understanding of the outcomes". This articulates a likely role for planning and policy and requires a shared understanding of sustainability and sustainable development among stakeholders who are able to identify windows of opportunity for socio-technical and system innovation across multi-level dynamics (Geels and Kemp 2007, 445). Transitions researchers have been developing a research profile for the role infrastructure transition and transition can play in sustainable transition (Bolton and Foxon, 2015; Frantzeskaki and Loorbach, 2010; Giordano, 2014; Markard, 2010; Markard and Truffer, 2006).

Infrastructure is spatial: it has spatial impacts and exists in space. Spatial awareness and analysis in transitions research has been addressed (Coenen et al., 2012; Hansen and Coenen, 2013; Truffer and Coenen, 2012) and research in infrastructure system planning has found deficiencies in addressing sustainability, integrated planning and long-term impacts (Carroli, 2018; Regan, 2010; Shibata and Sanders, 2010; Störmer et al., 2009). Giordani (2014, p. 184), for example, has found that "decision-makers favour short-term growth-enhancing, unsustainable infrastructures over innovative infrastructures that can contribute to a sustainability transition". For example, in a study of the economic impacts of road infrastructure investment in Spanish provinces, Matas et al (2018, p. 1682) found that the regional economic benefits of road investments were realised for those projects that "effectively reduce transport costs to the market, relieve pressure due to bottlenecks and/or

connect strategic parts of the network". That is, they were not grounded in modal shift, system dynamics, sustainable transport or considerations of socio-ecological impact; such decisions affirm the transport regime.

In transitions literature, infrastructure is examined in its network context as socio-technological networks or 'infrasystems' that are intrinsic to regimes (Castán Broto et al., 2013; Frantzeskaki and Loorbach, 2010). Because infrastructure systems are regarded as inflexible, difficult to change and vulnerable to path dependence and lock-in (Markard, 2010), this can result in 'wedged' options, often arising from regime resistance (Geels, 2014b), and inertia for many cities and regions. For example, in Corvellec, Campos, and Zapata's (2013) case study of waste management in Göteborg, Sweden, it was found that reliance on incineration prevented or locked-out the investigation and adoption of more sustainable waste management innovations. In the regional or urban setting, path dependence assures some semblance of stability for large and complex systems and protects the longevity of major public and private investments and assets (Egyedi and Spirco, 2011; Frantzeskaki and Loorbach, 2010). Incumbent technologies also inform planning with various spatial arrangements prevailing as a result of complex infrastructural assemblages that reinforce lock-in.

2.2.3.1 Infrastructure Regimes

Technology and infrastructures can be viewed as non-human actors in regional planning and transitions contexts. The affordability of fossil fuel and private car use, for example, entrenched carbon lock-in through expanding suburbanisation and housing styles and the need for increasing investments and planning for major road infrastructure. As infrastructure and socio-technological relations become entrenched as regimes, complex problems can emerge especially where shocks, for example resulting from resource scarcity and climate change, are anticipated. In response to these path dependent and locked-in situations, as Egyedi and Spirco (2011, p. 948) note, strategic interventions addressing de-entrenchment, niche management, momentum, and alternative path creation have developed. A further consideration and cost is associated with stranded assets (Erickson, Kartha, Lazarus, & Tempest, 2015), and infrastructure assets can be dormant for many decades before an adaptive re-use or rehabilitation is feasible. As infrastructure systems can also play a role in incubating change, Frantzeskaki and Loorbach (2010) propose that a system like transport, which is characterised by multidirectional flows, has more opportunities for innovation than optimisation and efficiency gains. They suggest possibilities in use and design alternatives, synergistic systems and social innovations as playing a role in regime changes, in

automobility and/or carbon regimes, which are also impacted by spatial patterns. Infrasystem transition, as a mode or type of sustainable transition with a direct relationship to regional planning, encapsulates and addresses these needs through its evolutionary frameworks. It recognises that processes of variation and emergence are integral for system change. Consequently, a focus on transport modes, while addressing a sustainable transport paradigm, is not constitutive of sustainable transport transition (Geels, 2012).

The composition and nature of regimes is highly contested in the urban context. For example, while Spickerman et al. (2014) establish multimodal mobility as a mobility regime, an 'agreed mix' could also result in what Geels (2012) describes as rearranging subaltern regimes that lack momentum for transition. Such speculations about the nature and structure of regimes highlight a need for greater specificity in research that addresses infrastructure regimes and their integration. With 'integration' as a key principle of urban planning, further investigation of the obstacles that Spickerman et al. (2014) identify is needed. Integration is at risk of occupying policy and governance discourse as an empty signifier, manifest through pre-figured solutions rather than complex problem solving. Mobility in the planning context is further examined by Switzer et al. (2013) who, like Næss and Vogel, focus on integrated land use and transport planning. Where Næss and Vogel (2012) point to the multi-segmented nature of land use and transport as regimes, Switzer et al. (2013) refer to the transport land-use feedback cycle to highlight hindrances that result in lack of integration and coordination. Socio-technical systems perspectives and analyses are providing insights to urban and infrastructural dynamics including an understanding of the role planning is playing in hindering and supporting transitions.

2.2.3.2 New Infrastructures

Planning and policy address normative concepts such as sustainable planning, sustainable transport and sustainable infrastructure. Sustainable infrastructure implies adherence to ecological sustainable development principles, and support for sustainable development and intergenerational equity (Jonsson, 2000). These terms not only have currency in planning research and scholarship, but also in policy, professional, and industrial contexts (Meadowcroft, 2000). Ferrer et al (2016, p. 9) found that research examining sustainable infrastructure has "evolved from social science to engineering, from concerns with 'urbanism' in the middle of the last century to the engineered network of facilities, infrastructure, and communication of urban spaces nowadays". Over three decades (1984-2015), research focus shifted from modernisation and modernism to climate change, greening, and digital cities. Ferrer et al (2016, p. 11) propose an expanded understanding of

sustainable urban infrastructure as concerned with networks other than utilities, housing and transportation. Sustainable urban infrastructure should also be concerned with:

> ascertaining whether the intake and consumption of resources are renewable and that all aspects of a complex network of people intertwine in the urban space through electronic equipment and communication networks (Ferrer et al., 2016, p. 11).

Conceptualising and defining sustainable infrastructures is highly contested, with researchers identifying opportunities for radically reconceptualising both what infrastructures are and the role they play in cities and regions. For Brown (2014) and Pandit et al (2017), the possibility of sustainable infrastructure is best understood as comparable to ecological systems. In formulating ideas about 'next generation infrastructure', Brown (2014, p. xii) proposes:

> It is possible to design and build infrastructure for transportation, water management, and energy that reduces ecological damage, climate risks, and construction and maintenance costs, while improving human health and creating the economic foundation for broad-based and sustainable prosperity.

More recently, research has turned to nature-based solutions which address sustainable transition from socio-ecological and governance perspectives and examine the policy, role and co-benefits of hybrid infrastructures and nature-informed innovation (Frantzeskaki, 2019; Frantzeskaki et al., 2020; Raymond et al., 2017). In this analysis, the purpose of infrastructure is grounded in human wellbeing not economic growth, and is fundamentally transformative and transformed. This perspective is also aligned to the urban ecology and infrastructure ecology perspective in which infrastructure systems are analysed like ecological systems (Nielsen, 1999). Rather than separate infrastructure systems or sectors – such as water, energy and transport – infrastructure ecology is concerned with the interrelationships of these sectors as vital for sustainability (Pandit et al., 2017). This would enable system design based on flows and processes, such as renewability, decentralisation, synergy, and adaptation, as integral to infrastructure system functioning. Infrastructural intersections, as examined by Cass et al (2018), highlight "some of the ways in which past and present infrastructures interact and shape each other". Changes in one infrastructure system can and will affect others due to their inherent connectivity. Such intersections are also place specific, such as the 'threading' of electrical vehicle charging infrastructure through cities with specific material and spatial constraints. Synergy is a compelling concept particularly where wasted resources are diverted and where infrasystems perform multiple

processes (Jonsson, 2000). These examinations of infrastructures as metabolic present system innovations that can support sustainable transitions.

Ongoing segregation of infrastructure presents potential problems of waste and duplication. Corridors and co-location have been acknowledged in system design, although Castán Broto et al (2013) recommends that sustainable infrastructures be attentive to integration, rather than iterating separate infrastructure systems. This means addressing long-term cultural and political persistence and change, as well as anticipation of technological change. For example, digital technologies are already playing a role in infrastructure systems and are forecast to play a significant role in the reconfiguration of infrastructural service provision, such as Mobility-as-a-Service (Spickermann et al., 2014). Other notions of sustainable infrastructure do not call for such a shift and instead focus on material relationships such as decoupling socio-ecological, resource and economic flows and impacts, life cycle assessment and accounting, and eco-innovation for efficiency and optimisation (Swilling et al., 2013). Such material and resource relationships are constitutive of metabolic processes that also include cultural, social, political, and ethical issues (Hodson et al., 2012). Transitions must also be attentive to the multiplicity of infrastructure systems and the ways in which they co-exist, interact and co-evolve.

2.2.3.3 A Role for Planning?

The challenge of infrasystem transition, as a socio-technological transition, is in part a regional planning challenge whereby system innovation requires address particularly in relation to breaking persistent unsustainable paths and creating alternative development trajectories. This involves multi-scalar intermediation and translation, where strategic directions are translated at the local level and for differing local contexts (Medd and Marvin, 2007, p. 325). For Neuman (2011, p. 100), infrasystem transition requires interdisciplinary and multilevel planning methodologies that account for ‘long-term lifecycle stewardship’ at the network scale. Such stewardship is based on a critical approach to infrastructure systems which triggers, as Corvellec, Campos, and Zapata (2013, p. 38) propose, “Asking the question “Are we in a lock-in?” [which] can serve as a practical starting point for sustainable urban transformations”. Regime changes and system innovation, of which infrastructure transition is one aspect, are intertwined.

Not all aspects of transitions and regime changes can be articulated or represented in regional plans or other policies, especially given that these policies and plans can be enmeshed in the regime. Translation between transitions and policy making is required so for

transitions lessons for planners and planning to be explicit (Niki Frantzeskaki, 2019; Niki Frantzeskaki & de Haan, 2009; Niki Frantzeskaki & Loorbach, 2010). Deeper understanding of the forces that form, support, and trigger socio-technical change or societal innovation is required. These forces can be identified and understood in terms of how they act in a system and as part of three main components of a system: its material, cultural, and structural components. This approach requires a more systems-oriented approach to policy making that accounts for both internal and external system dynamics and enables policy makers to appropriately intervene at different transition stages (Frantzeskaki and de Haan, 2009).

Sustainable transitions literature and research expresses limitations and critique of planning that indicates a search for new methods, policies and governance approaches that engage uncertain futures and contingent conditions (Balducci et al. 2011; Albrechts et al. 2003; Albrechts 2006; Gunder and Hillier 2009). Transitions scholarship also developed tools and methods, such as the MLP and transition management, to enable transformative process. While these were found to be limited in their application to real life urban settings, they were also found to be extendable and flexible. In applying alternative methods and a socio-technical systems perspective, planning can engage in more reflective practice or learning to address spatial and socio-technical problems (Raynor, Doyon, and Beer, 2017; Truffer, Störmer, Maurer, and Ruef, 2010b).

In averting a command and control or rationalist approach to policy, Malekpour et al (2016) propose a more exploratory approach in urban and regional planning. Rather than privileging existing socio-technical configurations and relationships, systems and exploratory approaches attend to anticipation and consideration of what is changing or what should and can change within a system. More exploratory approaches can result in a turn from usual rationalist and predict and provide approaches (Malekpour et al., 2016; Störmer et al., 2009). Another proposition for infrastructure planning to challenge dominant policy paths, particularly in renewal stage, include initiating small scale exploratory approaches where long-term timeframes and uncertainty are considered through scaled and integrated multi-component approaches (Willems et al., 2016). Learning is essential for these changes to occur. Sustainability transitions provides an analytical and theoretical approach that offers novel approaches to sustainable development and planning, particularly in adopting a strategic outlook and exploratory approach (Quitzau et al., 2012; Wittmayer, Roorda, and Steenbergen, 2014; Wittmayer et al., 2015).

These approaches also allow for previously discarded options to be considered more fully, especially in times of crisis, where cities and regions may be addressing shortcomings of

maladapted infrastructures. Such a proposition is similar to those emanating from the planning discipline for collaborative, participatory and relational processes (Healey, 1997, 2007b; Raynor et al., 2017). In applying an exploratory approach in a strategic planning context, Malekpour et al (2016) found a possible disconnection between the purpose and practice of public service (infrastructure provision), where planning for societal needs, often framed as liveability, conflicted with operating public services or infrastructures as primarily technical endeavours. The type of questioning or interrogation that arises from alternative approaches creates windows of opportunity for innovation in response to societal and environmental priorities or needs and uncertain conditions. These experiments and innovations in planning and policy processes assert that planning is insufficient in its current form to support sustainable transitions.

2.3 Conclusion

This chapter has provided and an overview of theory and research in sustainable transitions, as an emerging and interdisciplinary research arena, to identify relationships between sustainable transitions and infrastructure systems with attention to the role of regional planning in socio-technical systems. It recognises a tense but necessary relationship between socio-technical systems and regional planning in tracing transition paths. Sustainability issues and pressures require ongoing policy attention, but existing policy and planning processes and tools have been found to lack efficacy, reflexivity and impact where long-term and complex systemic and structural change is required. Sustainable transitions approaches have been applied in and adapted for sectoral, infrastructural, policy and regional contexts to de-lock unsustainable development, socio-economic decline and socio-technological path dependence and lock-in.

Transitions research focuses on socio-technological systems, and infrastructure systems or infrasystems are of interest because of their broad societal, ecological and economic impact and contestation. Societal transitions cannot occur unless infrastructure systems transition because much societal functioning at urban, regional, and extraterritorial scales is reliant on them. As large technical systems, infrastructures have significant spatial presence and socio-ecological impacts, playing a role in both shaping society and space. Both spatial planning and sustainable transitions address infrastructure systems as integral to the sustainability of urban and regional settlements. Sustainable transitions research examining infrastructure systems in primarily European urban and regional case studies has revealed the role of system innovations and learning in responding to path dependence and landscape pressures.

Disciplinary tensions are evident in relation to approaches to orienting towards sustainability and achieving sustainability objectives. Sustainable transitions research identifies planning as not only contributing to path dependence and lock-in, but also obstructing socio-technical change. That is, planning tends to strongly align with regime dynamics and is challenged by technological change, including digital technologies which are impacting socio-technical systems.

Urban and regional planning is also oriented to sustainability and informed by sustainable development frameworks. Planning plays a role in maintaining stability through incremental change. Research indicates that the relationship between urban and regional planning and infrastructure has eroded. The changing nature of infrastructure planning and procurement, particularly due to privatisation, has resulted in a more complex environment in which vested interests marginalise planning processes. Methodological aspects of planning are also found lacking in their ability to canvas and explore infrastructure options. Inertia in both planning practice and infrastructure systems has been found to limit infrastructure decision-making where preference is given to established systems and system stability even when pressures for system change are mounting. Sustainable transitions informed approaches and tools show promising results for system innovation and developing alternative pathways. The introduction of explorations and navigations in planning also allow for more open spatial and infrastructural problem solving.

The transitions field has undertaken work using case studies and many of these are European which can confer place-bias in its research methods (Sustainability Transitions Research Network, n.d.). There is a need to undertake research in non-European contexts to understand the mobility of sustainable transitions theory and methods. This includes urban and regional transitions. Spatial and scalar analysis and research of sustainable transitions has only recently attracted attention, notably by economic and political geographers who argue that sustainable transitions and socio-technical transitions are implicitly spatial and scalar. Knowledge of the spatial dynamics of sustainable transitions of infrasystems in other national contexts is needed to develop other locational understandings of transition dynamics. Regional planning can articulate and respond to transitions by grounding them and translating them in the planning process as both strategic and spatial issues, recognising that many of the interactions relating and relevant to physical infrastructure systems will occur at the regional and local levels. The next chapter will review literature addressing the themes of regionalism and policy process with a view to situating the spatial and policy implications of sustainable transitions and further bridging between sustainable transitions and regional planning.

Chapter Three

REGIONS AND POLICY PROCESS IN SUSTAINABLE TRANSITIONS

This chapter continues the thematic review of the literature focusing on the interactions between regions, sustainable transition and policy process. This focus drives towards acknowledgement of the region as an appropriate scale for governance and policy development and planning, as well as drawing on the geography of sustainable transitions which addresses spatial and scalar relations. It recognises that regional and urban planning is a policy locus where these themes converge and where spatial considerations are inflected in the policy mix. While Chapter Two recognised the socio-technical dynamics of infrastructure and the role of planning, this chapter primarily examines policy and regional processes in relation to sustainable transitions.

Geographies of sustainable transitions is a significant area of interest in transitions research (Binz, Coenen, Murphy, and Truffer, 2020). While much of this work has drawn on evolutionary economic geography and examined regional innovation systems (Binz, Truffer, and Coenen, 2014; Boschma, Coenen, Frenken, and Truffer, 2017; Marx, De Mello, Zilbovicius, and De Lara, 2014; Patchell and Hayter, 2013), the debates also reflect formations of new regionalism through attention to diverse flows, narratives, places, and relationships as constitutive of the region. The embeddedness of technologies in cities and regions exerts significant influence in how those environments develop and interact. Regional planning is a policy response to these complex relationships, including shaping relationships between urban and non-urban land uses, often with reference to sustainable development principles. From a sustainable transitions perspective, the institutional nature of planning and its role in affirming dominant socio-technical systems can impact steering transition pathways. Despite these limitations, several theorists have posited a transformative role and collaborative process for planning, although such theory remains idealised and marginalised in practice (Malekpour et al., 2015).

Building on the examination of geographies of transitions, this chapter also examines policy as an essential element of sustainable transitions and their governance. Transition studies has cultivated research examining the relationship between policy process theories and transitions. Learning, essential for system innovation, is pivotal in this relationship. This

includes the recognition of windows of opportunity and innovation, such as the formation of policy or planning niches, in steering transition pathways. Policy learning and innovation can be stifled through haphazard policy transfer in the planning field. Policy windows or critical junctures have resulted in planning models that aim to constrain urban expansion, limit environmental impacts and develop more compact cities. This has realised re-emphasis on the role of infrastructure in shaping settlements and property markets through more integrated land use and infrastructure planning models, principles, and ideals. The policy learning and transfer processes involved in the shift from a sprawling to a more compact settlement pattern have important implications for the planning, procurement, and provision of infrastructure. Because sustainable transitions and their governance are complex, the construct of policy mixes has gained currency in transition studies. Policy mixes emphasise a policy system comprised of instruments, processes, and actors that has developed over time. As such there can be gaps and inconsistencies in policy directed to sustainable transitions. In the sustainable transitions context – where visions are expressed in terms such as 'low carbon transition' or 'zero net emissions' – regional and infrastructure planning plays a role in the policy mix particularly where those goals lack complexity (Swyngedouw, 2010).

3.1 Sustainable Transitions and Regions

Regions and cities are foundational for socio-economic organisation and human development at the local and global scale. All human and social activity is spatial with geography constitutive of the social (Castells, 1983, p. 311; Warf and Arias, 2009). Regions are constitutive of the spatial dimensions of governance and policy flows, the allocation of resources, and socio-economic and socio-technological relations. They are not merely empty territorial envelopes in which societies act but they also shape social action and development. Regional perspectives also address spatial and political constructs such as place, locality, scale, networks, and territory (Jonas 2012; Jessop, Brenner, and Jones 2008). Even though technological systems display many similar tendencies across different contexts, they also develop in ways that reflect their timing and place (Cass et al., 2018; Hodson and Marvin, 2010; Hughes, 1983; Kivimaa and Kern, 2016). Due to global complexity, several theorists argue that urban and regional spatial scales are appropriate for addressing sustainability, sustainable development, and sustainable transitions (Rees 1999; Counsell and Haughton 2004; Wheeler 2009; van Zeijl-Rozema et al. 2008). In the Australian context, the Federation is comprised of national and State Government, with Local Government enacted through state legislation. Regional level governance and decision-making involves multiple local authorities - particularly in urban regions. Spatial

awareness is relevant for sustainability transitions, because, as Warf and Arias (2009, p. 1) state, "*where* things happen is critical to knowing *how* and *why* they happen" (emphasis in original). That is, different regions and their governance, policy, and planning processes will respond and innovate differently in relation to sustainability transitions, socio-technical systems, and path dependence.

Regionalism is understood as the focus on regions as policy, socio-economic and governance realms, often acknowledging and based on bottom-up processes (Collits 2007; Bellamy and Brown 2009; Morgan 2004). It has attracted mixed attention in theory and policy for much of the last century with a resurgence in regional theory and research in the late 20th century (Glasson et al. 2007; Wheeler 2002). Regional thinking and theory, particularly in relation to planning, also engaged evolutionary and systems-oriented theoretical perspectives as articulated by Geddes (1915) and McLoughlin (1969). Since the mid-20th century, regionalism developed as a spatial and scalar policy process for the comprehensive organisation of resources and development of economic territories (Friedmann and Weaver, 1979; Weaver, 1978). Regions are acknowledged as an appropriate scale for policy, planning and other society-shaping interventions (Friedmann, 1965; Weaver, 1978). Continuing theorisation of regional development, urban regions, and regionalism addresses the locational, institutional, and spatial relations of endogenous and exogenous drivers of socio-economic growth and decline (Weaver 1978; North 1955; Wheeler 2002).

Over several decades, interest in regions as a regulatory and governance scale has been revived. This is attributable, in part, to the acceleration and impact of globalisation, the rise of the urban region and state restructuring (Brenner 2004). Framed as 'new regionalism', this interrogation and theorisation of the region has researched institutional capacity and relations, innovation, sustainability, regional development and policy. Multiple new regionalisms have emerged, reflecting experiences of the global north and south (Wheeler 2002), and its theoretical influences can be traced to new institutionalism, economic sociology, network theory and evolutionary economic theory especially Schumpeterian theory stressing the importance of endogenous conditions in regional development (Rainnie and Grant 2005, 9–10; Amin 1999).

3.1.1 Sustainable Urban and Regional Transitions

Sustainability transitions, and the tools and methods that have emerged from it, have been critiqued for the lack of spatial and scalar awareness, although research that engages transitions at a regional or urban scale has contributed significantly to the development of

sustainable transitions thought (Coenen et al., 2012; Hansen and Coenen, 2014). Such thought considers the role of cities and regions in the co-evolutionary dynamics of sustainable transitions. Urban and regional planning often emphasises sustainable development and is a highly institutionalised policy process for redirecting development towards more sustainable paths (Albrechts, 2008; Albrechts et al., 2003; Rydin, 2013). The global impact of sustainability and unsustainability necessitates engagement at all spatial scales (Zuindeau, 2006) including the regional level which Benneworth, Conroy and Roberts (2002, p. 201) describe as "appropriate for the introduction of integrated sustainable development, given the poor 'fit' of many existing national policies to regional circumstances". The magnitude of socio-technological systems, particularly infrastructure systems, necessitates spatial approaches that account for both the role of cities and regions in transitions and the spatial dynamics of transitions (Guy et al. 2012; Hodson and Marvin 2010). Hodson and Marvin (2010) argue for transitions to address the importance of places in socio-technical transitions as well as for clarification of transitions thinking as it applies to the urban.

Regions are not singularly bounded territories. They are formed through the politics and interactions of globalisation, redefined roles of nation-states and multi-scalar governance (Agnew 2013). Regionalism at the international and sub-national levels has refracted as 'regionalisms' (Agnew 2012). This sense of multiplicity, elasticity and heterodoxy is reflected in formulations of new regionalism drawn from economic geography and political economy in response to the impact of globalisation (Glasson et al. 2007; Wheeler 2002). Regions are selectively imagined as discursive constructs linked to subjective, structural, and agency oriented tendencies and accounts (Lagendijk, 2007). This includes their institutionalisation through "historically contingent social processes" and networks that extend beyond spatial and political boundaries (Paasi, 2011) and what Jonas (2012, p. 263) describes as "contingent 'coming togetherness'". These ideas of process and contingency support the institutionalist perspective, as expressed by Amin and Thrift (1995; Amin 1999), as they relate to the complex processes through which regions emerge and change, including the influence of tacit knowledge (Gertler, 2003; Polanyi, 1966) and untraded dependencies (Storper, 1995) which can enhance regional capacities and actor relations.

In differentiating between structural and subjective (or agency-oriented) regionalisms, Lagendijk (2007, p. 1194) identifies a need to "embed ... 'softer' notions in a more structurally and historically oriented account with more emphasis on broader political-economic conditions and transitions". Regions are historically constituted as a result of policy, resource, spatial and institutional processes and structures that can interact at, and

across, all scales (Massey 1979; Agnew 2013). Paasi asserts that regions 'become' or evolve (1991). Evolutionary perspectives, particularly articulated as the integration of evolutionary economics and economic geography, also seek to offer explanations for regional fortunes and formation (Boschma and Lambooy 1999; Martin and Sunley 2006; Martin 2012). Tendencies such as path dependence and localised learning, as facets of adaptability and adjustment, can emerge in industry, institutions, and development in the regional context. Such spatial and relational processes not only demonstrate the strategic determinacy of regions, but also the plasticity of regionalism. Regional futures is a focus of policy and research and from a transitions perspective the pathways that create these futures steer away from unsustainable conditions – carbon intensive, polluting, wasteful, unhealthy, and resource intensive – to sustainable and future enhancing conditions (Coenen, 2017; Doyon, Coffey, Moloney, and Bosomworth, 2017). Development is addressed socially and contextually, resulting in considerable variability and variety in regionalism including regional and sustainable development strategies, regional governance, regional planning, and regional transitions.

The spatialities of economic development have historically and normatively been couched in terms of growth and competitiveness. Zuindeau (2006) argues that the spatial dimension not only raises new questions in relation to sustainability and sustainable development, but also reveals conflicts in addressing and operationalising sustainability. These conflicts result from the exchange between differing logics of sustainability and competition. Even where regions, cities and towns subscribe to sustainability initiatives, sustainability logics compete with economic logics (Zuindeau, 2006), as well as impositions of political practice and state space (Goodwin, 2012). Transitions approaches, such as transition management, are more responsive to complex conditions and can tool regions with an integrated governance framework that challenges normative regional development constructions of growth and development (Doyon et al., 2017). Therefore processes and means of mediating and managing tensions and shaping regional leadership are required to create networks and strategies that embed regional and inclusive understandings and approaches to sustainability and sustainable transitions (Ayres, 2014; Benneworth et al., 2002; Dawley, Pike, and Tomaney, 2010; Hodson, Marvin, and Späth, 2016; Pape, Fairbrother, and Snell, 2015).

Regional diversification is a necessary dimension of urban and regional transition pathways. While some related diversification is likely, unrelated diversification is more difficult yet more necessary for regional transitions, particularly non-urban transitions (Boschma, 2015; Boschma et al., 2017). A high degree of place dependence is evident in relations where "the local reproduction of localized knowledge, territorial institutions and vested interests

embedded in places, which tends to hamper processes of unrelated diversification of a regional economy" (Boschma et al., 2017, p. 7). A reinforcing relationship between place and path dependence is evident and challenges spatial restructuring in steering towards compact, connected and coordinated cities and regions. The city and region are not only a context for transitions, but are also undergoing transitions. Glass et al (2019, p. 1652) propose that analysing regions through infrastructure develops a perspective of "the vital discursive and material elements through which regions worldwide are produced, structured and struggled over". Examination of 'infrastructural regionalism' finds that the development of infrastructure and regions are mutually reinforcing and constitutive (Glass et al., 2019). There is scope in infrastructural regionalism for sustainable transitions to generate alternative discursive, network and material relations. Spatial reconfiguration recontextualises the deployment or redeployment of infrastructures and socio-technical systems (Hodson et al., 2016; Rutherford, 2020).

Evolutionary economics and geography research emphasise evolutionary and complex systems approaches (Boschma, 2015; Christopherson, Michie, and Tyler, 2010; Dawley et al., 2010; Hassink, 2010; Pike, Dawley, and Tomaney, 2010) which accommodate adaptation and adaptability, particularly "the long-term capacity of regions to reconfigure their socio-economic structure" (Boschma, 2014, p. 734). This reflects definitions developed by complexity theorists, such as Folke et al. (2002), addressing adaptive capacity and adaptability. Evolutionary and complexity accounts are compelling because they shift from a balanced equilibrium account to a relational and dynamic account of sustainability and regions as complex adaptive systems that includes self-organisation and emergence (Camaren and Swilling 2014; Martin and Sunley 2006; Pike, Dawley, and Tomaney 2010). In European sustainable transitions studies in both metropolitan and non-metropolitan regions, transitions plays a role in seeding alternative and new industries for renewal (Späth and Rohracher, 2010) as well as shaping land use regimes that support those industries.

The framing of regional sustainability and sustainable transitions represents a heterodoxy that cleaves the hegemony of competitiveness and growth discourses, while assuming and pursuing alternative development pathways. Bristow (2010, p. 158) and Donald and Gray (2019) are critical of domination of regions discourse, theory, and research by success and competitiveness narratives. They argue for alternative approaches and new imaginaries that are context specific and chart alternative and adaptive development pathways. Sustainable transitions research is also identifying this need through its emphasis of visioning, complex systems and paths. With reference to Australian regionalism, Collits and Rowe (2015, p. 82) draw on Amin (2004) to argue that regions are better understood as "bundles of relations" or

relational complexity (Paasi, 2013) enmeshed in global networks of distribution, production and communication. That is, regions are openly networked and require an action-orientation, with attention to broader domains, to create value and promote a more equitable type of development.

3.1.2 Geographies of Sustainable Transitions

Transitions are spatial in that they can be reliant on spatially contingent, place-based and relational processes and power dynamics. Transitions can also rely on leveraging socio-spatial relations as constitutive of transitions pathways (Zijlstra and Avelino, 2012). Even where transitions may be multi-scalar, local conditions will influence how transition pathways develop. Hansen and Coenen (2014) observe that the tendency in transitions research has been to layer spatial and transitions thinking rather than develop integrated approaches or change the ways in which planning, for example, is practiced. In their examination of energy transitions, Bridge et al (2013, p. 331) propose "the low-carbon energy transition is fundamentally a geographical process that involves reconfiguring current spatial patterns of economic and social activity". They further argue that recognition of the spatial dimensions of transitions can generate broader choices for low carbon pathways.

Awareness of spatial and scalar transition pathways and dynamics has developed in sustainability transitions research (Coenen and Truffer, 2012; Markard et al., 2012; Raven et al., 2012; Truffer and Coenen, 2012). European-based investigations of sustainable transitions at the regional and city scale as well as examinations of the geography of sustainable transitions has occurred (Hansen and Coenen, 2013, 2014). This body of research has addressed the scalar and spatial dynamics in sectoral and infrastructural networks, system innovation processes, institutional embeddedness, social values and practices, place-based practices, and post-positivist geography and economics emphasising relational and evolutionary dynamics. The co-evolution of policy, governance and system innovation at the regional scale is also acknowledged in processes of visioning, niche development and creating alternative development paths (Essletzbichler, 2012; Sengers and Raven, 2015; Späth and Rohracher, 2010). The spatial and scalar dimensions of system innovation and transitions, and the policy processes it involves for urban and regional futures, warrant further investigation in the Australian context (Coenen, 2017).

The significance of place-specificity in sustainable transitions has not been sufficiently established in tandem with alternative frameworks for examining transitions (Hansen and Coenen, 2014; Murphy, 2015). Some studies have been undertaken that examine regional

and multi-level energy transition (Bridge et al., 2013; Essletzbichler, 2012; Späth and Rohracher, 2010), policy mobility and bus rapid transit (Sengers and Raven, 2015), and urban transition labs and other aspects of urban transition (Nevens et al. 2013; Hodson and Marvin 2009). Several European cities have also trialled transitions approaches to socio-technological systems (Corvellec, Campos, and Zapata 2013; Burdett and Griffiths 2014; Hodson and Marvin 2009; Hodson and Marvin 2010). Because most transitions research and policy making has been undertaken in northern Europe, Lawhon and Murphy argue that it is already geographically bound in culturally cohesive policy systems. Accounts of hybridity and experimentation in relation to other regional and cultural contexts, especially the global South, are emerging (Bai et al., 2010; Lawhon and Murphy, 2012, p. 363).

Place-based dimensions of transitions are also examined by Murphy (Murphy, 2015) who proposes that geography can contribute to transitions studies by recognising that places and socio-spatial dynamics play a role in political and policy processes. Späth and Rohracher (2010) applied a transitions approach to 'vision building' in an Austrian energy region with the purpose of developing a guiding or intentional image for a sustainable regional energy system. Späth and Rohracher (2010) contend that vision building establishes a 'discursive niche' and the region acts as a discursive space. This is consistent with other case studies which identify the importance of vision in narrating a radical alternative or spatial imaginary (Frantzeskaki and Tefrati, 2016; Nevens et al., 2013). Like the Netherlands, there is significant effort in developing a discourse or storyline of transitions that powerfully links place, at national and regional levels, and vision (Smith and Kern, 2009). In Späth and Rohracher's case study of Murau in the Upper Styrian, Germany, which had experienced population and economic decline, a vision building process established a new discourse for regional identity and a development pathway based on energy transition. It resulted in experiments involving 'discourse coalitions' and other actor dynamics at the regional level. In linking sustainability, regional development and economic geography discourses, the visioning generated intentionality as part of a process of regional system innovation. Discourses and narratives are an integral part of institutional processes and system transformation, and through them transition agendas can be established in regions (Späth and Rohracher, 2010).

Sustainable transitions frameworks can be applied in regional settings through the development of territorial sensitivity or territorial flexibility. This can yield greater understanding of the role of institutions, actors, and multi-level networks enmeshed in transitions at a regional level and at multiple scales. Hansen and Coenen (2014) examined research that adds spatial sensitivity to transition studies and found that the role and

influence of place and scale in transitions is required to provide more diverse and challenging theorisation of transitions including the spatial relations of system innovation. For transitions to occur, spatial and place based relationships need to be understood especially where regional economies are enmeshed in and reliant on unsustainable regimes, such as in resource and agricultural regions, in bioregions threatened by expanding industrial, urban, and extractive activity, or in urban centres where agglomerations of regime incumbents and vested interests exert political and spatial influence (Geels, 2014b). Additionally, particular settlement patterns in urban regions also entrench regimes and the deep cultural patterns of landscapes, such as low density, sprawling and automobile dependent regions and sub-regions (Zijlstra and Avelino, 2012).

The geographic or spatial critique of sustainable transitions significantly addresses an economic geography perspective, although other disciplinary perspectives, including political science and ecological perspectives, are also emerging (Coenen, 2017; Coenen, Benneworth, and Truffer, 2011). Hansen and Coenen (2014) also identified recent research as tending to focus on the formation of innovation spaces rather than their impact on system change. Their analysis offers guidance in exploring a potential role for planning in sustainable transitions, and in spatialising transitions, recognising the spatial, co-evolutionary and relational dimensions of socio-technical systems and path shaping (Bridge et al., 2013). Shove and Walker (2007; 2007) stress the importance of place, as a contextual and determining factor of transitions, and their critique of transitions is that it does not address systemic and spatial power and political intensities. Transitions for Walker and Shove (2007) are contingent and anticipatory as well as politically intense, particularly in relation to the definition of systems, the determination of desirable interventions, and the space and scale of the transition. Lawhon and Murphy (2012) also recommend greater spatial awareness in transitions drawing on political ecology. This is particularly relevant in addressing socio-technological systems and tempering the technological emphasis of sustainability transitions. Together with Shove and Walker (Shove and Walker, 2007, 2010; 2007), Lawhon and Murphy propose that socio-spatial processes play a formative role in knowledge creation and power relations.

Planning is inherently spatial and addresses change over time and in relation to space and scale. While a difference between planning and sustainable transitions has been identified, some research endeavours to bridge them with emphasis on urban or city-scale planning (Voß and Kemp 2005; Voß and Bornemann 2011; Wittmayer et al. 2015; Malekpour, Brown, and de Haan 2015). However, the specific and prospective exchange between regional planning and sustainability transitions – or any potential hybridity - has received

marginal attention (Bush et al., 2018; Morrissey et al., 2018). In part this is attributable to a region-urban divide where the urban is addressed as an intensified socio-technical agglomeration for sustainable transition (Hajer and Versteeg, 2019; D. Loorbach and Shiroyama, 2016). In Wittmayer et al.'s (2015) comparative study of sustainable transitions and Agenda 21, as policy and governance frameworks in the European context, found that both have a role to play in addressing sustainability from a planning and policy perspective. Agenda 21 is applied as a framework to benchmark planning for sustainable development (Meadowcroft, 1999b). Agenda 21 provides a comprehensive strategic framework for sustainable development, while transitions approaches promote experimentation and learning that inform selection and variation in an evolutionary sense (Wittmayer, Feiner, Piotrowski, Steenbergen, and Baasch, 2013). Australian case studies (Bush et al., 2018; Doyon, 2018; Malekpour et al., 2016; Morrissey et al., 2018) indicate that metropolitan and regional planning and sustainable transitions experience tensions which are difficult to resolve without changes to planning. The sustainable transitions perspective highlights the role of planning in maintaining regime stability and locking out disruptors. Sustainable transitions represents a break or difference from traditional urban and regional planning and can present alternative opportunities in cities and regions.

3.1.3 Sustainable Transitions and Regional Planning

In investigating the relationship between sustainable transitions and regional planning, it is acknowledged that several descriptive terms are in circulation, including planning for sustainable development, planning sustainability, and others. Kenny and Meadowcroft's idea of 'planning sustainability' (1999) stresses the need to prioritise sustainability over sustainable development, as it is discursively possible and potentially desirable to decouple ideas of 'growth' and 'development' and to recognise the strategic dimensions of sustainability beyond growth oriented pathways or visions. This is important to define a difference between sustainable transitions and sustainable development and to elevate both the goal of sustainability and what it means in policy and social domains. Diverse influences operating at multiple scales have coalesced to drive changes in regional planning and policy, such as the introduction of strategic approaches to planning, which has enabled innovations (Albrechts, Healey, and Kunzmann 2003; Albrechts 2006; 2004; 2008).

Acknowledgement of sustainability has meant that a principal policy focus on land use was untenable for proponents of urban and regional planning initiatives (Albrechts 2004). According to Albrechts, strategic approaches to planning "frame[s] the activities of stakeholders to help achieve shared concerns about spatial changes" (2004, p. 749) through

the development of strategic visions, goals, and objectives which guide development (Albrechts 2004; Chapple 2015; Healey 2007a). These strategic approaches to urban and regional planning also emerged as a response to regional development (Chapple, 2015, p. 24) which imbues a global perspective because many actions at the regional or sub-regional scale have multi-scalar impacts. Such complex relationships benefit from a relational or collaborative approach and a relational response within a spatial frame (Healey, 1997, 2007b).

The expression of sustainability or sustainable development as a planning principle or goal does not assure a common vision, although the articulation of vision does establish pathways reflecting the 'willed future' (Martin and Rice 2013; Ozbekhan 1969). Much planning research examines both the diverse interpretations of sustainability and sustainable development in policy debates and the conflict over appropriate responses in planning (De Roo and Porter 2007; Counsell and Haughton 2006; Haughton and Counsell 2004). Hillier (2011), for example, calls for planning to embrace a more speculative, exploratory and post-structural approach that engages complexity (Christensen, 1985). The need for an exploratory approach that stretches boundaries of planning process and practice is also identified by Malekpour et al (2016). Planners can play a mediating and intermediary role among diverse stakeholders in the development of sustainability definitions and principles that are applied in plans and policy, and across government, non-government, and private sectors (Counsell and Haughton, 2006; de Roo and Porter, 2007; Hodson and Marvin, 2010).

Sustainability is not exclusively a matter of balance and preservation, but of integration, navigation, and mediation of dynamic systems and innovations that are multi-scalar and multi-level, while equally place-based or contextual. In their study of English regions, Haughton and Counsell found that the use of sustainability terminology failed to build consensus as "different actors sought to define and adopt the term in often contradictory ways" (2003, p. 237). Such accounts present questions about the capacity and role of urban and regional planning for addressing complexity, instability, and uncertainty particularly in highly conflicted and agonistic situations (Christensen, 1985; Hillier, 2007; Zuidema and de Roo, 2004). These accounts also propose openness in planning that engages transformative and innovative action both in terms of the planning and subsequent implementation (Ziafati Bafarasat, 2014).

As planning is both an 'institutionalised practice' and influences institutionalisation (Buitelaar, Lagendijk, and Jacobs, 2007), it can both catalyse and obstruct attempts at reinvention (Hartman and de Roo, 2013, p. 557). Transitions approaches were applied to

policy in the Netherlands because other policy tools, including spatial policy, were found to be ineffective (Kemp et al., 2007). In examining the relationship of policy to institutional change and system innovation, the dichotomy of design and evolution can cleave thinking in relation to policy and in relation to institutional pathways (Buitelaar et al., 2007). Planning horizons are also a central consideration and Bunker (2012) has argued that metropolitan planning in Australia is more suited to a medium term focus rather than a long-term outlook, which differs from the proposed long-term vision for sustainable transitions. In transitions literature and case studies, planning is framed as a limited policy platform for addressing the spatial dimensions of sustainable transitions (Carroli, 2018). The acknowledgement of sustainability as a strategic issue with spatial implications assigns a role for planning in progressing sustainable development. While this has led to the inclusion of goals for environmental protection, social equity, and economic domains in strategic spatial plans, the role of planning in sustainable transitions warrants further negotiation and navigation.

3.1.3.1 Strategic vs Static

In reflecting on the European experience of planning, Albrechts (2004, p. 750) distils the typical objectives of regional plans, all of which have sustainability implications, as "to articulate a more coherent spatial logic for land-use regulation, for resource protection, for action orientation, for a more open type of governance, for introducing sustainability, and for investments in regeneration and infrastructure". In Australia, particularly in plans for urban regions, a distinctly Australian planning paradigm has developed that addresses sustainable development as well as spatial arrangements in terms of long horizons, infrastructure coordination, strategic involvement of the private sector and market, and the relationship between state and local controls (Searle and Bunker, 2010, p. 106). However, the magnitude of challenges facing Australian cities and regions, such as climate change, require broader policy orientation and intervention than a focus on infrastructural and spatial arrangements (Dodson, 2009; Searle and Bunker, 2010; Steele and Gleeson, 2009). These needs are not well served by traditional planning which Webb et al (2018, p. 65) critique as focusing on

> urban form and design that is often formulaic using old 'planning manuals' and neglecting people and 'place-making'; planning not well connected to urban 'processes' and 'metabolisms'; political lobbying of powerful private interests distorting 'public good' planning; economic development considerations override planning principles.

The European experience is instructive for understanding the role and power of regional planning in governance and decision-making. Through several detailed case studies, Albrechts et al. (2003, p. 128) highlight the importance of shifting policy discourse and governance culture.

While relational, fuzzy and transactive forms of planning and governance are practiced in Europe (Healey 2007a; Allmendinger and Haughton 2009; De Roo and Porter 2007), Searle and Bunker (2010, p. 114) found that Australia's planning is relatively static, Bunker (2012) found that Australian metropolitan planning experiences inertia, rigidity and path dependency, and Dodson (2009) argues that a state focus on infrastructure dominates weak spatial strategy. In Queensland, planning reforms that reflect market based anxieties about flexibility and certainty, deflect attention from pressing sustainability priorities (Steele and Dodson 2014; Steele and Ruming 2012). Regional and urban planning in Australia ordinarily involves government and governance assemblages to undertake policy and planning (Bunker and Searle, 2009; Stilwell and Troy, 2000). However, Australian urban governance and planning has been critiqued as inappropriate for addressing the complex challenges and structural reforms facing cities and regions (Gleeson et al., 2010; Newton and Bai, 2008), with disconnection between Federal infrastructure expenditure, economic policy and spatial frameworks (Stilwell and Primrose, 2010). This inertia suggests that planning itself is challenged in reflecting and steering spatial, socio-technical, and network sustainability.

Regional planning as a policy process is concerned with spatial and strategic problem-solving in which innovation is both implicit and necessary (Allmendinger, 2002; Healey, 2007a). Healey proposes that this requires more attention on processes, means, participants, and actions in planning (2007a, p. 21). Gunder and Hillier (2009, p. 3) argue that the normative dimensions of its 'solution-led orthodoxy' inhibit the development of alternative spatial planning processes – or heterodoxies – and innovation. In complex problem solving, solutions are regarded as the source of more problems, and consequently there is a need to retain focus on the problem, rather than the solution, so that ongoing problem solving is undertaken, particularly in relation to wicked problems (de Haan and de Heer, 2015). Many problems are not easily solvable and, as Gunder and Hillier (2009, p. 1) argue, the aspirations expressed in many planning visions are "often illusions ... attained at best with limited success". Solutions are incomplete, ephemeral and contingent even when resulting from deliberation (Rittel and Webber 1973; Beers et al. 2006; Voß and Kemp 2005). Consequently, flexible and process oriented approaches with reflexivity and adaptation are proposed as more suited for complex and ambiguous problems (Voß and Kemp 2005; Voß and Bournemann 2011).

Despite its inherent incrementalism which can inhibit change, planning has played a role in enabling experiments and niche activities (Carroli, 2018; Malekpour et al., 2015; Moloney and Horne, 2015b). Like other policies, planning is process driven but dependent on institutionalised approaches that also inhibit and misrepresent change (Gunder and Hillier, 2009; Malekpour et al., 2016; Vogel, 2015). For planning to address radical change and socio-technical systems perspectives, some of these tendencies require either negotiation or reform, with flexible frameworks for problem framing and solving (Raynor et al., 2017). In planning theory, considerable attention is given to more open and collaborative approaches which are transformative, but which are rarely undertaken in planning practice. Non-linear development trajectories, as distinct from incremental change, can catalyse system innovation. This can be described as open-endedness or immanence, inferring a sense of becoming, emergence and otherness in which problem solving, like decision-making, is always incomplete (Gunder and Hillier, 2009; Hillier, 2007, p. 190). In identifying innovations and opportunities in, for and through regional planning, many critiques and case studies also identify its, as yet, unrealised potential with 'real life' planning practice rarely applying alternative methodologies (Albrechts, Healey, and Kunzmann 2003; Allmendinger and Haughton 2010; Chapple 2015; Healey et al. 2003; Hillier 2007; Gunder and Hillier 2009). One instance of a planning or policy experiment is the establishment of 'niche planning' in Denmark (Quitzau et al., 2012) in which a protected space was created to enable innovative approaches to planning for sustainable development. In Queensland, regional planning was initially introduced as a voluntary or non-statutory commitment. It has a sense of experiment and trialling leading to the introduction of statutory regional plans (Abbott, 1995, 2001). A similar niche space was identified in the spatio-temporal development and policy diffusion of bus rapid transit as a socio-technical configuration (Sengers and Raven, 2015). The intention is not to promulgate 'best practices' or 'planning models' but rather to exhort new planning epistemologies (Roy, 2005), offer critiques of rancorous and performative policy arenas (Hillier, 2007), and instil reflexivity, experiment and openness in planning as political, networked and emergent processes (Healey 2007b; Gunder and Hillier 2009; Grin, Rotmans, and Schot 2010).

Urban and regional planning processes in diverse national and regional contexts have been critiqued for their engagement with sustainable development. In turn, these can contribute to path dependence, inertia, and unintended consequences, especially where the power of physical forms is assumed to significantly determine human and social action and behaviour. Boelens describes current spatial strategy engagements with sustainable development as 'unconvincing' and ineffective for developing solutions in response to complex stresses and

politics (Boelens, 2010, p. 56). In detailing the Dutch experience and advocating for an actor-relational-approach, Boelens observes that the Anglo-American context has resulted in 'disappointing', long-term, sustainability frameworks such as new urbanism and smart growth. While Boelens proposes that an actor-relational-approach suggests a more actor oriented and interpretive planning approach than those more formulaic and prescriptive frameworks or 'empty signifiers' (Gunder and Hillier, 2009).

Despite recognition of sustainability as a relational concept (De Roo and Porter 2007), a continuing blueprint approach to planning has offered a static and stable outlook that, seemingly illusorily, eschews uncertainty, risk, and disruption (Fainstein 2005; Albrechts 2004; Gunder and Hillier 2009; Gunder 2013). This reflects Meadowcroft's (1999a, 1999b) assertion that sustainability is ambiguous and cannot be blueprinted and Gunder's (2013) proposition that planning is predisposed to the proliferation of fantasies, some of which are impossible, and Vogel's (2015) idea of hypocrisy in planning. Such fantasies and hypocrisies speak to promises of certainty in a sustainability which is inherently uncertain. Technological or infrastructural fantasies, in which infrastructure becomes an empty signifier, may also emerge. Yet prescriptive solutions and patterns are applied to diverse socio-ecological systems in urban and regional contexts without address of their ideological underpinnings or weight (Gunder and Hillier, 2009). Healey's proposition that the social construction of knowledge production calls for a social process that instils understanding (Healey, 2007a), highlights the need to integrate human agency and sustainability planning to facilitate social learning and problem-solving (or innovation) (Healey, 2007a; Meadowcroft, 1999a). Several theorists also propose that ongoing confidence in planning's potential social contribution has accompanied policy attention addressing sustainability (Owens 1994; Haughton and Counsell 2004; Rydin 2013). The scale and complexity of contemporary urban and regional challenges has resulted in calls for new governance, institutional, and policy approaches (Sanyal, Vale, and Rosan 2012; Gleeson, Dodson, and Sipe 2010; Salet, Thornley, and Kreukels 2003). As infrastructure systems are a prominent feature of both urban and regional planning and sustainable transitions, it is an arena in which to address the boundary and intermediation issues of such questions (Medd and Marvin, 2007; Owens, Petts, and Bulkeley, 2006).

3.1.3.2 Spatial, Social and Technological Change

A socio-technical perspective critiques planning for its incremental, regime bound and path dependent tendencies (Hernández-Palacio 2017; Geels 2012; Eames et al. 2013). Internationally, connections between urban and regional planning, sustainable transitions,

and socio-technical systems are under investigation (Malekpour et al. 2015; Adil and Ko 2016). Some of these studies and critiques conclude with an emphasis on reflexive, exploratory, participatory and discursive tools, processes and paths that would require change in planning processes and stakeholder relations (Truffer et al. 2010; Malekpour et al. 2015; Adil and Ko 2016). Planning is not well equipped to anticipate and address changing technologies and their distribution despite its articulation of integrated infrastructure and land use planning (McPhearson, Haase, Kabisch, and Gren, 2016). As Næss and Vogel (2012) found, planning approaches include systemic responses that are not necessarily reliant on 'taken for granted' technical solutions or new technologies.

Rapid technological change can be problematic for planning given the inertia of the urban environment, yet planning must be undertaken with, and in, multi-segmented regimes in ways that steer away from environmentally unsustainable types of development, infrastructure, and transport in a generally inert built environment (Næss and Vogel, 2012, p. 43). Multi-segmented regimes are proposed as a correction to the notion of the regime as a homogenous technological system. Rather, the multi-segmented regime is characterised by multiple technologies, consumer segments and practices, including diverse housing types and transport modes, particularly in Western neo-liberal cities and regions (Næss and Vogel, 2012). Adil and Ko (2016) examine the relationship between decentralised energy systems and urban planning, where centralised energy is prioritised in planning despite the uptake of decentralised energy systems. Adil and Ko (2016) argue for better incorporation of decentralised energy through processes such as collaborative planning, participatory approaches and an integrated systems approach. In their study of three decentralised energy systems, Adil and Ko (2016) found planning to be unresponsive to changing energy systems and their spatial and urban form implications despite their importance for climate change mitigation. In proposing such reconfigurations the intermediary role of planners in highly contested political, infrastructural, and territorial contexts is acknowledged, yet infrasystems can suffer from the regime effects of black boxing in planning (Hodson and Marvin 2010; Moloney and Horne 2015; Quitzau et al. 2012; Quitzau et al. 2013). These critiques indicate that more strategic forms of planning are needed to address the demands of sustainable transitions and socio-technical systems including integrated land use, infrastructure, and transport systems (Quitzau et al. 2012; Næss and Vogel 2012; Switzer et al. 2013; Truffer et al. 2010).

The application of the MLP in urban contexts has revealed tendencies in urban and regional planning that can inhibit and obstruct sustainable transitions. The piecemeal and incremental change that planning tends to support highlights the need for innovation in planning and the

need to meaningfully connect transitions and city-scale or region-scale thinking (Eames et al., 2013a). Planning plays a significant regime role, as Adil and Ko (2016) also demonstrate, particularly in terms of supporting stability in uncertainty as occurs in many urban regimes. The multi-segmented nature of urban regimes poses significant challenges for urban contexts as co-evolutionary processes need to account for systemic, multi-actor and multi-sector dynamics (Switzer et al. 2013). Wächter et al. (2012) propose that regional energy systems require greater problem solving and innovation as well as improvements in integrated planning and policy than planning presently provides, indicating that system changes are not well accommodated in planning.

In relation to infrastructure systems, urban planning and its engagement with sustainability has resulted in alternative framings and models of planning. This includes planning and policy grounded in sustainable transport and new urbanism, such as compact cities and smart growth (Zijlstra and Avelino, 2012). Sustainable planning, which has been part of urban governance worldwide for decades, provides niches which are intended to disrupt dominant paths of urban development from resource intensive sprawl to a more compact, more urban, less car dependent form. In turn this has renewed planning practice with alternative development and policy objectives. However, for Zijlstra and Avelino, as a niche that challenges the automobility regime, there is a need to address a broad range of socio-spatial dynamics. Malekpour et al. (2015, p. 74) advise that connections between planning and transitions need to be cognisant of planning's incremental modality. The form of these connections requires further examination, and may include developing and testing new tools. Hernández-Palacio (2017) examines urban policy and densification in Norway, applying the MLP and finding that planning policy cannot achieve sustainability objectives as the incremental change delivered through planning is not sufficient.

3.1.3.3 Challenging Planning

In their recasting of planning as better served by "long-term policy design", Voß, Smith and Grin (2009) identify reflexivity and institutional transformation as necessary for democratically addressing sustainability, heterodoxy and policy making (Pike, 2004; Torgerson, 2013). Reflexivity in governance, policy and planning means "[i]t understands itself to be part of the dynamics which are governed" (Voß and Kemp 2005, 4). Healey also proposes greater attention on policy processes where re-thinking policy processes can result in planning as a site for "generating policy ideas" in relation to the "transformative power of sustainability" (2007a, p. 36). It also means that planning must overcome its ambivalence and resistance (Fastenrath and Braun, 2018; Vogel, 2015). This view of policy making aligns

with Quitzau, Hoffman and Elle's (2012) proposition for policy niches or niche planning as an approach to planning that is more strategic than current planning practice. Questions of governance and transformative capacity also arise from research in urban and regional sustainable transitions (Hölscher, Frantzeskaki, McPhearson, and Loorbach, 2019; Wolfram, 2016b). Despite criticism and shortcomings, planning theorists continue to emphasise the potential of planning to address complex problems and issues. If the shortcomings are paradigmatic (Kuhn, 1970), as Ziafati Bafareset (2014) proposes, and due to capacity and capability limits, then transitions theory and research offers some alternatives and extensions to constrained and path dependent policy practices.

Even though planning and related policies articulate sustainable development and work towards greater efficiency, this has not resulted in radical change in urban regimes. Hernández-Palacio (2017) proposes that planning and policy instruments need to be changed through new regime rules and that a stronger emphasis on niche developments and experiments is required. Planning is revealed as highly regime bound and constrained, and unable to act as a vehicle for radical change without institutional reform and cultural change (Wolfram and Frantzeskaki, 2016). While scholars, such as Geels (Geels, 2012), acknowledge the importance of changing land use and transport priorities in planning at the city and regional scales, these changes have also been slow to catalyse widespread change. In part, this is attributable to the complexity, scale, and inertia of infrastructure systems. Certainly, in many cities, the growth of urban footprints has slowed or been redistributed, with a broader range of housing and transport choice, greater localisation and grassroots organisation (Zijlstra and Avelino, 2012). However, technologies alone, such as electric cars, are not a solution to the problems arising from automobility and intrinsic to the current transport regime. Spatial organisation plays a role in reproducing regime dynamics and obstructing transitions, which will ultimately require radically different configurations of space and policy at different scales. This is not a spatial determinist view, but recognises that greater scrutiny of planning and socio-spatial relations is required to grasp multi-scalar and transformative dynamics (Wächter et al., 2012; Wolfram, 2016a, 2016b; Zijlstra and Avelino, 2012).

3.2 Policy Process and Sustainable Transitions

Policy is an essential aspect of sustainable transitions and transitions governance that can influence both the trajectory and pace of transitions (Edmondson, Kern, and Rogge, 2018; Rogge, Kern, and Howlett, 2017). A growing body of research examines the relationship

between policy process and sustainable transitions, recognising that diverse policy instruments and mixes are required (Kern & Rogge, 2018; Reichardt & Rogge, 2016; Rosenow, Kern, & Rogge, 2017) and that policy resistance particular by regime incumbents is obstructive (Bosman et al., 2014; de Gooyert, Rouwette, van Kranenburg, Freeman, and van Breen, 2016; Fastenrath and Braun, 2018; Geels, 2014b). This literature also includes reference to policy learning, policy windows, and policy innovation as integral to the formation of policy mixes that steer sustainable transitions. In jurisdictions where transitions have been underway for some time, attention is also given to the co-evolution of system innovation and policy mixes (Edmondson et al., 2018). Regional planning, as a policy process, plays a role in the coordination of policies in changing urban and regional conditions (OECD, 2001). Regional planning is embedded in and in dialogue with the governance and policy systems, or institutions, that reproduce unsustainable development patterns globally (Cowell and Owens, 2006; Gunder and Hillier, 2009). While planning and policy has often curtailed environmental impacts, carbon emissions continue to rise in many countries, including Australia (Ndever Environmental, 2018). Institutions and policy develop through combined design and evolutionary processes (Edmondson et al., 2018). Policy does not, and cannot, always counter or control the externalities that shape society's production, distribution and consumption dynamics.

Planning continues to be a government-led process (Albrechts 2012; Searle and Bunker 2010) and is one element of policy systems responding to socio-technological development, often unable to achieve vision priorities (Hodson and Marvin, 2010). It not only adopts institutionalised paths that can result in path dependence and inertia, but can also reinforce incumbent regional path dependences, including infrastructural path dependencies. Propositions for renewed roles and aspirations for planning also emerge from research (Albrechts, 2008; Gleeson, 2012), implying learning and exploration in response to changing conditions rather than perpetuation of reactive and precautionary planning cultures (Birkeland, 2008; Malekpour et al., 2015). Sustainable transitions recommends 'exploratory transition policies' which facilitate learning-by-doing (Elzen et al., 2004).

Policy process theory can provide some insight into the role of planning in a more complex policy mix. This section of the literature review examines policy process and sustainable transitions through key concepts. Windows of opportunity are examined in relation to sustainable transitions literature and the multiple streams approach in which policy windows are a key feature. The role of policy learning is examined, acknowledging a relationship between policy learning, policy innovation and social learning. Learning is vital for transitions as it is a component of system innovation. The concept of policy mix is being

applied to transitions arenas to better understand policy mixes that support transitions. This literature includes frameworks for analysing policy mixes in relation to technology and sustainable transitions.

3.2.1 Windows of Opportunity

Windows of opportunity, which can include policy windows, are an essential aspect of sustainable transitions theory and research. In sustainable transitions, windows of opportunity tend to be moments in which external pressures or internal problems allow niche innovations that have gained sufficient moment to breakthrough to act in and on regime dynamics with varying degrees of impact (Geels, 2002; Nill and Kemp, 2009). Disasters, malfunction, and failure can often focus attention and create windows of opportunity for social and policy learning in relation to resilience and adaptation (Castán Broto et al., 2013; Furlong, 2014; B. Vogel and Henstra, 2015). As an ephemeral and liminal situation, the window of opportunity does not catalyse change. Windows of opportunity develop due to instability and provide an arena in which solutions can be matched to specific problems. In an infrastructure context, many of these problems and solutions have policy implications.

The metaphorics of windows of opportunity also act in broader socio-eco-technological global dynamics, recognising planetary limits. Environmental degradation and climate change impacts are such that time is lessening for action to limit temperature rise to below 1.5ºC or 2ºC as agreed in international commitments which feedback to national policy processes and evaluation of feasible sustainable transitions pathways (Turnheim et al., 2015). As these timeframes change, challenges and windows emerge for extending the window and/or addressing acceleration of transitions (Roberts et al., 2018). As climate change and environmental degradation are problems of global magnitude, understood as landscape pressures, they are contributing to destabilisation of regimes and creation of windows of opportunity for niche innovations (Geels, 2002). In a policy and governance context, capability and capacity is required to stimulate windows of opportunity and influence change deliberately, including to protected spaces for niches and acceleration of transitions to avoid the worst of climate change impacts (Roberts et al., 2018; Tukker, 2008). These are overtly political processes that involve diverse policy stakeholders, policy entrepreneurs and advocacy coalitions who can be self-organising and exert pressure to create policy windows (Grin et al., 2010b; Hartman and de Roo, 2013).

Policy windows are rare circumstances where different elements of the policy ecosystem align to focus on specific issues or problems. Kingdon's (1995) Multiple Streams Approach

"examines the process of making policies under conditions of ambiguity" (Zaharisadis, 2007, p. 83) and is applicable for understanding policy innovation and opportunity through policy windows. It contains five elements to produce a policy outcome: problems, policies, politics, policy windows, and policy entrepreneurs (Figure 3). Three of those elements are simultaneously occurring streams – problems, proposals and politics – which converge to create a policy window. A policy is developed in a political context with input from policy entrepreneurs who advocate for specific solutions. Kingdon (1995, p. 165) describes a policy window as an "opportunity for advocates of proposals to push their pet solutions, or to push attention to their special problems."

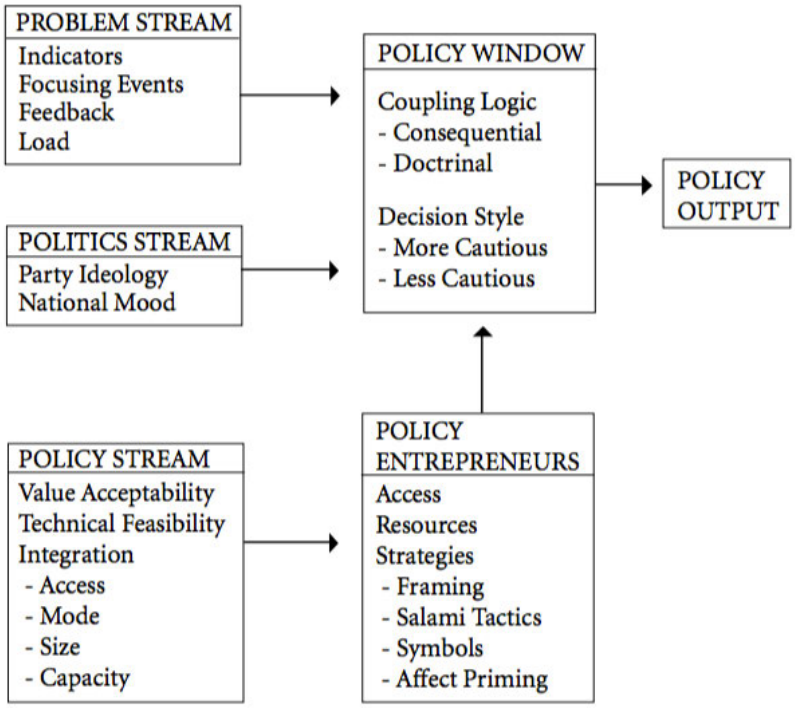


Figure 3. *Multiple streams framework*
Source: Zaharisadis 2007, p. 70

In a case study of Egedal, Denmark, Quitzau et al (2012; 2013) trace niche dynamics in relation to planning projects and energy efficiency where political changes, the election of a new mayor, resulted in policy window to innovate with planning processes. Key individuals, such as policy and planning coordinators, were also responsible for taking advantage of the changing political environment. The local authority's planning team found that the traditional planning framework was not adequate to achieve a highly energy efficient residential development. In response, the planning team deviated from standard procedures, which entailed a higher than usual level of risk, and enacted new planning regulations to achieve the project goals. The case study identifies the roles of institutions, politics and

individuals in developing responses to transitions problems. The policy streams require decisiveness and action that recognises convergence as a 'critical moment', resulting from external and/or internal pressures, through which a 'critical juncture' is possible. Critical junctures or contingent events are a necessary initial phase for choosing and establishing development paths (Pierson, 2000b).

Both policy windows and critical junctures are necessary for path breaking and creation. In an analysis applying Kingdon's multiple streams approach, Hartman and de Roo (2013, p. 559) observe that when regions specialise, this can spur a development trajectory in which "spatial-functional lock-in is reinforced by a cognitive and/or political lock-in" that involves vested interests, spatial patterns, and institutional settings (Hassink, 2005). That is, the three streams are neither fixed nor linear with contingency shaping opportunities. Kingdon's theory shares some similarities with Sum's modelling of five points or 'selective moments' in the production of hegemony, drawing on Gramsci and poststructuralist process (Lagendijk, 2007; Sum, 2004). Both Kingdon and Sum are concerned with contextual conditions that catalyse change, including discursive change, through the metaphor of 'window' to describe a circumstance of threshold or opening (Buitelaar et al., 2007; Lagendijk, 2007). Path dependence and lock-in are indicative of hegemony and power in that they involve institutional, discursive and socio-cultural settings as well as technologies. The introduction of regional planning in Queensland is also described as developing through policy streams and windows, where initial opposition by key stakeholders changed to support and resulted in a non-statutory process becoming statutory (Abbott, 1995, 2001). The introduction of statutory regional planning can be understood as a critical junction for policy and development paths in the state.

Internationally and in Australia, policy entrepreneurship, in which policy entrepreneurs act as 'agents of change' (Mackenzie, 2004), has been a viable strategy for policy innovation and mobility in planning (Tewdwr-Jones, 2012, p. 212). Policy mobility can occur when mobile knowledge workers, pioneers, and professionals, involved in planning and development can act as "transfer agents" (Sengers and Raven, 2015; Stone, 2004), policy entrepreneurs (Mintrom and Norman, 2009), or intermediaries (Hodson and Marvin 2009). Policy transfer is another strategy in which policies from one national or regional context are adopted in others. In Australia, this approach has been found lacking (Gurran, Austin, and Whitehead, 2014; Hale and Eagleson, 2015) as innovation and emulation are not commensurate with transitions or adaptive policy making (Peck and Theodore, 2010; Swanson and Bhadwal, 2009). Policy transfer can be framed in terms of 'best practice', which raises issues of validity and validation in relation to their determination and

ascendency to standardised or hegemonic practices and discourses (Stead 2012; Walker and Marchau 2003). Policy process concepts, such as policy learning and multiple streams, emphasise the importance of action, agency and interaction of diverse actors involved in collaborative policy transformation (Healey, 2009; Sørensen and Torfing, 2012).

Critiques of Kingdon's approach highlight that the multiple streams approach does not reflect the messiness of policy making, due to considerable overlap of the streams that can obfuscate the broader landscape (Mackenzie, 2004). Such messiness also includes bargaining and deal making as well as interdependence and interaction of the three streams (Zaharisadis, 2007). Policy-making is much more complex and networked than the theory describes (Sabatier 1988; Hajer and Wagenaar 2003) and to some extent Geels and Schot's multi-level perspective has sought to address that complexity by mapping system dynamics which include policy. Geels and Schot (2007a) further elaborated this through the identification of transition typologies. The three streams of the policy window do not directly correlate to the three levels of the multi-level perspective, and the sustainable transitions theory of 'guided evolution' recognises that "[c]ritical junctures are rare events in the development of an institution: the normal state of an institution is either one of stability or one of constrained, adaptive change" (Capoccia and Kelemen, 2007). However, the multiple streams approach is sensitive to the informational and political influence on decision-making. The problem-solution relationship is also prone to manipulation as solutions are understood politically rather than rationally; problems in search of solutions and solutions in search of problems (Zaharisadis, 2007). The multiple streams approach addresses policy systems as dynamic and evolving on the basis of interactions (Kingdon, 1995).

3.2.2 Policy Learning

Policy learning refers to diverse processes in relation to systems, networks and governance where knowledge is acquired collectively and collaboratively (Heclo 1974; Grin and Loeber 2007). For Grin and Loeber (2007, p. 201), "learning theories have sought to address the complex relation between power and knowledge in the policy process and to consider changes in ideas as a central factor in understanding policy change". This idea of meaning is inherently co-evolutionary in that meaning flows between society, government, and policy as learning and change. In this sense, learning in relation to espoused and tacit knowledge becomes a social, mutual, or collective process (Grin and Loeber, 2007). Networks and collaboration are stressed in policy literature as essential attributes for policy and system innovation in multi-actor settings and as symptomatic of network society (Rhodes 1997; Kickert, Klijn, and Koppenjan 1997; Hajer and Wagenaar 2003; Castells 1996). Policy

decisions are no longer solely determined by government in command and control mode and policy networks include non-government actors as stakeholders in policy decisions. Parsons (2004, p. 52) proposes that complexity means that policy making is geared for "letting go, fostering innovation, creativity and diversity rather than just improving steering and weaving capacity". Policy networks play a role in this process and establish stability for a heterogeneous group of actors whose interests in policy issues are interdependent (Rhodes, 1997; Sørensen and Torfing, 2012).

Policy networks perform different roles than governance networks (Blanco, Lowndes, and Pratchett, 2011). This is evident in Brown and Bellamy's (2009; 2010) case study of Queensland's Central West region which traces governance and policy networks in relation to a range of regional issues, and is represented as a network of networks where regional planning plays a coordinating or mediating role. The regional planning process may also potentially be involved in a type of meta-governance which "involves the use of institutional design, political and discursive framing, process management and direct participation" (Sørensen and Torfing, 2012, p. 9). A Regional Planning Coordination Committee was formed, as one of many groups working on regional issues, to inform the development and implementation of the *Central West Regional Plan 2009*. Such committees in a regional planning and policy context can also play a role in filling the 'institutional void', as described by Hajer and Wagenaar (2003) in terms of a discursive polity eliciting deliberative or deliberate policy-making (Brown and Bellamy 2010; Everingham 2009). For Hajer and Wagenaar (2003), policy-making is a site where identities, needs, and desires can be negotiated and contested in an agonistic public sphere that is inseparable from its social context, and the agency of the actors often involved in networked relationships (Hillier, 2007).

Policy innovation and policy learning are related concepts. Transitions theory addresses policy learning as a precursor to policy innovation and social innovation, and ultimately system innovation. Transitions research has also engaged with the policy entrepreneurship and windows of opportunity theory and practice, particularly in relation to discourse and transition storyline (Smith and Kern, 2009). This highlights the role of intermediaries and advocacy in the policy process who were able to seize opportunities to negotiate on agendas. With reference to Dutch policy innovations, van Buuren and Loorbach (2009) examine the value of establishing new spaces for policy experiments and renewal that can lead to institutional learning by introducing new institutional arrangements and realising breakthroughs in relation to system pressures and innovations. This approach is affirmed by Sørensen and Torfing (2012, p. 5) who propose that:

> [c]ollaborative innovation in the public sector can be enhanced by creating spaces outside but close to service production in which public employees with different professional backgrounds can collaborate with each other as well as with users, managers and policy experts to develop and test new innovative solutions in practice.

Planning has offered an arena for diverse policy processes including policy entrepreneurship and policy learning that advocates a range of planning solutions, such as smart growth and new urbanism, which have assumed 'discursive hegemony' (Hajer 1995; Sum 2004; Gunder and Hillier 2009). In Quitzau et al's (2012; 2013) Egedal case study, in recognising that existing planning frameworks were not suited to a specific planning task, a planning niche developed where policy learning in relation to the specific objectives resulted in policy innovation and the introduction of new regulations addressing sustainability and transition goals. Sustainability issues have necessitated the development of adaptive and new policies and policy processes. This can involve developing capacities and learning processes that respond or adapt to a changing policy and socio-technical context as in the case of bus rapid transit forming a socio-technological niche (Sengers and Raven, 2015). Heclo (1974) argues that policy involves both power imbalances and intellectual responses among stakeholders in addressing changing conditions, where lessons from one policy context or government can be investigated and adapted for another. Sustainability as a global challenge presents localised impacts and has resulted in significant levels of policy transfer and learning.

Planning that is directed to more sustainable, compact and constrained urban forms has experienced significant mobility and uptake worldwide through policy transfer and learning. Carroll and Common (2013, p. 1) assert that "significant aspects of nationally developed policies are copied from elsewhere in what is described as a process of policy transfer and learning". This has not necessarily been a purposeful process and Hale and Eagleson (2015) find that in Australia this has not only been haphazard but lacking in rigour. This raises the question of how learning can occur between transitions and planning, and how transitions can be introduced into regional planning as a practice arena that remains bound by professional and regulatory constraints (Howlett and Rayner, 2007). A further matter is how regional and urban planning can respond to sustainable transitions in relation to infrastructure to create an appropriate policy mix (Keast, Mandell, and Brown 2006; Howlett and Rayner 2007). With reference to public sector and policy innovation literature (Hajer and Wagenaar 2003; Kingdon 1995; Mintrom 1997) as well as international experiences (Frantzeskaki and Loorbach 2010; Geels 2004b), the interchange of regional planning and

infrasystem transitions involves policy learning, in part due to disconnections between regional planning and infrastructure planning.

Sustainable transitions research and theory emphasises learning and experiment, including policy experiment and an ongoing examination of how learnings and experiments inform or challenge planning may be beneficial. While experiments are not sufficient to trigger system change, it is useful to understand how experiments and learning influence regime dynamics, in which planning is implicated, through co-evolutionary dynamics (Kivimaa, Hilden, Huitema, Jordan, and Newig, 2017). Switzer et al. (2013) recommend that education and practice in transport planning include a broader set of skills to address actors and institutions and managing innovation involving socio-technical relations. For Hodson et al (2012, p. 797), urban experiments not only inform but they help policy makers

> understand how learning can then be used to reshape the organization and priorities of infrastructure regimes at other levels. Taken together, this type of learning can help us understand existing systems, the degree of flexibility and autonomy in developing new configurations, and the issues involved in upscaling and accelerating transitions.

Reflexivity is also a recurring concept in transitions literature as a counter to standardisation, path dependence, and inertia (Truffer et al. 2010; Hodson et al. 2012; Wolfram 2016b; Switzer et al. 2013; Malekpour et al. 2015). Reflexivity in governance, policy, and planning means "[i]t understands itself to be part of the dynamics which are governed" (Voß and Kemp 2005, 4). Reflexivity in policy is integral for social learning and participatory engagement as well as developing governance and transformative capacity (Torgerson, 2003). However, learning involving new ways of working and organising also requires significant investment to challenge dominant paths (Willems et al., 2016). Such commitments may be undesirable for neo-liberal public sector agencies and educational institutions and fiscally constrained governments.

In Europe, policy learning is underway in infrastructure transitions with both European Union and other European nations examining lessons from the Dutch transitions policy experiments and applications. Germany is investigating lessons from the Netherlands to inform its own long-term energy transition (Gawel et al., 2014). This differs from policy transfer, which has attracted scrutiny in spatial planning research (Peck and Theodore, 2010; Stead, 2012; Stone, 2004; R. Thomas and Bertolini, 2015), in that policy transfer or borrowing involves identifying, sourcing, and applying 'best practices' from international

contexts while policy learning involves a more critical and reflective approach to diverse international examples through interpretation and option identification (Raffe, 2011). Examination of international policies can deepen understanding of the domestic policy environment and enrich policy in the local context.

The Netherlands' experience demonstrates policy learning through the creation and maintenance of 'safe spaces' or policy niches in the policy environment to enable policy learning for sustainable transitions. Such innovation percolates or bubbles up from the niche into other aspects and arenas of policy making. In Europe and Asia, for example, these safe or protective spaces have taken the form of 'urban labs' where innovations are developed and their 'stickiness' or suitability is tested (Baccarne, Mechant, Schuurma, De Marez, and Colpaert, 2014; Nevens et al., 2013). Soft descriptors, like 'bubbling' and 'stickiness', point to a flexible and open approach to examining what works in problem solving or de-locking processes of policy as usual. The acknowledgement of policy learning as a process supporting and informing policy processes and mixes (Bennett and Howlett, 1992) enables exchanges between sustainable transitions and regional planning that promotes regime and infrastructure system shifts (Domènech, March, Vallès, and Saurí, 2015).

3.2.3 Policy Mix

Policies are not developed or implemented in isolation and there is increasingly recognition that new policy instruments contribute to a policy mix (Keast et al., 2006). Kern and Howlett (2009, p. 395) define policy mixes as "complex arrangements of multiple goals and means which, in many cases, have developed incrementally over many years." Policy interventions also include a range of stakeholders, such as governing bodies, public administration, and policy fields (Ossenbrink, Finnsson, Bening, and Hoffmann, 2018). Due to this complexity, the development of these mixes also involves policy learning and diverse instruments (Rogge and Dütschke, 2018). Cairney (2015, p. 1) defines policy instruments as "tools used by governments to pursue a desired outcome. Examples include economic tools (taxes, spending, incentives), and regulations (voluntary, legal)". To achieve greater uptake of different aspects of transitions, such as increased public transport use or active transport, diverse instruments are introduced into policy mixes to promote desired results or disrupt existing dynamics through creative destruction (Kivimaa & Kern, 2016).

Rogge and Reichardt (2016) draw on policy mix approaches in environmental economics, innovation studies and policy analysis to find that concepts of policy mix tend to emphasise instruments and their interactions to achieve objectives. They argue for a more expansive

concept of policy mix to address sustainable transitions that accounts for real world complexity, policy processes and related politics, and the strategic dimensions of long-term horizons and targets. System change requires the development of "disruptive policy mixes" which is difficult to achieve give the political constraints imposed in achieving greater coherence in policy mixes (Kivimaa and Kern, 2016, p. 206). However, some uncertainty remains about what parts of the policy mix are relevant for analysis and how to delineate highly flexible boundaries shaping different parts and levels of the policy mix (Ossenbrink et al., 2018; Rogge and Reichardt, 2016).

Policy mixes develop over time, and Howlett and Rayner (2007) identify three different types of development that recognise policy is rarely, if ever, a tabula rasa: layering where additional instruments and policy objectives are stacked on existing instruments and mixes; drift where policy goals change despite changes in the instruments not being carried out; and conversion where instruments change but goals do not. Kern and Howlett (2009) also note that policies can also be consciously replaced and supplant existing goals and instruments in a consistent and coherent way. The prevailing type of policy mix development tends to be "layering, or repeated bouts of policy conversion or policy drift". Most policy mix processes tend to lack consistency and coherency, which results in policy patching and policy packaging playing a role in developing coherence and consistency (Howlett and Rayner, 2007; Kern, Kivimaa, and Martiskainen, 2017). Policy patching is particularly suited to the complexity and messiness of policy making as it provides a strategic approach for policy makers addressing sustainable transitions (Kern et al., 2017). Rayner (2013) proposes that policy patching aims to "reduce the destructive tension between layered elements in a policy mix without total redesign for which policy capacity and/or political support may be lacking". In the transitions context, policy patching may enable different elements of a policy system or mix to interact in response to changing policy priorities. A deeper understanding of these processes is relevant given the degree of policy development addressing climate change and commitments for low carbon transition being undertaken worldwide.

Policy domains do not simply align even when they attend to meta-policy goals like zero net emissions. Bache et al (2015, p. 825) argue that sustainable development and carbon reduction targets are the focus of meta-policy which "guide[s] the development of numerous more specific policies". However, in practice, there is a tendency to rely on single instruments rather than policy mixes and policy programs (Roberts et al., 2018). The policy processes for sustainable transitions are complex and evoke consideration of not just policy mix but bridging boundaries between multiple domains, scales and instruments while also addressing issues of regime resistance and incumbency. Policy patching and packaging are

an important part of strategically navigating and bridging changing policy domains. Rosenow et al (2017) argue that "incoherent and inconsistent policy mixes are unlikely to achieve policy goals" because they require trade-offs or counteract each other. These conflicted policy mixes, which can be the result of incumbency, can also result in creative and destructive actions (Kivimaa and Kern, 2016) or destructive recreation (Johnstone, Stirling, and Sovacool, 2017).

Examination of policy mix design and implementation can inform deliberate approaches to sustainable transitions, particularly by accounting for "policy coordination and implementation across multiple sectors and levels of government" (Rogge et al., 2017). Howlett and Rayner (2007) identify several dynamics of policy mix including layering, drift, conversion, and replacement indicating highly political policy contexts but also the strategic and assemblage dynamics of policy. Due to these political flows and contests, Flanaghan et al (2011) argue that no policy mixes are "unambiguously "good" mixes". By necessity policy mixes change during transitions which are long-term and coherently target a range of economic, social and economic levers and goals (Kemp-Benedict, 2014). Kivimaa and Kern (2016) propose that examination of policy mixes should address the role of policy in stabilising and destabilising unsustainable regimes, such as the carbon regime and lock-in. Because those policy and governance assemblages are addressing socio-technical transitions as complex, a systems view is needed for successful transition policy Smith et al. (2010). Such success is predicated on a more integrated, comprehensive and targeted policy mix that can steer the uptake of more sustainable technologies (Foxon, 2002; Rosenow et al., 2017). This has significant implications for regime incumbents who include highly vested corporations and lobbyists, as well as policymakers (Geels, 2014b; Johnstone et al., 2017). Consequently, policy process should focus on the actors, instruments, institutions, and interactions involved in policy (Flanagan et al., 2011). A focus on components of the policy process also recognises the bounded, assemblage and constrained nature of policy mixes.

The socio-technical systems of infrastructure, transport and land use planning – as carbon intensive domains – involve a broad range of policy, regulatory, and planning instruments which have evolved over time and involve multiple levels of government and other stakeholders. Policy mixes can support 'creative destruction' which attends to the destabilisation of regimes and incentivisation of niches (Edmondson et al., 2018; Kivimaa and Kern, 2016). In decreasing the benefits and incentives to incumbents and providing targeted support to niches, policy mixes are able to influence the direction of transition (Edmondson et al., 2018). Because policy mixes develop in complex ways and involve combinations of instruments, there is also potential for unintended consequences

(Edmondson et al., 2018). In response to this, Rogge and Reichardt developed an extended framework for analysing policy mix. They present three building blocks of policy mix comprised of elements, policy process, and characteristics. These building blocks can also be further elaborated through dimensions such as time, policy field, scale, and governance. The building blocks can interact with socio-technical change in diverse ways and consideration must be given to the challenges of boundary setting (or scope of policy mix under examination) and operationalisation of the policy mix (Rogge and Reichardt, 2016). The framework can be used to analyse policy mixes and their role in shaping the direction and rate of socio-technical transitions.

Given their complexity and dynamism, coupled with potential for unintended consequences, policy mixes play a role in shaping transition pathways. Rogge and Reichardt's (2016) framework asserts a system perspective and a need to establish appropriate boundaries for analysing policy mixes. Their framework, which was applied to the energy transition in Germany, provides insight into the dynamics of a transitions policy mix. A further case study adapts this framework to energy storage in California and seeks to delineate different types of policy in a mix (Ossenbrink et al., 2018). The examination of policy mixes in relation to transitions is growing rapidly with Rogge and Reichardt's framework providing grounding for policy examinations while also undergoing development. In particular, there is a need for policy researchers to be clear about how they define the policy under examination, by strategic intent or by its impact domain (Ossenbrink et al., 2018).

3.3 Conclusion

This chapter has examined the overlapping and interacting arenas of regions and policy process in relation to sustainable transitions and regional planning. Socio-technical systems and transitions are spatial and socio-technical. As such, place, location, economic geography, and scale are inflected in regional patterns, policy mixes, and transitions pathways. Local and regional conditions shape socio-technical systems and transition pathways. Regionalism has had significant influence in spatial relations in a globalising world with emphasis on regional development, socio-technical systems, and governance. The networked and relational dimensions of space and regions contributes to sustainable transitions pathways. Regional economic priorities, such as growth and competitiveness, are often in conflict with sustainability and sustainable development, resulting in trade-offs and contradictions in planning where sustainable development and climate change action are goals, but plans continue to affirm unsustainable socio-technical systems and relations.

Sustainable transitions are unlikely to occur at any scale without appropriate policies that are responsive to place and locality, except possibly in circumstances of shocks. Where regions are understood as an appropriate territorial scale for policy development and governance, recent research in the transitions field indicates a need for greater consideration of policy process and policy mix (Kern and Rogge 2017; Kern et al. 2017; Rogge et al. 2017). This highlights the political dimension of regions and policy making in addressing the complex nature of sustainable transition. In addressing the significance of regions in relation to path dependence and socio-technical transitions, spatial perspectives of sustainable transitions were examined. Regions not only have a distinct role to play in relation to socio-technological networks, but those networks also shape the development paths of regions. This involves both locational and interrelational attributes that facilitate a multi-scalar and relative account of socio-technical systems (Hansen and Coenen, 2014; Raven et al., 2012).

Policy development is an increasingly complex and political process in which institutional and individual actors exert considerable influence in a political field. As Kingdon's (1995) multiple stream approach demonstrates, policy making is not a rational exercise and often involves political manipulation in interactive settings where power is not evenly distributed and where policy and regime resistance are at play. However, the complex nature of policy making can also mean that policy learning and policy innovation is possible when highly complex socio-technical problems are addressed through more collaborative and reflexive processes. Because socio-technical transitions and its attendant policy priorities of shifting unsustainable regimes are complex, a mix of policies are required. Analysing policy mix is a developing area of research linking sustainable transitions and policy process. While some studies have identified innovative policy processes in planning, others found planning to inhibit sustainable transitions. This has bearing on the effectiveness of policy mixes which are charting transitions pathways in urban and regional contexts. It questions whether those socio-spatial and built environment innovations in planning, such as compact cities and smart growth, have sufficient momentum for urban and regional transitions.

3.4 Research Focus

The literature review, comprising chapters two and three, traces a relationship between regional planning and sustainable transitions enacted through spatial, socio-technical, and policy processes. Sustainable transitions research has examined development and infrastructure programs and projects in cities and regions. The roles planning plays are

mixed and planning can inhibit socio-technical change through its own regime bound process and practice. Planning can also be a site of niche experiments where learning in the planning and change in the urban environment are interactive and co-evolutionary. The literature reveals that for planning to contribute to sustainable transitions, there is a need to both accept its limitations, and possibly limit its influence, while creating niche spaces to plan. Learning, reflexivity, and experiment are integral to not only shaping transition pathways, but also in addressing the limitations of planning.

This literature review reveals that regional planning is an existing policy process informed by sustainable development and is influencing regional and socio-technical (infrastructural) system development. Regional and urban planning are aligned to sustainable development with settled ideas of sustainable transport and sustainable planning, which are not necessarily commensurate with transition. They can be constitutive of transition pathways and in some circumstances may inhibit or resist sustainable transitions. Regional planning is not a readymade policy response to systemic and structural issues even with its adherence to compact and managed spatial models of urban and regional development (Zijlstra and Avelino, 2012). In Queensland and Australia, regional policy and governance, potentially through regional planning, sets some parameters for addressing sustainability, although not at the expense of economic growth.

In the Australian context, co-evolutionary relationships exist between socio-technical systems, policy, governance, and location. Both transitions and planning play a role in shaping sustainability and socio-technical systems at the regional and urban scales over the long-term. The task for this research is to ascertain how these two disciplines or types of knowledge interact in the regional policy context to steer transition pathways. The spatial, temporal and scalar dynamics of sustainable transitions of infrasystems are embedded into policy mixes and policy narratives. Further research examining the role planning plays in infrasystem transitions is warranted to better understand the connective and co-evolutionary implications of long-term policy development. In seeking to examine policy narratives embedded in regional planning and policy regarding infrastructure systems, this research seeks to analyse the discursive and narrative dimensions of incumbent policy in relation to sustainable transitions. A study of an infrastructure planning context in an Australian region, that specifically identifies the role of planning in sustainable transitions policy mix, has not yet been undertaken. By examining planning in a broader policy context, its implications for infrastructure system innovation and transition will be better understood. Having established the rationale for this research, the next chapter presents the case context and provides an overview of SEQ policy and planning initiatives relevant to this research

Chapter Four

CASE CONTEXT: AN EVOLVING PLANNING AND POLICY MIX IN SEQ

Queensland's regions experience critical and complex sustainability pressures such as population growth, infrastructure failure, natural disasters and climate change. Queensland is the second largest state in Australia in terms of land mass and the third largest in terms of population. This section elaborates the context of the case study, including historical and spatial background. Information about environmental and social pressures is also presented. The state, like much of Australia, is particularly vulnerable to the impacts of climate change having endured major flood, cyclone, fire and drought disasters in recent years. The state was the largest greenhouse gas (GHG) emitter in 2014, although overall emissions declined from 2004 to 2014 (Department of Environment and Heritage Protection, 2016). In 2014, the stationary energy sector emitted most GHGs comprising 43.5 percent of total state GHG emissions, followed by transport (14.3 percent) then agriculture (13.9 percent%). Land use was the fourth highest GHG emitting sector (12.7 percent). Combined, the top four sectors produce 85 percent of Queensland's total GHG emissions. Queensland has specific challenges in realising sustainable transitions and recent policy aims to leverage land use, transport and infrastructure sectors to realise zero net emissions.

Planning at all scales plays a critical role in steering and coordinating the policy response to complex pressures, and for several decades the State Government has undertaken planning reform to pursue a range of settlement and development objectives. Framed by legislation and State Planning Policy, the state's regional plans are central instruments for decision-making to meet medium to long-term regional development and resource management goals including the provision of infrastructure systems. As a strategic spatial planning process, regional planning crosses multiple governmental and policy domains to address challenges such as spatial restructuring, regional competitiveness and infrastructure. In confronting a legacy of fragmented and disconnected settlement and building on the successes of voluntary collaborative planning processes, Queensland's Beattie government (Labor, 1998-2007) introduced statutory regional plans in 2005, commencing with the *South East Queensland Regional Plan 2005-2026,* as frameworks for growth management (England, 2010) and infrastructure development (Bunker and Searle, 2009; Dodson, 2009). Queensland's

statutory regional planning was a national first and the SEQRP also serves as a greater metropolitan plan given the urban and relational nature of the region centred on Brisbane, the state capital. Regional plans set out regional development goals and principles, highlighting community, environmental, industry and infrastructural priorities.

Regional plans in Queensland are the state's longest horizon policy statements and they have been directed towards addressing infrastructure development in regions. They are statutory and set a strategic framework for sustainable regional development for lower level planning, providing lower levels of government and lower order plans with direction and scope to meet regional level development goals, while enabling address of sustainability issues relative to local conditions. Local planning schemes and development must address the provisions of the regional plan. Prior to 2005, regional planning was voluntary and resulted in insufficient coordination of development and infrastructure (Steele & Dodson, 2014, p. 145).

4.1 Regional Profile

While planning is principally a State Government responsibility, urban planning is split between State and Local Government, which exists by state legislation. According to Margerum (2002, p. 181), "State intervention has historically been limited, except to ensure that Local Governments recognize state issues such as regional transport or issues affecting state land. This has created a culture of strong Local Government control." Prior to the introduction of regional planning, development in SEQ was generally managed by local government as delegated by state legislation but with limited recognition of overlapping or contiguous interests and a willingness to approve undesirable development including impingement of rural and agricultural land (Queensland Government, 2005b). The resulting settlement and development pattern was fragmented, sprawling and disconnected. Development in the region is characterised as low-density, car dependent and suburban, creating problems for connectivity and service provision (Baum, O'Connor, and Stimson, 2005; Kenworthy and Laube, 1996; Mees, 2010; Minnery and Barker, 1998)

Brisbane and SEQ have developed in a pattern similar to other Australian cities which are highly car dependent and suburbanised. Australian cities, including Brisbane, remain strongly anchored by their central business districts which continue to act as the most prominent employment centres, with regional centres having also developed to form a multi-nodal metropolitan or regional pattern (Freestone, 1997, p. 255). The land mass of SEQ is 22,420 km². SEQ is the most populous and urbanised region in the state, with the region now

comprising 12 Local Government areas being Brisbane City Council, City of Gold Coast Council, Ipswich City Council, Lockyer Valley Regional Council, Logan City Council, Moreton Bay Regional Council, Noosa Shire Council, Redland City Council, Scenic Rim Council, Somerset Regional Council, Sunshine Coast Council and part of Toowoomba Regional Council (Figure 4). The State Government amalgamated local councils in 2008 and the Local Government composition of the region has changed since 2005. Over 71 percent of the state's population resided in SEQ based on 2016 census data.

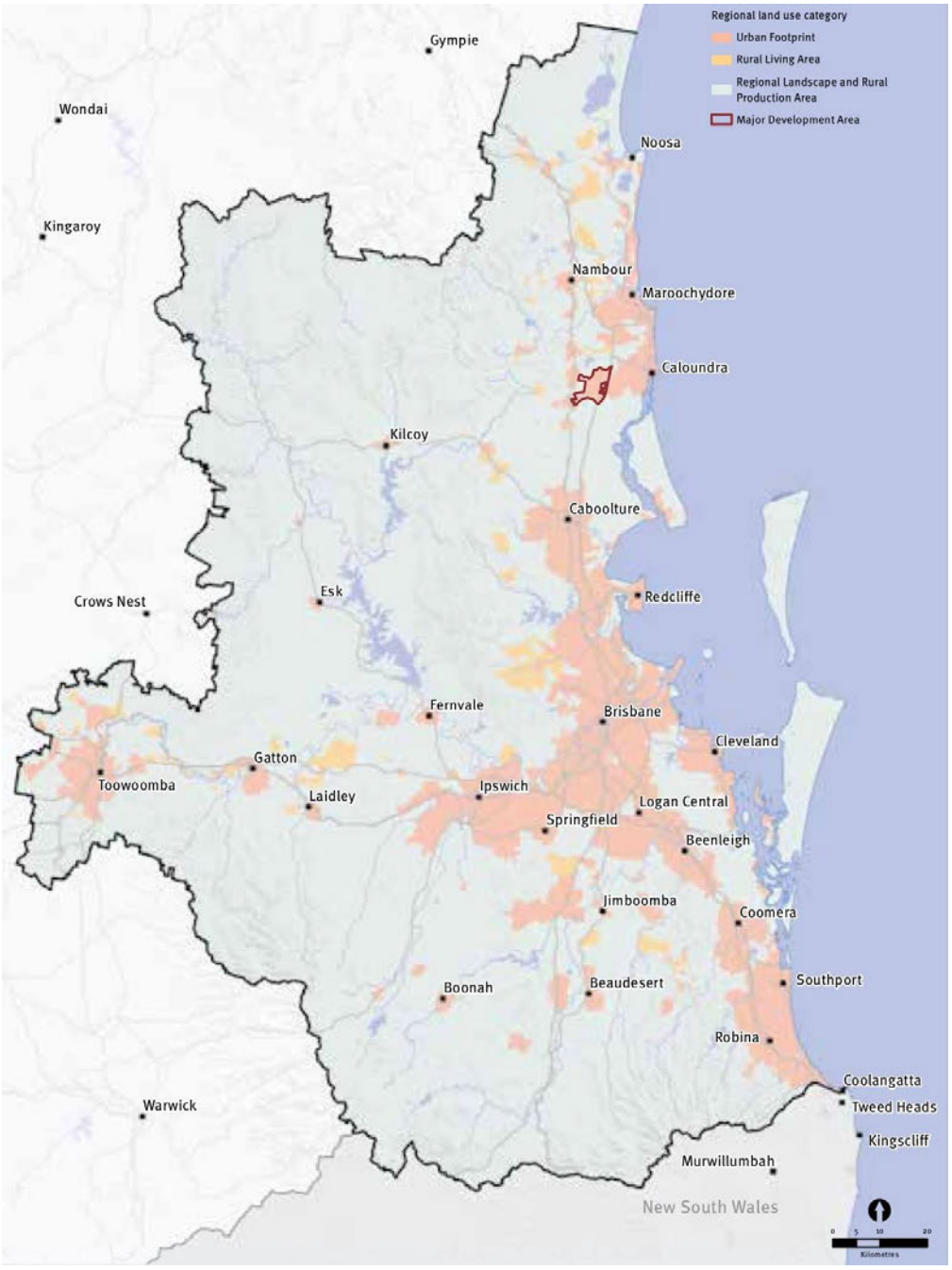


Figure 4. *SEQ regional planning framework in ShapingSEQ*

Source: (Department of Infrastructure Local Government and Planning, 2017, p. 41)

Population growth figures per Local Government Area are presented in Figure 5. The overall SEQ population increase in the 15 years from 2001 to 2016 is 848,040 persons (33.82 percent on the 2001 population level) (Table 1).

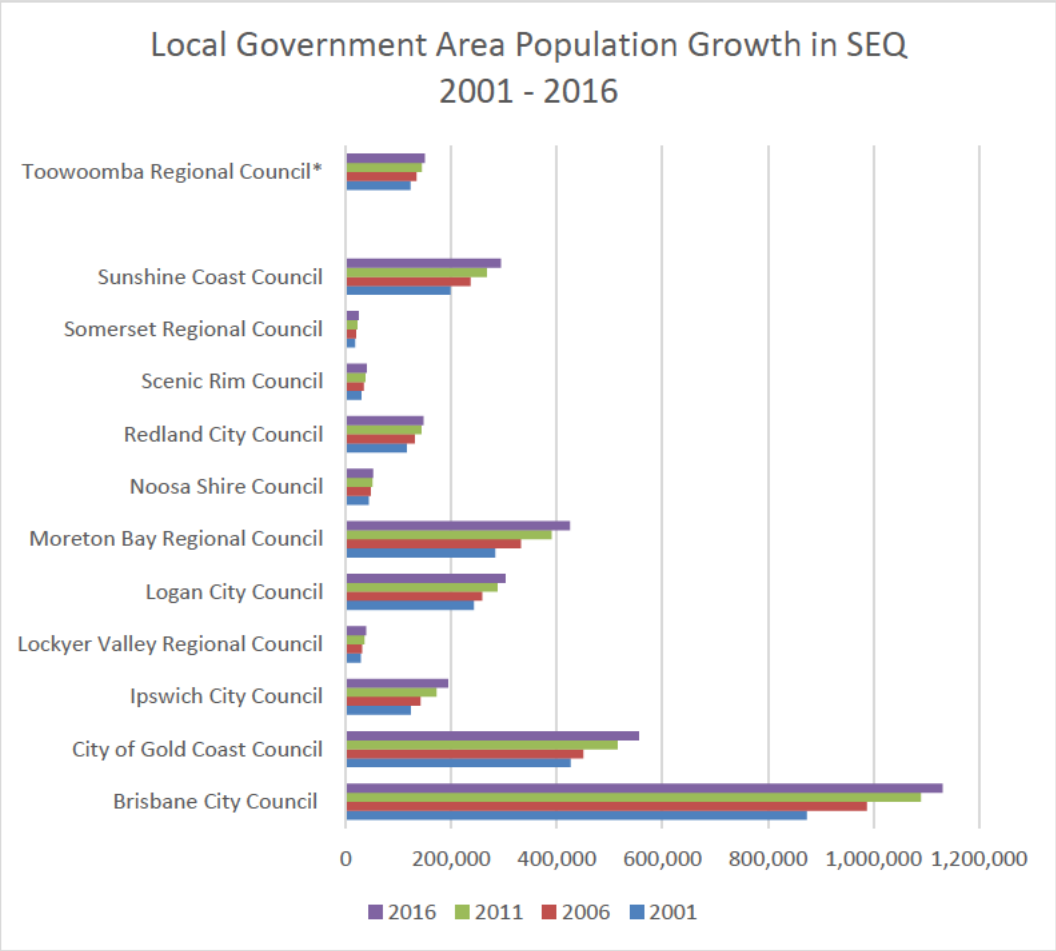


Figure 5. *SEQ Population Growth Time Series by Local Government Area*

Note: * Toowoomba City Council (Toowoomba SA3)

Table 1. *Time series population figure per Local Government Area*

	2001	2006	2011	2016
SEQ TOTAL	**2,507,573**	**2,805,293**	**3,156,671**	**3,355,613**
Population increase		11%	12%	6%
QLD State Population	3,585,639	3,904,532	4,332,739	4,703,193
SEQ population as a percentage of QLD population	69.93%	71.84%	72.85%	71.34%

Note: Data for some LGA are based on Australian Bureau of Statistics (ABS), Australian Statistical Geography Standard (ASGS), July 2016. In some cases these data have been concorded from other geographical boundaries.
Source: ABS and Queensland Treasury – Office of the Chief Statistician

4.2 Non-Statutory SEQ Regional Planning, 1990 - 2001

With a history of unplanned and uncoordinated development in the region, the projected rate of population growth prompted the State Government to investigate growth management strategies. The early 1990s are recorded as the beginning point for regional planning in South East Queensland as earlier attempts had failed (Abbott, 1995, 2001). The regional context prior to the 1990s lacked cooperation between local and State Governments as well as reliance on developer led growth and Ministerial rezoning to facilitate development. The regional planning priority was growth management and, in 1990, the State Government convened a regional conference to develop SEQ2001, as a non-statutory and voluntary regional plan. Under the umbrella of the SEQ2001 project, Regional Frameworks for Growth Management (RFGM), including SEQ2001 and SEQ2021, were released in 1994, 1995, 1998, and 2000. This initiative formalised and instilled more cooperative and joint decision-making relationships between State and Local Governments in regional coordination through high-level political committees such as the Regional Planning Advisory Group (RPAG) and its successors (Abbott, 2001, 2011). SEQ2001 also resulted in greater engagement of industry and non-government stakeholders in strategic political and policy coordination. Abbott (2001) describes this as a partnership approach which developed over a decade to facilitate consensus building and learning among stakeholders, highlighting the need for more collaborative approaches to complex problems and contexts at the regional scale.

Non-statutory growth management frameworks were introduced in the mid-1990s with a non-statutory regional plan introduced in 2001 (Abbott, 1995, 2001, 2011). These non-statutory processes set much of the policy process and established learning for the subsequent statutory planning including joint State and Local Government cooperative arrangements. Gleeson (2007, p. 79) also proposes that the development of voluntary instruments was necessary for building support for statutory regional plans.

4.3 Statutory SEQ Regional Planning

The State Government created the Office of Urban Management in 2004, as well as embarked on an ambitious program of planning reform resulting in amendments to the Integrated Planning Act (IPA) which provided a framework for growth management and instated the SEQ Regional Plan as a statutory instrument. The *South East Queensland Regional Plan 2005 – 2026* was introduced under the provisions of the *Integrated Planning Act 1997* (IPA). The IPA specified that the regional plan should be linked to regional

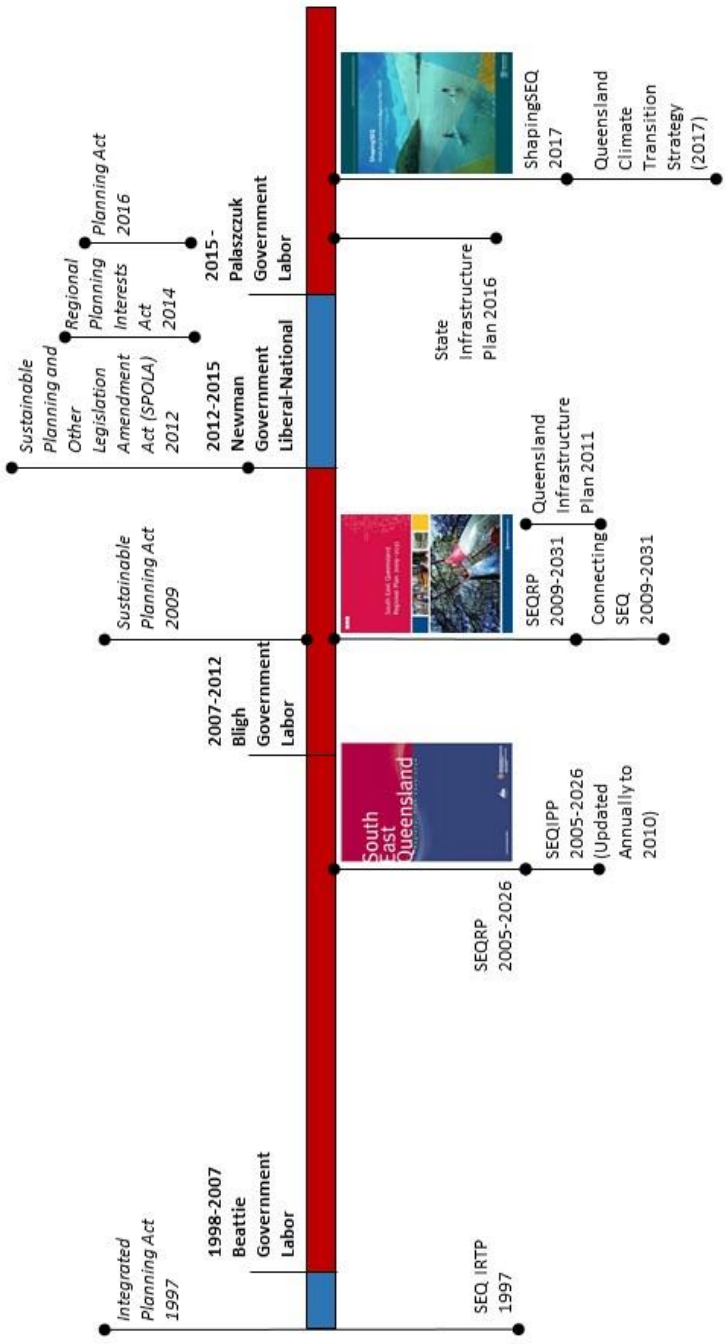
infrastructure provision as well as address urban growth boundaries to ameliorate urban sprawl, consolidate settlement pattern and address resource allocation.

The *Sustainable Planning Act* was introduced in 2009 under the Bligh Labor Government, replacing the *Integrated Planning Act*, and reiterates the defining attributes of a regional plan including the provision of infrastructure. The SEQRP2005-2026 was reviewed and released as the SEQRP 2009-2031. The regional plans address the state's interest as explicated in the State Planning Policy. Dedekorkut-Howes and Mayere (2013, p. 11) note that while the Act was intended to streamline planning approvals with the support of the development industry, "the new amendments may result in avoiding the necessary evaluation of applications that give rise to detailed ecological assessments, sustainability principles and subsequent recommendations".

Further reforms by the single term Newman Government (Liberal-National, 2012 - 2015) emphasised reforms further aligned to microeconomic reform which stressed economic development and growth with removal of 'green and red tape' and streamlining to expedite development (Philippa England, 2015; Steele and Dodson, 2014). The Newman Government continued the remit of regional planning with an "aim to foster diverse and strong economic growth; plan and prioritise infrastructure; manage impacts on the environment; and where necessary, plan for urban growth and resolve land use conflicts such as those arising between agricultural and mining activities" (DSDIP, 2012). England's (2015, p. 74) examination of planning law reform under the Newman Government found that "development proponents, especially large operators, should benefit from the increased flexibility and speedier decision-making". By prioritising economic interests, the Newman Government also created an imperative of removing obstructions to economic development and activity in property, construction and mining from planning and environmental legislation.

Under the Palaszczuk Government (Labor, since 2015), further planning reform was instigated in 2015 to address both regional planning and infrastructure development. A review of the regional plan was released as a 50 year plan titled *ShapingSEQ* in 2017 following the introduction of the *Planning Act 2016* as part of a planning reform program titled *Better Planning for Queensland*. Over several governments the policy and regulatory relationship between regional planning, infrastructure planning, and sustainability has been reformed to address the growth needs and capacity of the region (see Figure 6).

Figure 6. *SEQ Regional planning timeline*



State planning legislation has consistently included ecological sustainability as its purpose. This is defined as a balance that integrates ecological processes, economic development, and socio-cultural wellbeing. The IPA and SPA both explicitly sought to achieve ecological sustainability through planning and development. The purpose of the *Planning Act* is to provide a "system of land use planning and development assessment to facilitate the achievement of ecological sustainability" (The State of Queensland, 2017, p. 15). Both the SPA and the Planning Act, include reference to climate change with provisions for minimising or avoiding adverse impacts.

Two of the three plans produced to date were developed under the Bligh Government (2007 - 2012) and one under the Palaszczuk Government (2015-), both State Labor Governments. Even though separate infrastructure and transport plans have been produced, or are being produced or reviewed, for SEQ and the state, the regional plans include specific sections addressing infrastructure, connectivity, mobility and transport. The purpose of the regional plan has remained consistently focused on sustainable growth management (Figure 7) as a response to accumulative problems such as population growth, demographic change, climate change and environmental degradation.

SEQRP 2005-2026	SEQRP 2009-2031	*ShapingSEQ*
The primary purpose of the Regional Plan is to provide a *sustainable growth management strategy* for SEQ to the year 2026. (Queensland Government, 2005b, p. 1)	The purpose of the *South East Queensland Regional Plan 2009–2031* (SEQ Regional Plan) is to *manage regional growth and change in the most sustainable way to protect and enhance quality of life in the region*. (Queensland Government, 2009a, p. 4)	*ShapingSEQ* is the Queensland Government's plan to guide the future of the South East Queensland (SEQ) region, prepared in collaboration with the region's 12 Local Governments … It aims to *accommodate future growth sustainably* and in a way that responds to change positively, and enhances the social, economic and environmental systems that support the region's liveability. (Department of Infrastructure Local Government and Planning, 2017, p. 10)

Figure 7. *Purpose of Regional Plans*

Growth management in SEQ is informed by Smart Growth approaches and principles with emphasis on integrated land use, transport and infrastructure integration. This is manifest in higher densities, compact centres, urban consolidation, and mixed-use development. The region remains highly suburbanised and car dependent. This approach is aligned to ESD and marked a significant change for the planning of the region as an urban region.

4.4 Regional Infrastructure Planning

Infrastructure plays a pivotal role in serving population growth and 'shaping settlement'. In Queensland, infrastructure policy, planning, and management does not occur exclusively through or as a result of regional planning, although integrated land use and infrastructure planning is an acknowledged principle in the state's planning policies. As part of the state's regional planning program, infrastructure planning was also initiated at the regional level. This not only recognised the multifaceted role infrastructure plays in regions, particularly as a contributor to economic growth, job creation, competitiveness, and liveability, but also highlighted significant underinvestment in the state's infrastructure networks often framed as an 'infrastructure deficit' (Productivity Commission, 2014; Queensland Government, 2009a).

For much of the 20th century, the State Government favoured forward planning of major projects, particularly under Labor governments. Scott et al. (2001, p. 258) trace a development and progress mindset in the Queensland government and Office of the Coordinator-General of Public Works for the first part of the 20th century, which promoted rural development, primary industry and decentralisation, while seeking to 'control nature' in a state which is significantly exposed to natural disasters and climate cycles. In identifying historical and geographical biases in the planning and provisioning of infrastructure in Queensland, Wilmoth (2005, pp. 13–16) found that the state's Office of the Coordinator-General exercised a bias against south east Queensland and urban infrastructure, while favouring infrastructure that supported industry and mining in non-metropolitan regions. This bias indicates the entrenchment of path dependence in the state in relation to specialised regional development paths, such as agriculture and mining. This had consequent impacts on the management of infrastructure and public works in other regions. More recently, Queensland governments have adopted a 'smart deferral' approach to infrastructure planning which resulted in delayed or just-in-time infrastructure delivered on a project basis as well as a significant backlog of projects (Wilmoth, 2005, p. 2).

The State Government released the *South East Queensland Infrastructure Plan and Program 2005-2026* to provide a program of infrastructure investment and provision identified in the *SEQRP* (Regan, 2010). In 2011, this plan was replaced by the *Queensland Infrastructure Plan* which included individual sections outlining infrastructure priorities for each of the state's regions. The plan specified priorities in transport, energy, water, information and communication technology, and social and community infrastructure (Queensland Government, 2011). With the adoption of regional plans and infrastructure plans under the rubric of growth management, Burton (2010, p. 210) proposes that growing differently requires the "provision of various infrastructure to support new urban forms, or perhaps to support urban forms that differ from the prevailing low-density suburban form of much of SEQ". In relation to transport, the SEQIPP 2005-2026 and 2009-2031 addresses 'urban congestion' and refers to 'travel choice', 'sustainable transport' and higher levels of active and public transport. These are also represented as having behavioural dimensions where behaviour change and infrastructure development are mutually reinforcing. Road network development and improvement as well as corridor preservation are represented as necessary elements of transport infrastructure provision particularly in growth areas. Given the level of car dependence in the region, investments in public and active transport infrastructure are prioritised and supported continued growth in public transport use. These were strongly tied to the SEQRP 2005-2026 and were intended to support the review of the regional plan in 2009.

The Newman Government also emphasised the role of infrastructure in its economic priorities and State Planning Policy (Department of State Development Infrastructure and Planning, 2014). Regulatory and planning responses to climate change and environmental protection were also repealed with greater emphasis placed on economic development than sustainable development. The Newman Government sought to review and update the *Queensland Infrastructure Plan* within revised policy frameworks and further privatisation but it was not finalised in the single term of the government. However, the revised State Planning Policy specified transport and infrastructure as state interests in 2013.

Under the subsequent Palaszczuk Government further infrastructure planning and policy reform was undertaken (Department of Infrastructure Local Government and Planning, 2015). The Palaszczuk Government also committed to developing a revised state infrastructure plan which was released in 2016. The relationship between infrastructure planning and regional planning is addressed by State Planning Policy. Nationally, the provision and development of infrastructure systems is under pressure to reform and several major research and government initiatives address issues of financing, markets, system

dynamics, and policy focusing significantly on efficiency and cost-effectiveness (Productivity Commission, 2014; SMART Infrastructure Facility, 2014; Spiller, 1999). The State Infrastructure Plan presents sustainability and resilience objectives which includes greenhouse gas emissions reductions. The SIP also promises to integrate regional, economic and transport plans to ensure infrastructure provision is aligned and consistent and assets are well located.

4.5 Regional Transport Planning

Transport is one of several infrastructure domains addressed in both regional transport plans and regional plans. Legislation introduced by the State Government, *Transport Planning and Coordination Act 1994*, established that transport planning and coordination would be consistent with overall State Government strategic priorities. It provided that integrated state and regional transport planning would be carried out and that a South East Queensland transit authority would be established. The first *SEQ* IRTP (Department of Transport and Main Roads, 1997) was released in 1997 after a three year period of consultation and collaboration, offering a vision of transport in the region that included significant mode shift from automobile to public transport and active transport, supporting the sustainable development, integrated land use and transport, and growth management priorities that emerged in the 1990s. The IRTP adopted a different approach to earlier transport strategies and studies prior to the 1990s, which were largely demand driven at a time when public transport use was declining. The IRTP presented its point of difference as "past approaches to transport planning were based on identifying and satisfying likely growth in peak period travel demand" rather than developing a future transport system that was based on "a major shift towards efficient, environmentally friendly modes of transport which can provide people with access and mobility without the undesirable impacts of single occupant car travel" (Department of Transport and Main Roads, 1997, p. 15).

Implementation of the IRTP was carried out in the medium term under the *Transport 2007: an action plan for South East Queensland* (Queensland Government 2007), released in April 2001. Transport 2007 implemented the ITRP and resulted in delivery of the South East Busway in collaboration with the Brisbane City Council in 2001 and the creation of Translink Transit Authority in 2003 (Mees, 2010; Stimson, 2002). In Stimson's (2002) analysis of these planning documents, he argues that the objectives of the plans are agreeable and necessary, but there is a need to ask whether planning can or will meet the transport requirements of a growing urban population. The 1997 IRTP, written prior to the

introduction of statutory regional planning, included provisions for climate change mitigation, resilience and adaptation. It provided the basis for major investments in public transport infrastructure in SEQ, and together with the SEQRP laid the groundwork for more compact settlement pattern and transit oriented development in which trips were anticipated to be more self-contained, although the transport network remained significantly Brisbane-centric at both the metropolitan and regional scale.

A revised IRTP, *ConnectingSEQ 2031*, was released in 2009. It not only set out the transport objectives and actions but also guided the SEQIPP 2010. The SEQRP 2009-2031 made reference to this forthcoming plan and provided a strategic framework for its vision and objectives. *ConnectingSEQ* 2031 included specific planning objectives for urban form such as Transit Oriented Development which could take root throughout the transit network (Department of Transport and Main Roads, 2011). *ConnectingSEQ* 2031 also presented a vision of a 'rail revolution' in SEQ that included the Cross River Rail project which was necessary for increasing rail capacity in both Brisbane and the broader SEQ region. Other priorities in *ConnectingSEQ* 2031 included cycle and walking infrastructure, busway extensions, and integration of technology for transit and traffic management.

The integrated regional transport plan has not been updated recently, although a joint planning initiative between State Government and Brisbane City Council, Connecting Brisbane, was released in 2017 to guide the development of a mass transit system with the primary goals of guiding infrastructure provision for capacity improvements and addressing congestion and improving high frequency integrated services. A Queensland Transport Policy is currently in development that will inform the development of further integrated regional transport plans.

4.6 Queensland Climate Transition Strategy

In 2017, the State Government Department of Environment and Heritage Protection released its transition policy, *Pathways to a Clean Growth Economy: Queensland Climate Transition Strategy* together with *Pathways to a Climate Resilient Queensland: Queensland Climate Adaptation Strategy*. Combined, the two strategies outline the government's response to climate change in terms of addressing key drivers of climate change, such as carbon emissions, and adaptation to threats of climate change. Transition presents a specific policy discourse and trajectory in relation to the normative policy priorities of adaptation, mitigation and resilience. A discussion paper, *Advancing Climate Action in Queensland:*

Making the transition to a low carbon future (Queensland Government, 2016a) initiated a 'public conversation' about low carbon transition, although it framed the discussion and focused particular priorities. A subsequent consultation report documenting the public conversation was also released in April 2017 followed by the two climate strategies released in July. A feature of the process for the introduction of the strategy was Labor Party policy entrepreneurship (Mintrom and Norman, 2009) in which an environmental interest group, Labor Environmental Action Network (LEAN), successfully moved for transitions to feature in the platform at both State and Federal conferences. After the election of the Labor government in Queensland, they lobbied for government to introduce policy to progress transitions (Labour Environmental Action Network, n.d.; Queensland Branch of Australian Labor Party, 2015).

The *Queensland Climate Transition Strategy* was presented as the State Government's response to the Paris Agreement (United Nations, 2015) to limit global warming and reach zero net emissions. It also responds to a lack of low carbon transition leadership and response at the national level. The strategy commits the government and the State to goals of zero net emissions by 2050 with an interim commitment to 50% renewable energy and at least 30% reduction on 2005 levels in greenhouse gas emissions by 2030. The commitment to reduction of emissions relies on ongoing national and global response to Paris Agreement goals (United Nations, 2015). The Queensland government is joining other Australian states which have committed to zero net emissions. The Strategy presents a statewide vision which regional plans will need to address in subsequent reviews:

> *Our vision is an innovative and resilient Queensland that addresses the risks and harnesses the opportunities of a changing climate. We will make the transition to a low carbon, clean growth economy in a way that secures new jobs and opportunities for Queenslanders, supports and strengthens our communities and protects our precious natural environment* (Department of Environment and Heritage Protection, 2017, p. 5).

The *Queensland Climate Transition Strategy* makes specific reference to infrastructure, land use and transport planning as well as regional and local initiatives. The strategy stresses integration of the zero net emissions goal into other policies, such as infrastructure as well as better integration of policy domains, such as land use and transport, to achieve zero net emissions.

4.7 Conclusion

Combined, the regional infrastructure, transport, and land use plans, established regional strategic and spatial priorities and a program that aimed to manage growth and consolidate settlement pattern. While these plans addressed normative concepts of sustainable development, growth management and sustainable transport, they are presently not directed to sustainable transition articulated in state policy as the objective of zero net emissions. However, the development of these plans has been attentive to the sustainability and longer-term future of the region with acknowledgement of the exogenous pressures and challenges the region may face. These plans both responded to higher level state strategies as well as guided local and metropolitan planning carried out by local authorities. While the initial planning had sought to embed collaborative governance and sustainable development objectives into regional scale planning and growth management, at the time SEQRP 2009-2031, SEQIPP and *ConnectingSEQ 2031* were released, the plans had come to address greenhouse gas emissions reduction in response to climate change, although without significant subsequent success. Changes in State Government have resulted in repeal of some climate change, environmental provisions of planning. The most recent regional plan, *ShapingSEQ*, makes reference to carbon neutrality but does not detail a program to achieve this, indicating that regional planning is yet to establish the urgency of zero net emissions and embed it in the plan. At present a mix of state and regional plans and policies shapes the development of socio-technical systems.

The Queensland planning system has undergone significant reform over the past three decades, including the introduction of statutory regional planning for managing urbanisation and growth and sustainable development (Steele and Dodson, 2014). The purpose of planning reform in Australia has been characterised by Ruming and Gurran (2014) as promoting economic growth through simplification of rules and regulations, often at the expense of sustainability and, at times, through evocation of sustainability considerations as unnecessary impediments or ‘green tape’ (Gurran et al., 2014; Ruming and Gurran, 2014). Sustainability, particularly in relation to environmental protection, has been regarded as imposing extraneous regulatory and compliance burdens on development and hindering economic growth. The relationship between regional planning and infrastructure planning has changed over several reform processes, although the regional scale is embedded in the State’s planning and State Infrastructure Plan. Regional transport planning appears to have slowed, although drafts of the SEQ ITRP and State Transport Strategy were released in 2019.

While Queensland governments have pursued the goal of greenhouse gas (GHG) emissions reduction over time, the *Queensland Climate Transition Strategy* introduces the goal of zero net emissions as a State Government objective applicable to many policy domains. Despite historic commitments to sustainable development and carbon emissions reductions in Queensland, many targets have not been met. Through the lens of growth management and smart growth, SEQRPs make extensive references to diverse policies and programs by referring to them, integrating them and/or interpreting them in relation to land use, urban form, transport and infrastructure at the regional scale. Over time a distinct and high-level policy mix has emerged that identifies multiple sectors at the regional scale as integral for socio-technical system transition.

Planning and transitions are grounded in different theoretical and practical knowledges, yet planning remains integral to the development of infrastructure systems. However, in transitions, other dynamics are at play including the necessity for retrofitting and entropy, which may necessitate and create opportunities for rethinking planning or different approaches to planning (Fry, 2017). Similar to how regional planning in the 1990s embraced alternative patterns of, and approaches to, planning in the region, the magnitude and complexity of the transitions challenge warrants transformative and future oriented thinking (Hodson et al., 2016; Malekpour et al., 2016; Silva, Healey, Harris, & Van den Broek, 2014; Wolfram, 2016b). With a five-year review of the regional plan projected to occur in 2022 and the State Government's promised substantive response to transitions pathways due in 2020 pending, it is timely to examine how regional planning and sustainable transitions interact and what this means for infrastructure systems. As regional scale growth management and sustainable transitions are not commensurate, their dialogic relation requires significant problem solving that is responsive to co-evolution of socio-technical systems, settlements, and regions.

Having established the case context in this overview including outlining the sequence of events and policy and planning initiatives, the next chapter outlines the research methodology and research design in response to the research question and the methodological opportunities presented by sustainable transitions research.

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Chapter Five

METHODOLOGY

The methodology is designed to address the project aim of examining how policy narratives that have developed over time have conditioned the regional planning approach to sustainable socio-technical transitions in infrastructure systems, particularly transport. This is predicated on the examination of the intersection of regional planning and sustainable transitions in infrastructure systems in policy narratives. The research is designed as an explanatory case study adopting an interpretive and constructivist approach to examine successive iterations of the SEQRP associated infrastructure plans and policy and stakeholder accounts of the planning process in relation to transport. Socio-technical systems and transitions methods are recognised as engaged in interpretivism and constructivism (Geels, 2010). Regional and infrastructure plans in Queensland refer to environmental sustainability, greenhouse gas emission reduction, and related considerations as well as infrastructural responses such as renewable energy and transport mix. These cannot be assumed to be evidence of infrasystem transitions as a more detailed socio-technical transitions analysis is required to examine the narrative dimensions of regional planning in system change and innovation in relation to infrastructure systems. In presenting the methodology, this chapter aims for "thick description" of the process to enable understanding of results and analysis (Lincoln & Guba, 1985).

This explanatory case study includes examination of regime dynamics that acknowledge the interrelationship between path dependence and socio-technical system transition. Sorensen (2015, p. 24) argues that planning research about path dependence "should be particularly attentive to the moments when new policies and approaches are established" as these moments represent the creation of new institutions. Such moments, as critical junctures in policy making, can also indicate shifts in policy dynamics and policy mix (Kingdon, 1995). This research addressing the Queensland context is delineated by two such moments. First, the first statutory *SEQRP 2005-2026* was introduced in 2005 and, second, the introduction of the *Pathways to a Clean Growth Economy: Queensland Climate Transition Strategy* in 2017, which includes guidance for infrastructure, land use, regional and local level transitions to address the goal of zero net emissions by 2050. The 2017 iteration of the SEQRP, *ShapingSEQ*, was released in August several weeks after the July release of *Pathways to a Clean Growth Economy: Queensland Climate Transition Strategy* as major state policy initiatives committing to diverse goals addressing long-term sustainability. The introduction

of the statutory regional plans and other associated plans in Queensland since 2005 are moments of new policy and this is the basis for an embedded case study.

This chapter provides details of, and rationale for, the research methodology and research design. An outline of the research design is provided, followed by an overview of interpretivism and constructivism as a methodological paradigm. The socio-technical transitions methods that are applied to the case study, and their relationship to narrative explanation, are outlined. The case study method, including data collection and analysis, is described. The ethics, transparency, consistency and reliability of the research, as qualitative and interpretive research, is also established.

5.1 Research Design

As an explanatory case study, the research is designed as interpretive research examining a complex and changing policy process in relation to sustainable transitions in its context (Table 1). Interpretive research recognises "that our knowledge of reality is gained only through social constructions such as language, consciousness, shared meanings, documents, tools, and other artifacts" (Klein and Myers, 1999, p. 69). Interpretive research examines the multiplicity of meaning and its implications that enables thick description and reflexivity (Geertz, 1973; Yanow, 2007b). The analytical method of the MLP enables focus on socio-technical change and policy process while the social constructivist and interpretive paradigm supports examination of complex phenomena and causal relations of agents and subjective knowledge. The explanatory purpose is fundamental to transitions work because it explains "patterns that result from interactions" and bears a relation to process theory which "explain[s] outcomes as the result of temporal sequences of events, timing and conjunctures of event-chains" involving situated actors (Geels and Schot, 2007b).

Table 2. *Research Design*

Ontology	Epistemology	Theoretical Perspective	Methodology	Methods
Interpretive	Social Constructivist	Socio-technical transitions / Multi-Level Perspective	Interpretive Policy Analysis	Explanatory case study Qualitative policy review Interviews

This methodological approach examines the relationship between sustainable socio-technical transition and regional planning from a socio-technical transitions theoretical perspective and undertakes analysis applying the MLP as a sustainable transitions framework (Figure 8).

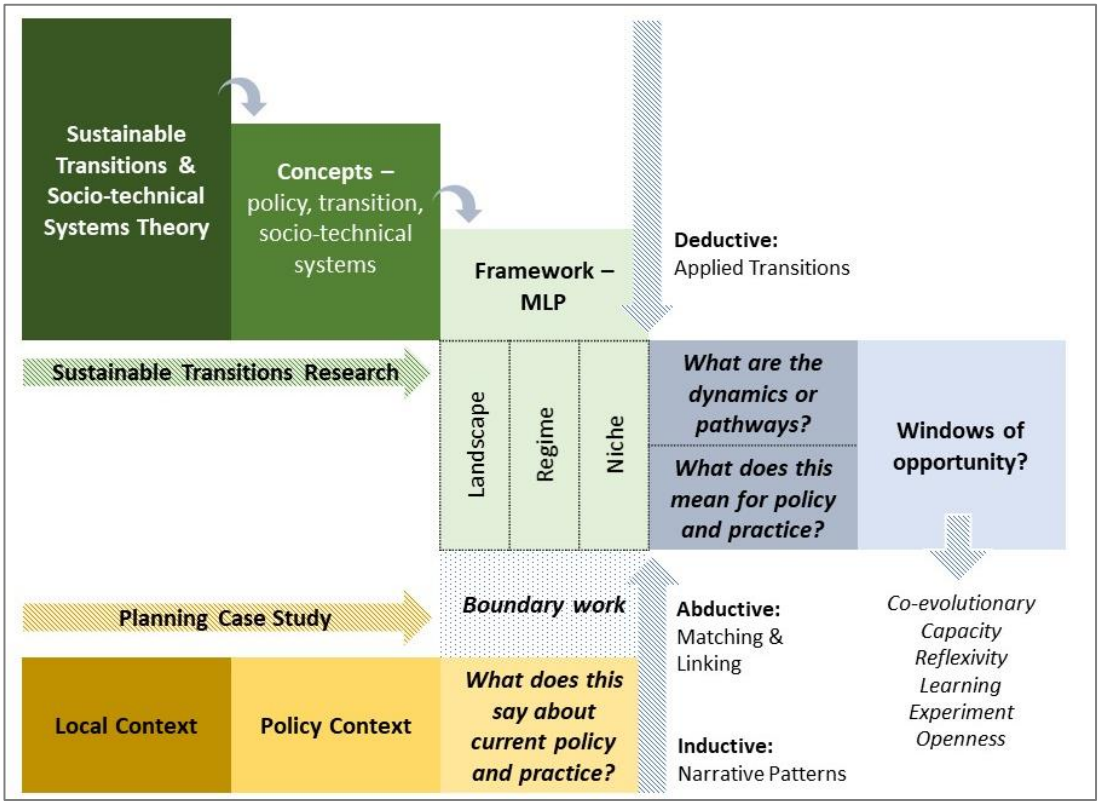


Figure 8: *Research framework*

This involves examining 'what is going on' using socio-technical transitions methods and approaches, recognising the long-term, multi-stakeholder and place-based nature of regional planning through a changing policy context (Silva, Healey, Harris, and Van den Broek, 2014, p. xxvi). The explanatory intent is based on a research design grounded in an embedded case study of an infrastructure domain (transport) addressed in regional level planning in Queensland with specific focus on the state's south east region. Transport and planning policy acknowledge that transport is a carbon intensive sector and has implications for sustainability and integrated development. While transport is already the focus of international sustainable transitions research (Geels, 2012; Sheller, 2012), the role of urban and regional planning in infrastructure transitions requires further research to ascertain how planning and transitions interface to achieve regime change. Sustainable transitions research has involved significant methodological innovation and hybridity including the development of research and practice based tools for analysis such as the MLP (Næss and Vogel, 2012; Truffer et al., 2010b).

This examination will undertake a detailed analysis of transition in transport as articulated in three versions of the SEQRP and associated regional scale policies and plans. The research recognises that multiple policy and planning domains, including regional planning,

infrastructure planning, and transport planning, shape the policy mix addressing the spatial and socio-technical system development of infrastructures. This research is not an appraisal or evaluation of infrastructure planning but an analysis, through narrative explanation, of the multi-level dynamics and policy mix addressing sustainable transitions in transport as articulated in regional planning.

5.2 Social Constructivism, Interpretivism and Interpretive Policy Analysis

Social-technical systems and planning research are suited to interpretivist ontology and epistemic social constructivism which are foundational for methods such as the MLP and approaches to policy analysis (Geels, 2010). As constitutive of a research paradigm, social constructivism and interpretivism are attentive to complex reality as it is lived or experienced by social actors and to the meanings that social actors ascribe to situations. Social actors are understood as ordering and conceptualising the world and constructing meaning (Cresswell, 2007; Denzin, 2003; Guba and Lincoln, 1989). The world and the meanings social actors create are negotiable yet inseparable. Both social constructivism and interpretivism focus on the processes of meaning making, negotiating and sharing, and how language constructs reality (Schwandt, 2003). In epistemic social constructivism this process is foundational for forming and understanding knowledge. It provides for alternative constructions of reality – particularly that which is taken for granted – and contributes diverse perspectives to public debate (Jørgensen and Phillips, 2002).

In examining socio-technical transitions in a policy context, social constructivism and interpretivism allow interrogation of an object of study from the perspective of those who have lived and created it. This is particularly relevant in relation to planning and socio-technical systems as meanings and intentions are formative of policy which is shaped significantly by diverse actors and institutions in a political sphere. Kern and Rogge (2017) argue for more interpretive approaches in transitions, particularly where uncertainty is a concern. Policy and plan making attends to and shapes the roles and interactions of institutions, actors and technologies within socio-technical systems (Bevir and Rhodes, 2015). The social shaping of technology and technological systems counters a technological determinist view and provides both a social perspective on the technological as well as a means for analysing socio-technical relations in which planning plays a role as a particular policy practice or process (Williams and Edge, 1996). Bevir and Rhodes (2015, p. 13) propose that “interpretive approaches often begin from the insight that to understand actions,

practices and institutions, we need to grasp the meanings, the beliefs and preferences, of the people involved". In relation to an interpretive approach to policy, Yanow (1996, p. 13) argues for a "focus on the meaning of policies, on the values, feelings, or beliefs they express, and on the processes by which those meanings are communicated to and 'read' by various audiences."

The interpretive approach of this research not only examines planning documents and actor commentaries in relation to socio-technical transitions but results in a narrative explanation of socio-technical transitions dynamics as articulated in planning documents and by actors. It recognises that narratives are constitutive of transitions and that transitions research has shaped particular discursive approaches and storylines that account for multi-level, actor and agentic dynamics (Rosenbloom, Berton, and Meadowcroft, 2016). For this research this interpretive process is directed towards what these plans and policies mean for sustainable transition. It adopts Yanow's (2000, p. 22) five steps for Interpretive Policy Analysis which are summarised in Table 3. The openness of Yanow's approach intersects with other approaches such as Hajer's policy storylines and Narrative Policy Analysis (Roe, 1994) which emphasise meaning, textuality, and discourse in response to uncertainty and complexity. Hajer (2006, p. 69) defines a storyline as "a condensed statement summarising complex narratives, used by people's 'short hand' in discussions". Similarly, Roe (1994, p. 2) argues "Stories commonly used in describing and analyzing policy issues are a force in themselves, and must be considered explicitly in assessing policy options". Such storylines and narratives can be artefacts that carry significant meaning for policy communities and that shape policy discourse, while also resisting change. They can define landscape-regime-niche dynamics through narrative strategies, which affirm complex landscape challenges, regime conditions, historic relations, desired niche innovations, legitimacy claims of innovation and niches, and projected visions and pathways (Rosenbloom et al., 2016).

Phronesis is also an important principle in interpretive research. Phronetic planning research prioritises the experiential aspects of knowledge production as a social act involving "the art of judgement" (Flyvbjerg, 2004, p. 284) and these experiences include the creation and shaping of narratives. Planning is a highly experiential and relational process and practice that involves social networks and learning in order to address conflict and complexity in developing strategic spatial strategies. Drawing on Aristotelian ideas of knowledge, Flyvbjerg (2004) proposes that planning can lose its reflexivity due to domination by other forms of knowledge production, such as episteme (analytic rational knowledge) and techne (practical-technical knowledge). As the third form of knowledge production, phronesis is contextual and interpretive, and often drawn from the tacit knowledge of actors and engaged

in discourse production. It prioritises values and the 'ethically practical' (Colebatch, 2006, p. 315).

Table 3. *Steps in Interpretive Policy Analysis applied to research*

Steps in Interpretive Policy Analysis (Yanow 2000, p. 22)		**Application to research**
1. Identify the artifacts (language, objects, acts) that are significant carriers of meaning for a policy issue, as perceived by policy relevant actors and interpretive communities		Identify key policy documents for regional planning, infrastructure planning and sustainable transitions, using a strategic intent lens *(Table 4; Chapter 4)*
2. Identify communities of meaning/interpretation/speech/practice that are relevant to the policy issue under analysis		Identify and interview key stakeholders involved in policy processes including elected representatives, policy officers, community members and industry organisations *(Table 5; Figure 12; Appendix 1)*
3. Identify discourses: the specific meanings being communicated through specific artifacts and their entailments (in thought, speech and act)	**Boundary Work**	Undertake interpretive analysis of policy documents and interviews with stakeholders to identify key narratives and sub-narratives emerging from policies, processes and speech *(Table 6; Figure 13; Chapter 6)*
4. Identify the points of conflict and their conceptual sources (affective, cognitive, and/or moral) that reflect different interpretations by different communities		Analyse narratives through application of Multi-Level Perspective. Identify multi-level dynamics. *(Figure 14; Chapter 7)*
5. Interventions/Actions 5a. Show implications of different meanings/interpretations for policy formulation and/or action 5b. Show that differences reflect different ways of seeing 5c. Negotiate/mediate/interview in some other form to bridge differences (e.g. suggest reformulation or reframing)		Identify the relationship/difference between sustainable socio-technical transitions and planning through policy narratives and what this means for infrastructure and transition. *(Figure 15; Chapter 8)*

Sustainable transitions methods are also described as phronetic because they involve practical experience to explore context bound problems and responses (Smith et al., 2010). This is apparent in the multi-level perspective which involves tracing and analysing relationships and flows in socio-technical systems. While policy and planning work is likely

to involve all three forms of knowledge (Colebatch, 2006), phronetic considerations of experience and narrative relate to sustainable transitions and the normative orientation of ideas of sustainability. The assertion of a storyline (Smith and Kern, 2009; Smith et al., 2005) counters the adoption and application of universal planning solutions, or empty signifiers, like 'sustainable development' and 'transit oriented development' engaged in institutionalised urbanist rhetoric (Gunder, 2010; Macarthur, 1996). Contextual experience can include place-based knowledges and spatial conditions, which can be contingent and phenomenological.

Traditional social science and technocratic policy analysis does not provide sufficient explanation for complex human systems and interactions as occur in planning. For Flyvbjerg (2004), the phronetic approach reveals knowledge production resulting from power, process, practice, and discourse. An argumentative or deliberative turn in policy analysis recognises that diverse interests are represented (Fischer, Miller, and Sidney, 2007). Flyvbjerg (2001, p. 83) argues the purpose of a phronetic social science is "to contribute to society's practical rationality in elucidating where we are, in whose interest this is, where we want to go, and what is desirable according to different sets of values and interests". That is, phronesis is concerned not only with examining current realities but also identifying future directions. System structures and dynamics need to be understood in order to anticipate the impact a policy may have and to account for learning and innovation (Derwisch and Löwe, 2015). This includes recognising policy controversies, which are intractable, that can arise in planning where uncertainty and complexity prevail (Gunder, 2010; Schön and Rein, 1994). Phronetic questioning in sustainable transitions and policy analysis are grounded in values and visions to reflectively and ethically understand the desirability of policy options, beneficiaries of planning and policy decisions, and power dynamics by which decisions are made.

Both planning and socio-technical transitions experience strong constructivist and interpretive trajectories in theory and research. Healy proposes that an interpretive perspective cultivated over several decades in planning research and scholarship has resulted in critical analysis of a breadth of planning practice including discourse production and power and conflict dynamics. For Healey, a principle concern of the interpretive perspective in planning research is "with transformation, with what to change and how to make change happen" (Healey, 2015). Like socio-technical systems and transitions research, the interpretive understanding enriches the social construction of transformation as a complex phenomenon. Because socio-technical transitions involve long-term, non-linear and co-

evolutionary pathways, an interpretive research approach is required to systemically unravel them.

5.3 Boundary Work

This research is undertaken as boundary work, intending to examine the interface and intersection of urban and regional planning and sustainable transitions policy narrative and discourse. The concepts of boundary work (Gieryn, 1983), boundary objects (Star, 2010; Star and Griesemer, 1989), boundary concepts (Metze, 2007), boundary organisations (Hoppe, 2010; Kallis, Kiparsky, and Norgaard, 2009), and boundary bridging (Koehrsen, 2017) have been used in transitions theory and research to examine complexity and diversity in socio-technical studies. These concepts particularly address the dynamics of interdisciplinary and transdisciplinary work and organisation so that groups from different fields or sectors can effectively communicate and understand each other. The concept of boundary object is attributed to Star and Griesemer (Star, 2010; Star and Griesemer, 1989) who applied it to examine scientific contexts. The concept has since been broadly applied to intersectoral, multi-scalar and/or multi-stakeholder contexts, including policy (Koehrsen, 2017). As boundary work, this research acknowledges the social boundaries around planning and sustainable transitions – in theory, research, policy, and practice – as well as the blurring of those boundaries to facilitate boundary bridging (Hoppe, 2010).

A boundary work approach, as Koehrsen (2017) argues, acknowledges that transitions involve diverse actors and communities of actors working together or in communication with each other. Boundary work and boundary bridging for facilitating collaboration is not reliant on consensus, accommodating the 'interpretive flexibility' of concepts, ideas, visions, and words (Koehrsen, 2017; Star and Griesemer, 1989). Notions of boundaries and bridging involve in-betweenness and permeability, such as meeting points and reference points. Boundary work and bridging boundaries play a role in both transforming and creating divisions by enabling agreement on a broad goal such as emissions reduction while debating the means for achieving that goal (Weller, 2012). Policy is an essential aspect of sustainable transitions and transitions governance that can influence both the trajectory and pace of transitions (Rogge et al., 2017). Policies are not developed or implemented in isolation and there is increasingly recognition that new policy instruments can contribute to a policy mix (Keast et al., 2006).

Boundary objects do boundary work in that they are shared or common symbols, ideas, or concepts that facilitate exchange, translation, and communication between communities of practice or knowledge (Fox, 2011, p. 71). Star and Griesemer (1989) outline the qualities of boundary objects as collaboratively produced, "adaptable to different viewpoints and robust enough to maintain identity across them" and can "adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites". Loorbach et al (2017) argue that the concept of sustainable transitions functions as a boundary object, or a meta-object, that enables bridging across scientific and policy disciplines and practice. Also, concepts like 'sustainable transport' and 'sustainable development' can also act as boundary objects in that they have "different meanings in different social worlds but their structure is common enough to more than one world to make them recognisable, a means of translation" (Griesemer and Star, 1989, p. 393). The interpretive flexibility of sustainable transitions enables it to act as a boundary object so that multiple meanings and perspectives can form around it (Voß et al., 2009). The flexibility of concepts also enables wider relevance so that the notion of transitions becomes a common reference point for stakeholders (Kemp and Rotmans, 2009; A. Smith et al., 2005). Equally important is the concept of boundary concepts which Metze (2007) asserts are used to intentionally blur boundaries. Such concepts are "mixed metaphors, discursive devices [that] blur boundaries and with that align different and possibly conflicting discourses and practices" (Metze, 2007, p. 10). Concepts such as sustainable development, sustainable transition, and sustainable transport can also act as boundary concepts.

The power of boundary objects, boundary concepts and boundary work lies in enabling shared spaces, new vocabularies and platforms for organising that response to diverse perspectives (Kallis et al., 2009). However such interventions are not easily or merely added to the policy process as they can require collaboration, intermediaries and co-production (Kallis et al., 2009). The application of transition discourse involves a highly flexible type of boundary work which demarcates, crosses and blurs boundaries (Avelino, 2011).

5.4 Socio-Technical Transitions Methods

As a relatively recent field, sustainable transitions introduced methods to examine socio-technical system dynamics, transitions, and policies. Three central approaches to examining sustainable transitions have developed: socio-technical, socio-institutional, and socio-ecological (Loorbach et al., 2017). The three approaches overlap and acknowledge sustainable transitions as involving nonlinearity, multi-level dynamics, co-evolution,

emergence, and variation and selection. While this research adopts a socio-technical approach in order to examine the role of regional planning in infrastructure transitions, it also relates to socio-institutional phenomena such as policy process and the research design reflects this. The MLP is a foundational framework for transitions research. However, researchers have found that the MLP is insufficient for addressing complex urban and regional socio-technical systems, with research based on layered and hybrid methods where the MLP is applied in tandem with other methods including discourse analysis. In this research, the MLP is applied to the findings from interpretive policy analysis to develop a transitions-informed analysis of regional plans and policies. Policy narratives play an important role in shaping socio-technical (or infrastructure) systems at the regional scale. The methods enable a contextual examination of the policy process – where the interpretive policy analysis enables identification of the narratives and discourses in the policy mix, the MLP establishes the landscape, regime, and niche interactions and dynamics embedded in those narratives and, in particular, enables identification of the role of planning in sustainable transitions. Policy making is political, is driven by political interests, involves a range of actors, and is underpinned by a complex array of discourses.

Multiple lenses are beneficial for examining policy change in relation to socio-technical systems transition. In adopting this layered approach to the analysis of policy and planning documents, this research recognises that multi-level dynamics are both internal and external to policy process. That is, policy is not only developed in a normative environment, but also internalises those dynamics, either to reproduce or challenge prevailing regimes in response to policy problems and objectives. By examining these multi-level dynamics across a policy mix potentially enables a more reflexive response in policy making and planning. While many theoretical perspectives can contribute to an explanation of these dynamics, combinations of theory can support a plural examination and explanation. In this research, the combination of sustainable transitions and policy analysis methods enables socio-political and socio-technological understanding.

The MLP has been found to experience several deficits including: prioritising technological artefacts as catalysts for change; lack of democracy based on limited participation of actors in governance processes with preference for elites; lack of spatial or geographic sensitivity recognising that transitions are contextual and occur at different scales; and a failure to address power relations and conflict. The MLP is not presented as a seamless roadmap for change but rather as a heuristic that enables some mapping of complex systems engaging in non-linear change over time. In order to address some of these constraints to develop a richer and more plural explanation of transition in policy, Yanow's Interpretive Policy Analysis

(2000) approach is initially applied to examine policy artefacts recognising the institutional, governance and power dynamics in policy narratives. This framework provides a means for examining how policy develops and interacts at a time when the policy mix is changing in response to a politically expressed transition agenda. This combination also acknowledges the co-evolutionary relationship between socio-technical transitions and policy narratives (Edmondson et al., 2018).

The research approach is diagrammed in Figure 5. The next section discusses the MLP in greater detail. Policy is positioned as a regime process that is influenced by landscape and niche dynamics. The overall relationship is that policy mix responds to landscape pressure and niche innovations and, as part of system learning and policy learning, may engage in policy innovation in the development of a policy mix responsive to socio-technical change. Policy may also seek to anticipate change and respond before niche innovations are mature. The MLP provides an overall analytical framework for the analysis of the policy mix using the Policy Mix Analytical Framework. Niches in this context can also include policy niches, which may be located within a policy unit, as an interdepartmental or cross-stakeholder initiative, or external to the policy unit, such as independent or stakeholder groups that are developing innovations to promote policy change or learning.

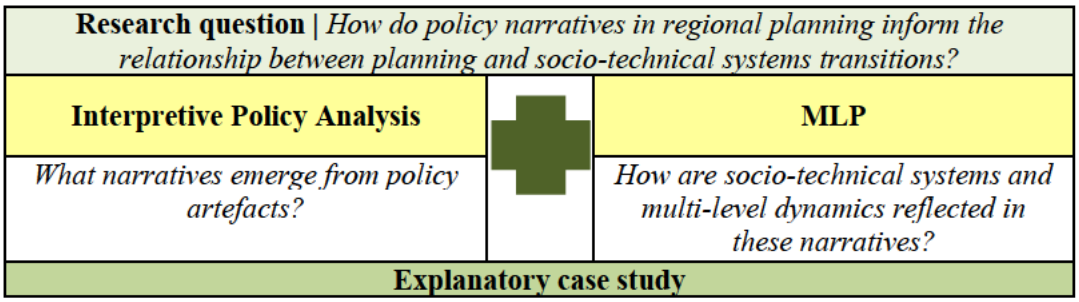


Figure 9. *Research path*

5.4.1 Multi-Level Perspective

The MLP, as a heuristic for examining sustainable transitions in socio-technical systems, is a foundational method in transitions research. It is both a descriptive and analytical framework for addressing socio-technological system innovation and radical change (Geels, 2002; Geels and Schot, 2007b; Rip and Kemp, 1998). As an analytical framework, the MLP was developed by Rip and Kemp (1998) with significant subsequent research and development by Geels and collaborators (e.g. Geels 2002; Geels and Schot 2007) as a means for analysing socio-technical systems and system innovation. It involves macro, meso and micro levels of analysis, understood as landscape, regime and niche levels to represent system dynamics

(Geels and Schot 2007) (Figure 10). The nested levels align with Giddens' theory of structuration in which the binary of human action and social structure is displaced through recognition that social structures not only frame human action but are also resultant from human action (Giddens, 1984). Analysis using the MLP is intended to examine the system-based dynamics of socio-technical systems in relation to the policy narratives. This approach allows for detailed examination of socio-technical systems and transitions as they relate to, and emerge from, policy narratives. In studies where researchers have sought to compare or bridge planning and transitions, significant differences between planning and transition narratives and outcomes were identified (Carroli, 2018; Driscoll, 2014; Malekpour et al., 2015; Späth and Rohracher, 2010; Truffer et al., 2010b). Planning was identified as inhibiting transition and system learning despite acting as a context for experimentation and innovation.

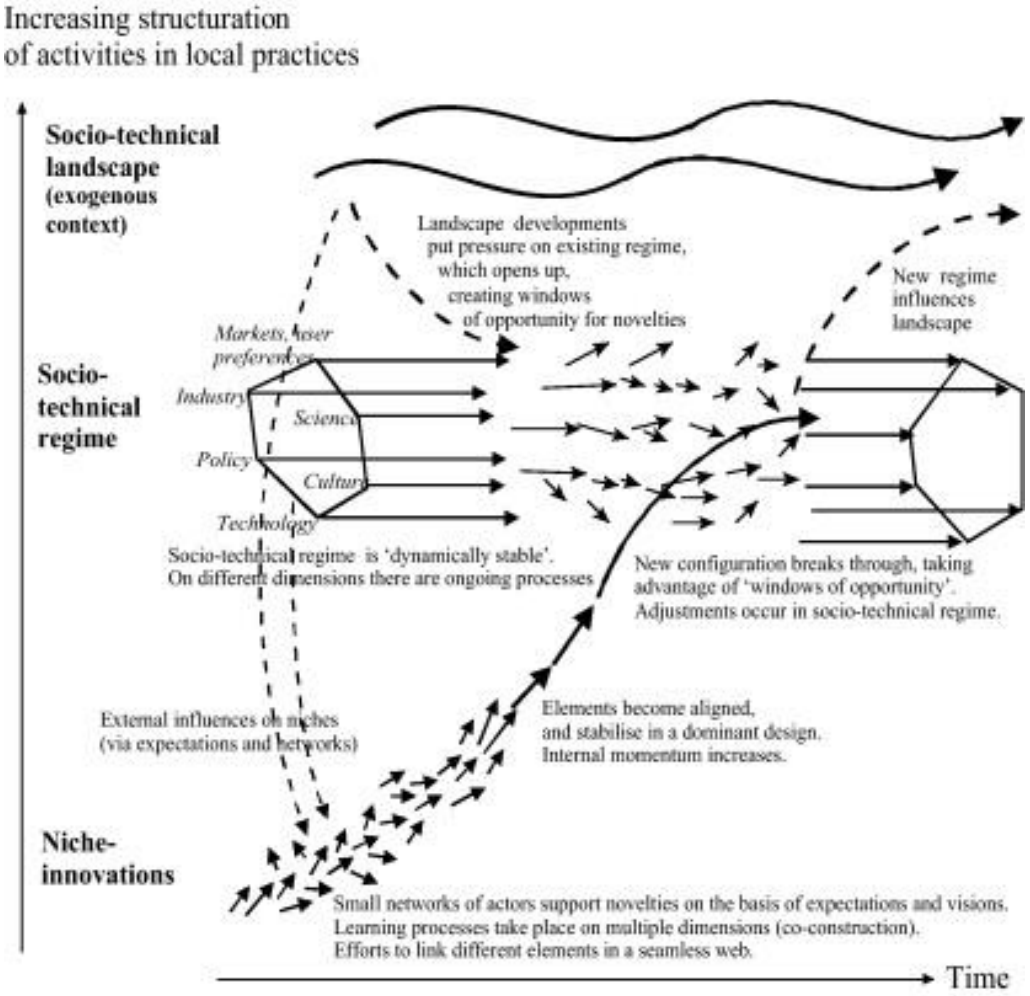


Figure 10. *MLP applied to sustainable transitions*

Source: Geels and Schot, 2007a, p. 401

The levels of the MLP are not conceptualised as spatial, place-based or scalar (Coenen et al., 2012; Raven, Schot, and Berkhout, 2012). While some analyses correlate the levels with geographic scales (Hansen and Coenen, 2014), the levels of landscape, regime and niche do not naturally correlate to the spatial scales of global, regional and local and cannot be assumed to be spatially or scale sensitive. For example, niches such as research institutes or labs can function as global networks and organisations. In applying the MLP, the sustainable transition of socio-technical systems can be steered or guided (Kemp and Van Lente, 2011) and innovations can, over time and space, emerge from the niche level to disrupt and compete with established technologies and practices at the regime level, often as a result of landscape pressures, learning and shocks (Kern, 2012). Essletzbichler encapsulates the MLP of socio-technological pathways as follows:

> new technological pathways are created in socio-technical niches operating outside the dominant socio-technical regime that are also influenced by landscape processes such as resource scarcity, peak oil, energy security or economic crisis (Essletzbichler, 2012, p. 64).

Sustainable transitions theorists acknowledge the limitations of the MLP and define a dynamic interchange between social systems, social structures and agents drawing on complex systems theories (Grin, Rotmans, and Schot 2010, 44ff). At the niche level, novelties and experiments develop. At the regime level, systems settle, interact and stabilise. The landscape level involves more persistent processes such as cultural, demographic, market and political dynamics. The three levels are nested and each level pertains to a diverse socio-technical configuration or assemblage. Another component of the MLP is the niche-regime where “a niche ... has grown powerful enough to gain a number of new characteristics, most important of which is the ability to attack (sometimes effectively) an incumbent regime (and therefore to potentially take over from it)” (Grin et al., 2010b, p. 64). In niche-regimes, Loorbach (2010) also acknowledges “that regimes can also represent the enabling environment for facilitating and legitimating a transition”.

As a process theory, the MLP stresses co-evolution of and interaction within and between the three levels, meaning that it does not apply to linear causality. As the three levels interact, they can align, resulting in windows of opportunity for transitions. Its architects stress that it is ‘not a theory of everything’ and can be complemented with other, more specific, theories (Geels and Schot, 2007a, p. 19). Ongoing examination of the MLP also suggests further development through critical realist epistemology (Sorrell, 2018; Svensson and Nikoleris, 2018). As a heuristic device, the MLP has undergone examination and application to test and

extend its limits in diverse contexts particularly in city and region scale research (Hodson and Marvin 2010; Eames et al. 2013). Næss and Vogel (2012) propose adaptation of the MLP for the complexity of the urban environment where regimes are multi-segmented, while Späth and Rohracher (2015) contend that the MLP should be supported by complementary analysis in the urban context to engage actor experience and problem framing.

The field of sustainable transitions is significantly focused on innovation and regime change, which can be evolutionary or disruptive resulting from pressures and innovations in the niche and landscape level. The levels which the MLP define asserts the systemic and structural dimensions of co-evolution of innovation in socio-technological systems, including socio-cultural, market, regulatory and economic trends (Kern, 2012). However, as Geels and Kemp (2007) found in their case studies of waste systems in the Netherlands, involving both transformative and transitional change, significant political contestation occurs. Accounting for combined system and actor dynamics is necessary for understanding change and power. The relations between and within the three levels of the MLP are also researched in order to develop a more nuanced understanding of pathways and co-evolutionary processes. Berkhout et al. (2010) draw MLP and strategic niche management analysis together to highlight the flows and learning across regime and niche levels arising from experiments with particular focus on developing countries. The influence of niches and experiments is highlighted in formulating 'greener' growth and economic development which involves technological innovation, involving infrasystems, to change regime and socio-technical configurations. It is proposed that landscapes and regimes are fluid rather than stable and that linkages and learning require facilitation to overcome obstacles to transition and generate greater understanding about sustainability experiments and hybrid innovation in technology relevant to infrasystems. Wolfram (2016a) also examines the formation of grassroots niches from a strategic niche management perspective to establish how such niches emerge in urban regimes. The city is integral to niche development and grassroots innovation through a reflexive approach to niches as they play a pivotal role in system innovation and learning and develop under contingent and local conditions.

A feature of sustainable transitions research in relation to infrastructure systems and urban systems is the application of the MLP in case studies. These studies test and critique the MLP based on its assumptions and its applicability to urban systems. Quitzau et al. (2013) found that regime actors can innovate and produce change in urban systems. However, some regime and landscape dynamics such as planning regulation and practice inhibit transition. Even though system experiments occur (Berkhout et al., 2010; Moloney and Horne, 2015b; Quitzau, Hoffmann, and Elle, 2012; Williams, 2016), these do not create conditions for

system change. Næss and Vogel (2012) argue that the focus on niche innovations in transitions research does not respond to the realities of the urban environment, particularly the relationship between land use and transport as multi-segmented regimes. The multi-segmented regime can be changed by altering the composition of the regimes as an 'agreed mix' through more effective integration.

The MLP introduces a relational and explanatory approach to socio-technical systems but given its heuristic tendencies, supplementary methods are required to elucidate the nuances and complexity of urban environments. Interactions between landscape, regime and niche levels warrant ongoing examination to draw out the greater complexities of power, contingency, context, structure and actors as well as the endogenous processes of each level in the context of urban and regional planning and infrastructure. Experiments alone are not constitutive of emergent transitions, nor do they necessarily create the conditions for transitions.

The MLP can also be applied to identify types of transitions pathways and several theorists have formulated transition typologies (Geels and Schot 2007; Geels and Kemp 2007; Grin, Rotmans, and Schot 2010; Frantzeskaki and Loorbach 2010). The intention of these typologies is to distil tendencies in both transition and infrasystem dynamics. Five transition typologies (Grin, Rotmans, and Schot 2010; Geels and Schot 2007), which trace the interactions between the levels, are identified as transformation, dealignment and realignment, technological substitution, reconfiguration, and mixed. A pathway condition of reproduction is also acknowledged but because this reproduces existing conditions it is not a transition pathway. The five transition path typologies are understood as follows:

> *Transformation*: Landscape pressure is moderate with niche innovations not developed, leading to regime actors modifying the development path and innovation activities e.g. emergence of organic food
> *Dealignment and realignment*: Landscape conditions experience a sudden rupture resulting in regime problems and erosion, characterised as dealignment. Because niche innovations are not developed or available, other innovations emerge and compete for dominance, which is understood as realignment e.g. transition in the USA from horse-drawn carriages to automobiles resulting in competition from other niche innovations such as the bicycle and electric tram
> *Technological substitution*: With significant and multidimensional landscape pressure and shocks occurring when niche innovations are developed, the niche

innovations can replace the regime e.g. Transition from sailing ships to steamships in Britain

Reconfiguration: As innovations develop in a relational and complementary way that can be adopted by the regime, they can trigger ongoing changes in the regime e.g. transition from industrial factories to mass production in the USA

Mixed: Particular landscape pressures can trigger a combination of transition pathway types in sequence e.g. climate change is expected to be this kind of trigger for transition in transport and energy regimes (Geels and Schot, 2007b).

Each typology describes the temporal, actor and multi-level interactions that arise in socio-technical transitions – many transitions occur over long-term, multigenerational timeframes. This typology is useful because change and opportunity are differentiated and made more traceable. The path is a principle object of analysis and action rather than a means to an end-state. The MLP provides a means for differentiating pathways through guided evolution and co-evolution over time. It anticipates that understanding these dynamics better equips key actors to steer transitions.

The MLP has also been applied to analyse and assess policy, although analysis of politics and power is also warranted (Geels, 2014b; Lawhon and Murphy, 2012). Hodson and Marvin (2009) identified the usefulness of the MLP in assessing urban strategies and policy in relation to the multi-scalar challenges of socio-technological transitions. Kern (2012) also applied it to assess innovation policy, specifically a single policy initiative intended to catalyse low carbon economy transition, and concluded that the MLP is an appropriate means for undertaking such an assessment. Geels (2012) assessed transport and low-carbon transitions with the MLP, identifying the significance of policy and planning in the relative stability and dominance of the automobility regime. In a study of low-carbon transition in the UK, Geels (2014b) found that regime resistance to transition is deployed through diverse strategies and exercises of power that obstruct system change and inform policy. Geels concluded that greater attention to regime dynamics is required in addressing transitions in policy to define a distinction between path dependence and resistance. As a non-linear framework, the MLP also applies in relation to system shocks and the resulting learning (Castán Broto et al., 2013). Such studies indicate that while the MLP is an analytical approach that is suitable for examining policy, additional interpretive methods are required to examine power and politics. Further, applying it to a spatial context does not make it a spatial theory. It takes advantage of its scale-blindness to raise spatial and scalar issues for further developing the theory.

The MLP provides an alternative perspective of socio-technical system change, agency, politics, and multi-scalar dynamics (Rohracher and Späth, 2017), as well as a useful explanatory and analytical framework for transitions (Swilling, Musango, Robinson, and Camaren, 2017). They particularly note how the MLP can assist in elucidating departures from the dominant regime. Swilling et al (2017) also propose that the MLP can support the creation of a detailed picture of transformative dynamics including material, institutional, discourse and social practice changes. The MLP, as a systems-oriented approach, acknowledges the importance of these relational dynamics in the formation of landscape, regime, and niche interactions. Niche actors can strategically intervene on discourse and social practice in ways that pressure regimes. Consequently, a focus on the policy narrative is useful for renegotiating and reframing planning and policy mixes that construct such narratives. The aggregation of narratives and discourses can result in landscape level changes (Swilling et al., 2017). Through the Interpretive Policy Analysis method deployed in this research, interviewee accounts provide insight into these dynamics to reveal three overarching narratives in the policy that shape the relationship between regional planning, infrastructure and transport. In this case study, the discussion and application of the MLP extends analysis of those policy narratives to understand how they inhibit and support the role of planning in infrastructure transition at the regional scale. This analysis and discussion extrapolates Yanow's methodological process for intervention or action particularly to draw out different meanings and ways of seeing and to reformulate or reframe.

As in other research deploying the MLP as an analytical framework, this discussion flexibly draws on the MLP so as to enable an interpretive approach to analysing and discussing complex spatial and policy systems and mixes (Foxon, 2012; Geels, 2011). The MLP is applied in a boundary bridging exercise that seeks to examine the interface of regional planning and sustainable transitions of socio-technical systems. Additionally, this addresses the role of space in transitions and the specificities of spatial, place-based, scalar and territorial contexts and variations. These contexts shape how discourses and institutions interact and how they scale to governance arrangements. Emphasising the importance of cities and regions, Rohracher and Spath (2017, p. 292) note that "cities and regions can thus be an important arena of struggles about the development and change of socio-technical regimes and partial implementation of systemic alternatives". Socio-technical systems are understood as dynamic systems comprised of soft and hard interacting elements that are socially constructed, rather than incontrovertibly real, for the purposes of analysis or action. The MLP further enables interpretation and empirical analysis of stakeholders, institutions, and technologies that constitute socio-technical systems (Baker, 2016). It recognises the interactions between "technology, policy/power/politics, economics/business/markets and

culture/discourse/public opinion" (Geels, 2011, p. 25). The narrative and explanatory tendencies of MLP analysis do not sufficiently represent the 'dynamic complexity' (Leach, Scoones, and Stirling, 2010) of spatial and multi-scalar dynamics of transitions or the flows of transition activity at multiple scales (Hodson et al., 2016). That is, it can underplay the role of learning and reflexivity in complex and changing arenas (Leach et al., 2010). However, it does enable analysis of policy process and appraisal of strategies and opportunities for progressing system learning through niches and experiments.

The MLP is particularly useful in developing a narrative explanation of socio-technical regime and system dynamics, including policy analysis. In applying the MLP to examine policy, Kern (2012) outlines and describes dynamics across the three levels of niche, regime, and landscape in narrative form. He identifies learning processes, pricing issues, support of influencers, emergence of market niches, changes in rules and values, changes in networks, the impact of political and macro-economic developments and cultural patterns as points for assessment and analysis. In Kern's study, the levels of the MLP were used to identify patterns and to structure the analysis. Through his policy assessment and analysis, Kern (2012) found that MLP analysis can trigger policy learning and destabilise locked regimes that inhibit sustainable development. Hodson and Marvin (2009) identified the usefulness of the MLP in assessing urban strategies and policy in relation to the multi-scalar challenges of socio-technological transitions. Regional transition storylines and visions have also been analysed to reveal the relationship of the spatial or territorial context of discourse and the power of regionally based guiding visions addressing transitions (Rohracher and Späth, 2013; Späth and Rohracher, 2010). Geels (2012) assessed transport and low-carbon transitions with the multi-level perspective, identifying the significance of policy and planning in the relative stability and dominance of the automobility regime. The learnings from these studies is that the MLP can be applied to different aspects of the policy process to interrogate multi-level dynamics. These interrogations also inform reframing of policy narratives and processes to trace how transition narratives are evolving.

The research seeks to understand whether and how changes in the three versions of the regional plan reflect socio-technical systems and transitions over time to ascertain how planning narratives construct sustainable infrastructure system transition. The MLP enables an explanatory account of the policy process. The application of this method in the research design provides a system-aware lens to regional infrastructure planning over time. The dynamics that are identified can indicate path dependence, political and actor resistance, windows of opportunity and socio-technical transitions. Importantly, the MLP is not a scale-sensitive or place-sensitive framework and applying it to a regional context will not make it

so. However, applying it to a policy and infrastructural planning context will support analysis of socio-technical systems at the regional level and at other scales (Smith, 2009; Späth and Rohracher, 2010). Planning as a field of study is a spatial discipline that addresses and examines scalar and spatial practices and policies. The MLP can be applied to urban and regional analysis and can contribute to spatial and place-based research.

Through application of the MLP, several researchers (Eames, Dixon, May, and Hunt, 2013b; Geels, 2012; Hynes, 2016; Moloney and Horne, 2015b) have found that planning and policy processes experience limitations in addressing transitions. They argue that the MLP is a limited analytical method that requires support by additional theoretical and disciplinary approaches. The MLP can be adapted or supplemented to address a broader range of urban processes and dynamics. The MLP introduces a relational way of addressing socio-technical systems but, given its heuristic tendencies, additional methods are required to elucidate the nuances and complexity of urban environments including the growing theory and research on sustainable urban transitions, much of which is not grounded in urban and regional planning (Moloney & Horne, 2015a). Interactions between landscape, regime and niche levels warrant ongoing examination to draw out the greater complexities of power, contingency, context, and actors, as well as the endogenous and experimental processes of urban and regional planning and infrastructure.

5.5 Narrative Explanation

Socio-technical transitions methods are conducive for narrative explanations which extrapolate what happened, why it happened, and how it happened, and can provide insight into causality and other dynamics over time. The MLP provide guides for narrative explanation of highly relational processes. For Geels (2010), the MLP is a central device, as a heuristic, to guide narrative explanation of transitions. Grin, Rotmans and Schot (Grin et al., 2010a) propose that transitions are best served by process theories, like the MLP, and that narrative explanations reveal patterns and mechanisms. They argue that the MLP is a process theory that identifies the relationships between different processes at different levels. The narrative explanation “can capture complex interactions between agency and changing contexts, time, event sequences, making moves in games, and identities” (Grin et al., 2010a). The narrative explanations developed through the application of Interpretive Policy Analysis and the MLP are anchored in and guided by theory. Interpretive Policy Analysis interrogates policy artefacts as a socio-political process that reflects and narrativises cultural, social, political and economic influences. The MLP enables the development of a non-linear

narrative that acknowledges the interactions of various actors, elements, and processes. In recounting this type of open-ended narrative explanation, in which critical moments and junctures also occur, non-linear and heterogeneous interactions are recounted (Griffin, 1993, p. 1099). This is not mere storytelling or a bland account, but the construction of a complex narrative that reflexively traces process by explaining and analysing socio-technical change, recognising patterns in context. It is itself an object of further inquiry (Grin et al., 2010a). According to Kay (2005),

> narrative explanation is a reduced form of causal explanation, useful when there is uncertainty about the mechanism operating or where a reason is accepted as existing that implies the mechanism.

In socio-technical change, causality is not always explicit given the nature of socio-technical pathways as complex, emergent, and co-evolutionary, and narrative explanation provides a means for reflecting that process. Actors develop their own understandings of these processes and their roles in them, together ascribing a relationship between meaning, action, and context which the researcher interprets to develop a narrative explanation (Orlikowski and Baroudi, 1991).

In policy and political studies, Bevir (1999) argues that narrative forms of explanation are fundamental and account "for actions, practices and institutions by telling a story about how they came to be as they are and perhaps also about how they are preserved". For Bevir (2000), the epistemic legitimacy of narrative explanations acknowledges that knowledge is 'imaginatively constructed' and usually framed by prefigured theories, values and methods. He argues that "every form of explanation works by postulating pertinent connections between entities of events. Narrative explanations relate actions to the beliefs and pro-attitudes that produce them." In socio-technical transitions research, the narrative explanation is a common and established process for elucidating complex conditions and event sequences guided by the MLP. In this research, the Interpretive Policy Analysis and the MLP are scaffolded to support the type of boundary work needed to negotiate the interfaces between planning and sustainable transitions.

5.6 Explanatory Case Study

Case studies enable the detailed examination of phenomena in their context. Case study research is also suited to research questions and objectives that address the 'how' of

situations (Yin, 2009) and, in this case, how transitions are understood in the planning context and how planning constructs knowledge in relation to transitions. Thomas' (2011) typology of case study research provides an organisational structure to guide case study development. The adoption of a phronetic principle in the case study involves examining systems and situations as they are and as stakeholders experience them (Flyvbjerg, 2004). In relation to phronesis, Gunder (2010, p. 39) says that in planning, "the development of expertise through practice - doing - constitutes the formation of unconscious skill and knowing-how in its own right". While that may be the case for planning, it is presently difficult to assert for sustainable transitions as an emerging set of practices and experiments split across diverse arenas of actors, practices and politics. This raises many questions and concerns about the truth claims of planning which Gunder (2010, p. 40; Gunder and Hillier, 2009) describes as seeking "legitimacy in the appearance of rationality while presuming to create and then to represent an illusion of public consensus as to how the present and future city ought to be". How planners and planning learn, practice, and form skills associated with sustainable transitions is not widely examined. This case study presents consideration of the current trajectory in a bounded spatial and historical context in which an emerging transition narrative is identifiable and has implications for planning and planning practice.

The case study is grounded in real life and is presents an opportunity for an in-depth exploration "of the complexity and uniqueness of a particular project, policy, institution, program or system" (Simons, 2009, p. 21). The research is designed as a detailed and embedded explanatory case study (Thomas, 2011; Yin, 2009; Yin, 2013) with the intention of developing a narrative explanation of socio-technical transitions in a regional planning context. The detailed examination of SEQ addresses transport as one of many infrastructure domains reflected in regional planning. The focus on transport is limited to human land-based transport rather than freight, airports, and ports. Applying Thomas' (2011, p. 518) typology, in which the subject, purpose, approach, and process of the case study should be clearly defined, is presented in Figure 11.

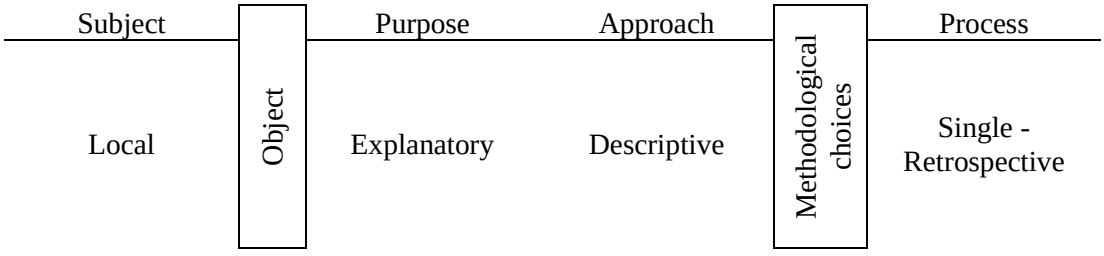


Figure 11. *Case Study Typology. Source: Thomas, 2011*

The local subject is the relationship between infrastructure transition and regional planning in SEQ. The object, as in theoretical frame, is socio-technical systems and transitions theory. The purpose is explanatory and traces the dynamics of the case to reveal meaning and narrative relations (Harder, 2010). The approach is descriptive and involves sensemaking and interrogating meaning arising from data analysis. The case study will be undertaken through the analysis of policy and planning documents and stakeholder interviews. Data generated through these methods will be analysed to trace transition policy narratives in relation to infrastructure at the regional scale. These methods capture data and establish an analytical approach consistent with the constructivist and interpretive ontology of this research. The case study is singular with reference to specific systemic dynamics of a regional planning context; it is retrospective and based on a trajectory of past policy development. By examining the policy and interviews undertaken with policy actors, transition dynamics can be traced to formulate a narrative explanation which can indicate whether a transition pathway is emerging for infrastructure in policy and planning.

5.6.1 Policy Documents

A total of eight regional plans and government policies were analysed including statewide plans with significant regional content or application (Table 4). These documents are produced by different agencies, all State Government, and are part of a strategic policy mix that determines and expresses how government and governance provide infrastructure at the regional scale. They are selected for examination for their strategic intent in relation to infrastructure development, with attention on transport. These documents are longer term policies that in combination establish a pathway for regional development in SEQ and define relationships between infrastructure and land use as spatial and socio-technical system configurations. Infrastructure planning was initially undertaken at the regional scale but in 2011 a statewide infrastructure plan incorporated regional level infrastructure plans and programs and continues to do so.

This case study will focus on the relationships between spatial, infrastructure, and transport planning and policy, recognising transport as a socio-technical system with significant infrastructural and spatial impacts. In some of these state policy and planning documents, the regional focus is not apparent but regional policy and planning must address those priorities, such as *Pathways to a Clean Growth Economy: Queensland Climate Transition Strategy* for which a regional climate impact report has been produced.

Table 4. *Policies examined*

Year of Release	Document	Responsible Agency / Department
2005	South East Queensland Regional Plan 2005-2026	Office of Urban Management / Queensland Department of Local Government, Planning, Sport and Recreation
2005	South East Queensland Infrastructure Plan and Program Updated annually until 2010	Office of Urban Management / Queensland Department of Local Government, Planning, Sport and Recreation
2009	South East Queensland Regional Plan 2009-2031	Department of Infrastructure and Planning
2011	Queensland Infrastructure Plan	Department of Local Government and Planning
2011	*ConnectingSEQ* 2031: An Integrated Regional Transport Plan for South East Queensland	Department of Transport and Main Roads
2016	State Infrastructure Plan	Department of Infrastructure, Local Government and Planning
2017	Pathways to a Clean Growth Economy: *Queensland Climate Transition Strategy*	Department of Environment and Heritage Protection
2017	*ShapingSEQ* 2017-2067	Department of Infrastructure, Local Government and Planning

Transition pathways can take shape over decades and generations: planning and transitions are differing yet related regional policy frames (Schön and Rein, 1994). However, the period of statutory regional planning has set changed circumstances in the policy environment that has enduring impacts on the way people live in the SEQ region on the basis of sustainable development. Transitions are long-term and co-evolutionary processes and not readily attributed to a single critical juncture or intervention. Transition pathways are constituted by system innovation and learning. The research sets a boundary around a specific set of policies that define the regional planning context of infrastructure and transport since 2005. By examining the multi-level dynamics embedded in policy and planning narratives, this research develops a planning based explanatory narrative addressing infrastructure and transport systems. This focus allows further clarity about and tracing of the interaction between regional planning and infrastructure transition, including spatial dynamics.

The regional plan as a strategic regional policy document has been developed and reviewed over changes of government and/or leadership, since statutory regional planning was introduced in 2005. The case study presents findings are applicable more broadly to the planning system in Queensland and elsewhere where similar planning conditions prevail. Regional planning is undertaken in fundamentally the same way in each region and is

dependent on the interactions and relations between stakeholders, with emphasis on government led processes. The case study was undertaken through a merging of research methods applied to policy documents and actor interviews. In regional planning, given the nature of stakeholder engagement and infrastructure governance, it cannot be assumed that a regional plan will address all infrastructure classes and sectors in the same way. Research on path dependence stresses examination of institutional patterns, relationships and contingencies over time. The MLP offers an analytical framework through which to examine system dynamics and analyse policy from a socio-technical transitions perspective.

This data provides a means of analysing current positions and propensities in regional planning in relation to socio-technical and/or infrastructure transitions to understand the narratives emerging from planning. Triangulation occurs across multiple actor interviews and between different sources. Analysing the plans provides insight into whether the regional plans as policy documents contribute to sustainable transition through new policy processes, languages and tools, policy learning, and system innovation. The examination of policy documents also informed the subsequent research stage of interviews for a more detailed picture of policy narratives.

5.6.2 Interviews

Semi-structured, in-depth qualitative interviews were conducted with diverse stakeholders who have played a role in SEQ regional, infrastructure, and transport planning and policy. These were drawn from Regional Planning and Consultative Committees and other panels and stakeholder networks which include elected representatives, planners, consultants, government officers, community representatives, and industry and business representatives. Regional Planning Committees are appointed by the Minister under the provisions of the planning legislation and significantly involve representatives from all levels of government. Other consultative committees have been established to support regional planning. Interviews were conducted using either web conference facility or face-to-face, using a narrative approach guided by a semi-structured interview outline. The questions are included in Appendix One. The interviews addressed three main themes: context and the interviewee's involvement, how and if transition is deployed as a policy concept, and learning as a policy or systemic process. The interviews were electronically recorded with the consent of the interviewee and, on average, were 90 minutes long.

Queensland regional planning has historically been pursued through prescribed or prefigured organisational structures such as committees and consultation processes and is led by

government agencies. Therefore a snowball sampling method was used to identify key stakeholders and participants in regional planning over time (Crouse & Lowe, 2018). This involved several techniques. First, seeking word of mouth recommendations from peers and colleagues in the planning and planning education sector. Second, referring to a range of research documents and committee documentation to identify people who have had a professional association with regional, infrastructure and transport planning in SEQ. Third, key term searches on a professional social media platform, specifically LinkedIn, were undertaken also to identify people with a professional association with regional, infrastructure and transport planning in SEQ. This approach acknowledges that regional planning in Queensland involves a relatively small and connected group of professionals who experience significant professional mobility across industry, community and government employment and consultancy.

Snowball sampling, as a type of network sampling, supported by identification of stakeholders identified in government documents, is appropriate given the networked nature of the policy process and reviews. The sampling not only recognises the stakeholders in relation to an issue or infrastructure domain, but also their stake over time. These form a historically and socially identifiable network of regional stakeholders and policy makers which are a limited pool. A total of 60 people were approached for interview with 22 people agreeing to be interviewed. Those who declined interviews also identified others to interviews and the resulting pool of interviewees reflected those recommendations. The interviews are used to both validate and extend the findings of the initial policy analysis to ascertain ‘what is (or was) going on’. Many interviewees, as actors in the planning profession and planning institutions, have charted highly mobile professional lives and many of the interviewees were involved in multiple regional planning iterations, or have held multiple roles in government, non-government organisations, such as industry and community peak bodies, and the private sector over the period since statutory regional planning commenced. The 22 interviewees represent 42 involvements in the planning and policy processes over time (Table 4). For example, an interviewee may have been involved in multiple planning and policy processes having worked for an industry body before gaining employment in government and then working in consulting. More concretely, a State Government planning officer was involved in several State Government regional and transport planning strategies over a decade and then gained employment in Local Government or industry and contributed to a regional planning committee or consultation.

Table 5. *Interviewee involvement in sectors over time*

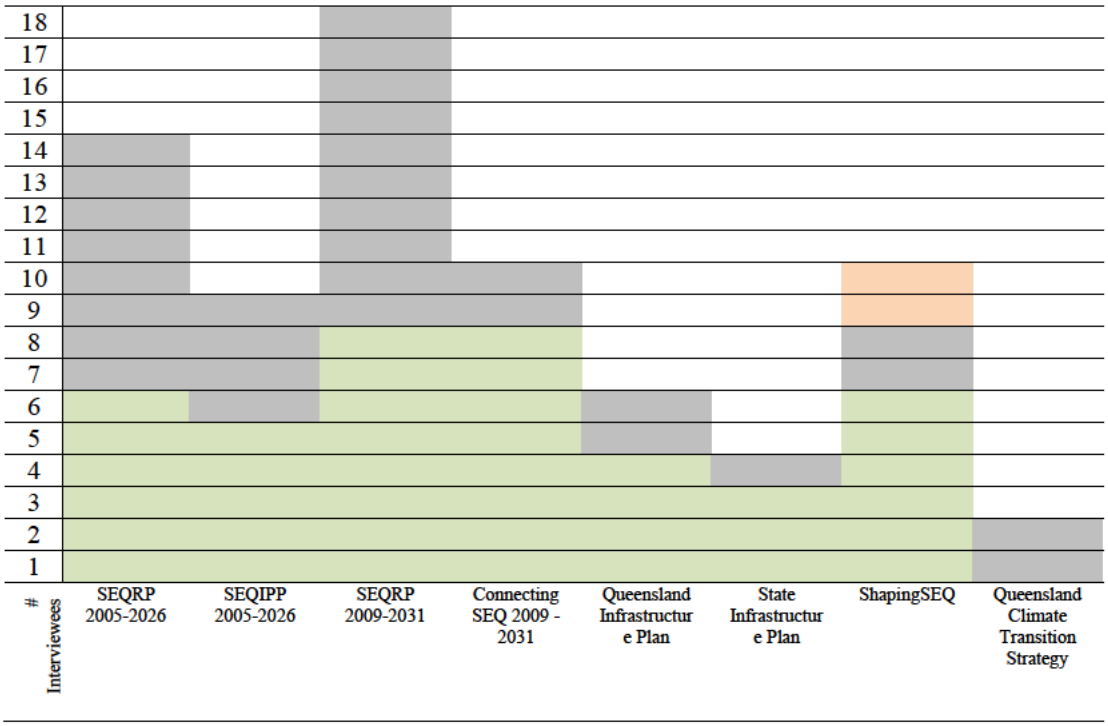
Sector	Number of involvements
Community and Environment	3
Government	
• Planning	14
• Transport	9
• Infrastructure	3
• Other	3
Industry	8
Elected Representative	2
Total	42

As interviews were used to extend policy narratives and understanding of the policy processes, the interview pool did not need to be broad or large but did need to be well positioned within the planning process (Figure 12). The interviewees were drawn from leadership and middle levels of the planning and policy process and stakeholder organisations. Comparatively fewer interviewees were sourced to discuss the development of the Queensland Climate Transition Strategy because approaches to the relevant government department were referred to the government department responsible for regional planning. The interviewees identified were associated with community stakeholder groups but interviewees associated with *ShapingSEQ* were aware the policy was in development.

Saturation was achieved on this basis and successive accounts of the planning were yielding similar data. Malterud et al (2016, p. 1754) propose that 'information power' is a more appropriate means for considering sample size where "larger information power the sample holds, the lower N is needed, and vice versa". They define information power in relation to (a) study aim, (b) sample specificity, (c) use of established theory, (d) quality of dialogue, and (e) analysis strategy. This study conforms with the attributes that indicate a smaller sample is sufficient: that is, the study aim is narrow, the sample is specific, there is significant reliance on established theory, interviews were in depth and exploratory, and the analysis strategy was a single case study (Malterud et al., 2016). Given the task of this research is policy analysis, focused on specific policy artefacts, the number of interviews is sufficient to represent the processes and relationships.

Many of those involved in regional and infrastructure planning are or were public servants who can be apprehensive about being interviewed and seek anonymity due to their role in government. However, as professional informants, who can provide insight into policy process and who are drawn from a relatively small group, their perspectives are necessary for

the research. Purposeful selection guided the identification of prospective interviewees, particularly where snowballing repeatedly led to a small network of people who had been known to engage with researchers (Lee, 1993). Such a small group carries memory and stories linked to particular institutions, as a form of social knowledge, even when they pursue alternate work trajectories and even when the institutional context is amnesiac due to, for example, organisational restructuring or redundancy (Linde, 2009).



KEY (*n*=22)

Leadership / Senior Level	
Middle Level	
Frontline	None
Consultant	

Figure 12: *Interviewee involvement in planning and policy over time*

The interviews also inform the development of narrative explanation synthesises from multiple narrative accounts recognising different perspectives, recollections, and priorities (Abell, 2004; Bevir, 2000). This is highlighted in sustainable transitions research as a suitable means of accounting for and recounting policy processes.

5.6.3 Data Analysis

The study of sustainable transitions in socio-technical systems in SEQ infrastructure planning was addressed through a detailed examination of the transport domain. This examination followed Yanow's Steps in Interpretive Policy Analysis (2000) and included

thematic analysis and keyword and text searches to identify terminology in planning and policy documents and interview transcripts. This is essential for identifying key concepts and meanings in relation to sustainable transitions, infrastructure, and transport across the policies. Qualitative data is interrogated for patterns, like themes or categories, and the analysis entails identifying and reporting these patterns (Castleberry and Nolen, 2018). The analysis was based on coding data (policies and interviewee transcripts) and required the establishment of templates, codes, categories and other protocols for collecting and managing data so that it was effectively analysed. In undertaking the thematic analysis narratives and constitutive sub-narratives embedded in the planning and process were identified and elaborated.

The analysis of the policy documents and interview transcripts involved multiple and iterative cycles of coding, an open coding process followed by axial coding using Nvivo software (Saldana, 2009, 2014) (Figure 13). The process dissembled and reassembled the data through interpretive interaction with the data. Where the initial coding identified key codes, concepts and ideas, the axial coding was more focused and intended to identify tensions in the policy that both affirmed and challenged regimes or indicated other connections between the codes. This was further supported through memos and annotations in which ideas about the relationship between coded material and sustainable transitions were noted for further examination and analysis. Initial codes and categories were developed through examination of policy and planning documents in Nvivo to identify keywords, patterns and other aspects of the policy narrative. This process was multifaceted in that it examined policies and plans individually and collectively.

Codes and categories are not sufficient to convey narratives and further interrogation drew out stories in the policy. In a narrative sense, sustainable transport is not just a planning model that appears in planning and policy documents, but also a story with intentionality, characters, action and moral. The interviews were essential for elaborating the story across multiple and conflicting points of view. An example is the evocation of ‘good planning’ in which plans, planning professionals and policy makers are non-objectively aiming towards a planning or urbanist ideal. Community members and other stakeholders may be conflicted about this ideal or experience it negatively as a loss. The policy narratives elaborated in the next chapter reflect these conflicts while also elaborating narrative formation.

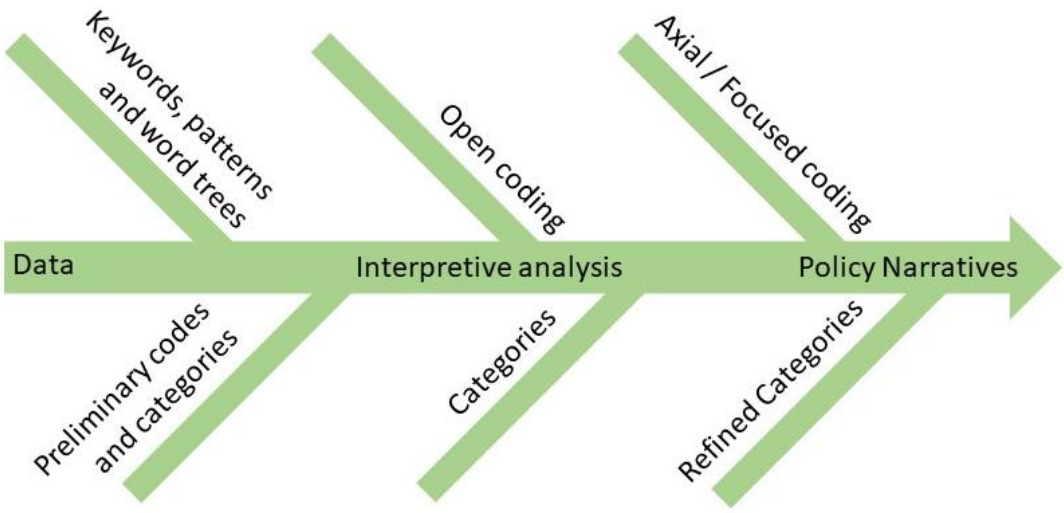


Figure 13: *Interpretive coding process*

The axial coding resulted in refinement of open codes to aggregate categories and then policy narratives and sub-narratives. An initial set of codes and categories referring to these interrogations were intentionally open and refined through the coding of the policy and interview texts. As an inductive process, the coding of interview text allowed for triangulation of data and use of memos to consolidate narratives.

5.6.4 Coding towards Policy Narratives

Coding was supported by multiple explorations of the texts – policy documents and interview transcripts - to identify key terms. This included keyword searches in Nvivo found high frequency of words and stemmed words including:

- Plan (plan, plan', planned, planning, planning', plans, plans')
- Region/s (region, region', regional, regionally, regions)
- Infrastructure (infrastructural, infrastructure, infrastructure', infrastructures)
- Transport (transport, transport', transport', transportation, transported, transporter, transporting, transports)
- Developments (develop, developable, developed, developer, developers, developing, development, development', developments, developments', develops)
- Government (governance, governed, government, government', governments, governments', governments')

- Community (communal, communicate, communicated, communicating, communication, communications, communities, communities', communities', community, 'community, community')
- Servicing (service, serviceability, serviceable, serviced, services, services', servicing)
- Projects (project, project', projected, projection, projections, projects)
- Roads (road, 'road', roads, roads', roads')
- Urbanism (urban, 'urban, urbanism, urbanism', urbanity, urbanize, urbanized)
- Growth' (growth, growth', growths)

While keyword frequency is indicative of some narratives, this was further examined using specific word searches and examination of word trees in Nvivo. This revealed multiple dynamics attached to keywords, such as sustainability which is commonly stated in the planning documents in relation to transport indicating that 'sustainable transport' is a key concept and framework that evokes specific responses in planning. Through iterative coding of data several categories were refined to five categories:

- **Legacy** referring to historic and path dependent spatial patterns and processes
- **Change** referring to alternative approaches, innovation and future vision
- **Planning** referring to planning practices, planning processes and the role and significance of planning in spatial and infrastructural development
- **Infrastructure** referring to the specifics of infrastructure planning, socio-technical relationships, technologies, transport
- **Sustainability** referring to the interpretation and application of sustainability and sustainable development

These codes also formed narratives when they assembled as structured stories and interpretations of the policies with narrative attributes of characters, moral, action and conflict. An example of coding is included in Table 5 and this example specifically illustrates how texts were interpreted in relation to the legacy of non-statutory planning including its influence on institutionalisation through regulation, collaboration, and consensus building. In this example, legacy and change represent a tension in planning that is constitutive of specific narratives and sub-narratives.

This process represents a point of difference in other policy analysis applying the MLP or analysing transition storylines where either the MLP had been applied as the only

interpretive framework (Kern, 2012) or where regime storylines and discourse coalitions were examined (Bosman et al., 2014). The thematic coding also enabled some preliminary examination of multi-level dynamics through annotation and relational mapping of text. This supported the subsequent analysis of the emerging narratives applying the MLP, which addresses the fifth step in Yanow's Interpretive Policy Analysis framework to address interventions, framing and bridging meanings. This reveals policy shifts and examines how transitions develop in and through planning or how planning is situated in, or in relation to, transitions dynamics in response to the research questions. This process highlights how multi-level dynamics are embedded in and enacted by policy and planning through framing and reframing.

Table 6: *Example of coding, category and narrative formation*

Interview text	Codes	Categories	Annotation	Narrative
… Collaborative planning in some format but it was very collaborative back in 2000	Collaboration	Legacy / Change	Collaboration and regional planning were both innovations in the non-statutory planning context; had become conditioned by 2000.	Changing planning – regional planning introduced alternative approaches and strategies Anticipating transitions – innovations in planning process and approaches
because we had much less legislation to fall back on … because it wasn't just a statutory plan as it is now	Legislation	Legacy	The regulatory environment has changed significantly; the previous regulatory environment was an opportunity.	Changing planning – the non-statutory environment enabled a changing regulatory system
we used to have to work with local governments at the grassroots.	Collaboration	Legacy	The non-statutory environment provided opportunities to test and experiment with processes; conditioning a relational, multi-stakeholder and/or complex approach. Collaboration was a means to ensure higher levels of consensus about emerging planning process – also problem solving	Changing planning – multi-stakeholder and collaborative approaches support consensus and change in the regional planning process Anticipating transitions – innovations in regional planning process that became institutionalised

Distilling findings from the interviews and policy documents in Chapter Six, particularly in deriving the narratives and sub-narratives, relies on verbatim quotes. The use of interviewee

quotes is common in social science qualitative research. It demonstrates how the interpretation elaborates the common and diverse perspectives of interviewees (Corden and Sainsbury, 2006). Interviewees construct their own narratives of the planning processes, often reflecting their agency and power within policy system. The quotes also highlight the ways in which interviewees talk about planning, often using a distinct language to represent highly institutionalised professional and policy positions and concepts such as 'land use integration'. Such terminology has a specific meaning in the planning discipline, but this is not always fixed and meaningful among diverse and complex stakeholder positions. Corden and Sainsbury (2006) also stress the role verbatim quotes play in affirming the contribution of interviewees to research while also establishing evidence, transparency, credibility, and validity (Sandelowski, 2003). The use of quotes conforms with Sandelowski's (1994) propositions of an ethics and aesthetics of quoting in which a balance is sought between description, analysis and interpretation. As an explanatory case study, the inclusion of quotes is intrinsic to the explanatory and interpretive purpose demonstrating how the narratives are constructed and the coded content interpreted (Sandelowski, 1994).

5.7 Research Ethics

The key ethics consideration of this research was to protect the anonymity of interviewees. Approval for Negligible/Low Risk Research involving Human Participants was granted by QUT (Approval Number: 1700000081). Having approached 60 people for interview and securing 22 interviews, the main reason provided for declining to be interviewed was concerns about anonymity due to professional roles and responsibilities. The pool of potential interviewees was relatively small and professionally networked and concerns about the risk of identification, despite assurance, resulted in prospective interviewees not participating. Protection of identities informed the ways in which participants have been coded in this research with no information about individuals provided. The researcher was responsible to ensure the protection of rights of privacy and protection of professional boundaries. The approach inviting participation from interviewees was grounded in informed consent as the responsibility of the researcher to fully describe the research and the role of the interviewee (Bloor and Wood, 2006; Byrne, 2001). Ethics protocols were adhered to with each prospective interviewee provided with an Information Sheet and Consent Form.

5.8 Research Trustworthiness

A central consideration in the design and implementation of this research has been to ensure its trustworthiness as qualitative and interpretive research grounded in a case study. For Yanow (2007a, p. 100), "[w]hen interpretive research is done well (meaning according to its own established and accepted procedures), it is, in point of fact, carefully designed and crafted and systematically carried out". This research was developed from the outset with regard for rigor and trustworthiness and with early conceptualisation of how the data would be analysed and the pool of interviewees that would enable validation through triangulation across multiple interviewee groups and multiple data sources. Altheide and Johnson (2011) recognise validation entails checking, questioning, and theorising which is integral for qualifying interpretations and acknowledges the role of the researching in knowledge creation and storytelling (Merriam, 2009). In outlining these measures and elaboration of other aspects of the research context, this methodology is aiming for transparency (Aguinis & Solarino, 2019).

For this research interviewees were drawn from three key sectors – government, industry and community – and all held multiple roles in multiple sectors in the regional planning processes between 2005 and 2017. This meant that the interviews were not homogenous, acknowledged multiple constructions of reality, and accommodated conflict in the construction of knowledge (Altheide and Johnson, 2011; Lincoln and Guba, 1985). This confers authenticity and fairness in which a range of views is included to assist enhanced understanding (Guba and Lincoln, 1989). The interviews were semi-structured with a specific set of questions asked of all the interviewees. This provided points of comparison and cross-checking to ensure the data was internally validated and credible (Creswell, 2003; Merriam, 2009). A further point of triangulation was between policy documents and interviewee statements. The policy documents and case background also provide the basis for triangulation in the sense that they provide accounts of the matters and histories which interviewees also describe.

The research is credible in the sense that Lincoln and Guba (1985) describe; it makes sense or is trustworthy because it is consistent, transparent, and dependable (Aguinis & Solarino, 2019). While this shifts the emphasis from replicability, the nature of triangulation in this research ensures reliability, validity, consistency, and dependability (Merriam, 2009; Roller and Lavrakas, 2015). The use of a semi-structured interview and NVivo supported a consistent and uniform approach to recording research data, developing and applying codes

and categories, and maintaining internal notes and memos (Belotto, 2018; Roller and Lavrakas, 2015). This included note taking and reflection after every interview and during transcription (Oliver, Serovich, and Mason, 2005). This approach to reflective research practice produced documentation, insight, intention, and reference notes that guided and developed the data collection and analysis (Schön, 1983). As transcripts and policy documents were coded, additional notes about multi-level dynamics were created. This was especially useful in identifying how commentaries indicated multi-level dynamics and supported the cross-disciplinary analysis that the research undertakes. Interviewees were invited to check interview transcripts or extracts at the time of interview to validate content and all but one declined and no changes to transcripts were required.

5.9 Summary

This research design is developed to examine the research questions addressing the relationship between regional planning and infrastructure transition in SEQ with specific focus on multi-level dynamics. It is based in social constructivist epistemology and interpretive ontology. As an embedded explanatory case study of transport in SEQ, it reflects and explains how socio-technical system transitions are addressed in prevailing policy and planning, undertaking interviews with key stakeholders and analysing policy dynamics and narratives over time. The research is undertaken as boundary work recognising that planning and transitions are distinct but overlapping disciplines that address infrastructural and spatial systems and relationships. The data collected is analysed through Yanow's Interpretive Policy Analysis framework to yield policy narratives. The resulting policy narratives are then analysed and discussed applying the MLP to form a narrative explanation of infrastructure transitions in and through regional level planning and policy. Attention to narrative, in policy and analysis, enables further development of sustainable transitions discourse and awareness in regional planning in relation to socio-technical system transitions. The next Chapter presents the findings from the Interpretive Policy Analysis through the elaboration of policy narratives.

Chapter Six

RESULTS: POLICY NARRATIVES IN SEQ REGIONAL AND INFRASTRUCTURE PLANNING AND POLICIES

This study is grounded in purposive merging of Interpretive Policy Analysis and the MLP to identify the narrative dimensions of transition dynamics in and through policy. Because planning plays a preeminent role in relation to socio-ecologically impacting and carbon emitting socio-technical sectors, such as infrastructure, transport, and construction, there is a need to understand how planning contributes and acts in the policy mix for sustainable development and sustainable transitions of transport and infrastructure. In summary, three narratives emerged from the examination of policy and planning documents and interviews with each of the narratives comprised of four sub-narratives. These are not linear extensions of the coding and categories explained in Chapter 5 but interpret the dynamics represented by these categories to elaborate narratives (Figure 14). The resulting narratives pivot on the tensions between legacy and change, where the pressures for sustainable development and sustainable transition call a range of cultural dynamics, practices and structures into question.

The first narrative, **changing planning**, acknowledges impetus for planning reform in Queensland due to rapid population growth and unsustainable development. This resulted in planning reform including the introduction of statutory regional planning based on a consultative and multi-level governmental process that was developed through earlier non-statutory processes. Regional scale planning in SEQ was instrumental in establishing a new pathway for urban and regional infrastructure development predicated on new models of planning, ESD and growth management that continue today.

In the second narrative, **limitations of planning**, specific constraints on and of planning are identified. The regional plans commit to aspirational goals and regional vision. Planning is reflected as a limited policy arena through which to effect change despite its perceived benefits. While shaping and consolidating the settlement, infrastructural and spatial relations of the region remains the remit of planning, its capacity to steer transformation is constrained

by complex political, actor, and organisational conditions. These limitations also impact policy innovation and the role it plays in system innovation. The limitations can be attributed to institutional arrangements as well as professionally imposed constraints.

The third narrative, **anticipating transition**, identifies that the policy discourses in relation to transition to 2017 are minor despite the introduction of the transition strategy in 2017. Policy that introduces sustainable transport, housing affordability and diversity, and sustainable infrastructure recognises 'multi-segmented' and 'subaltern' regimes. The planning conception of transition responds to other policy priorities through planning concepts and objectives such as 'sustainable transport'. This has implications for the transformative literacy and capacity of the region. Policy learning and innovation tends to occur incrementally and reactively, with a limited response to landscape pressures.

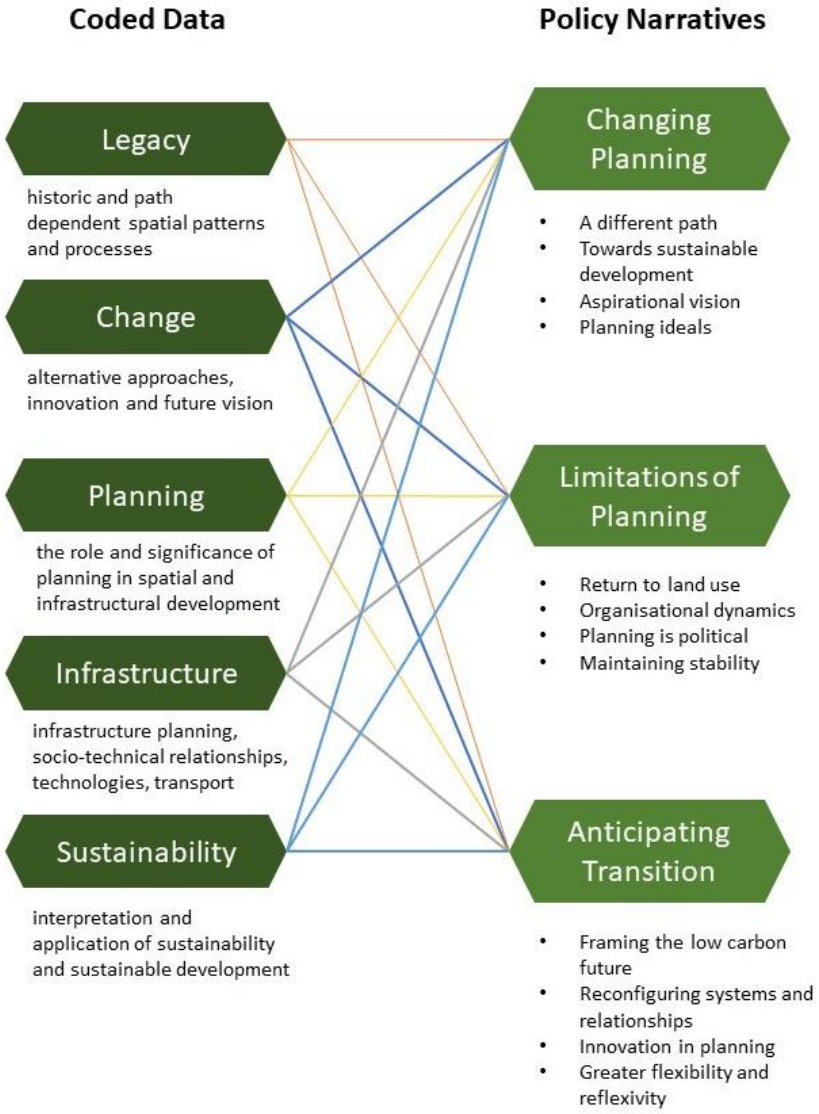


Figure 14: *Narrative formation from coded data*

6.1 Narrative 1: Changing Planning

The ‘changing planning’ narrative emerged from acknowledgement across plans, policies and interviews that the shift from non-statutory to statutory regional planning had made a significant difference in multi-level and multi-stakeholder governance and planning, particularly in linking land use, infrastructure, and transport. It resulted in new instruments, new processes and new planning ideals. This narrative also acknowledges that while planning can experience inertia and promote incremental change, institutionalisation of accepted planning principles and practices can be beneficial at the regional scale. This is particularly the case where planning reform directs away from unsustainable pathways towards more consolidated and integrated urban and regional configurations of land use, infrastructure and transport and has catalysed other policy processes that seek greater alignment. The plans, policies, and interviewees acknowledge and respond to highly complex and systemic pressures. As institutional processes, planning and policy are directed towards socio-spatial and infrastructural change in response to challenges such as greenhouse gas emissions, climate change, environmental degradation, biodiversity loss, urbanisation, economic shocks, and demographic change.

The four sub-narratives which comprise this narrative encompass dynamic dimensions of how planning and policy have changed over time. The plans and policies make statements about how and why new or different approaches to planning were required. Interviewees provide insight into how those plans and policies developed and particularly the political and power relationships that were at play during iterations of plans and policies. The discourses also highlight the ways in which initial intentions and hopes vested in regional planning have been curtailed through ongoing planning reform and contestation. This includes contradictory dynamics such as a strategic role prescribed for land use, transport, and infrastructure planning in the *Queensland Climate Transition Strategy* while the regional planning has become more land use and urban form focused, with greater emphasis on economic development.

6.1.1 A different path: “Alternative strategies”

The introduction of regional planning in Queensland was a significant juncture in planning that aligned to a related imperative to change planning to manage regional growth and steer a coordinated development pathway. The SEQRP 2005-2026 introduced two main growth management approaches, urban footprint (growth boundary) and compact development

(including infill and sub-regional self-containment), to redirect the historical legacy of unsustainable or sprawling development in the form of environmentally encroaching, sprawling, low-density, and car dependent development. The SEQRP 2005-2026 proposed that:

> It is also necessary to understand the implications of continuing the current trend of using low-density residential development as the principal means of accommodating future population growth. The community does not, however, have to accept this future. Alternative strategies can be adopted to better manage growth (Queensland Government, 2005b, p. 8).

As a global practice, planning is aligned to methods and frameworks that shape regional and urban spatial and socio-technical systems. This includes environmentally sustainable development, smart growth, and growth management. These models and constructs are evident in the statutory SEQRPs since 2005 and were referred to by interviewees. In SEQ the regional plans and policies elaborate and consolidate these frameworks, while also responding to shocks and challenges such as the GFC in 2007/2008 and rising greenhouse gas emissions. Rapid population growth was a driving issue in 2005 with the related challenges of infrastructure, service, and housing provision recognised as posing significant sustainability problems for the region. The SEQRP 2005-2026 stated "[i]f we are going to accommodate one million extra residents in this region in the next two decades, we need to be smarter in how we use the land available to us" (Queensland Government, 2005b, p. iii). This necessitated alternative approaches to regional planning and development. It not only meant rethinking urban form and settlement pattern in terms of sustainability, but also involved a more collaborative approach to planning involving State and Local government and community consultation.

6.1.2 Towards sustainable development: “really about economic sustainability”

ESD has significant implications for planning, infrastructure and transport. While this framing was integrated into planning legislation and non-statutory planning prior to 2005, ESD is a framework and set of principles that gained national and global currency. The Brundtland Report (Brundtland, 1987) conditioned responses to sustainable development; governments globally, including Australia, aligned regulation, policy, and planning to these principles since the 1990s with national policy frameworks informing state and local policies. The regional plans – and related infrastructure and transport plans –reiterated these

commitments and principles and this is represented as an important shift in the planning process and planning documents in response to legislative provisions for ESD.

In SEQRP 2005-2026, sustainable development is also included in the planning vision for the region as "creating a more sustainable future" (Queensland Government, 2005b, p. 10). Interviewees note that ESD was integral to the planning with the SEQRP 2005-2026 and beyond but that the commitment was partial and *"didn't go very far"*. Interviewees were also sceptical about sustainability commitment and monitoring, noting *"whether that is actually measured or seen as a key performance indicator is another thing"*. The foundation of planning on ESD principles was also observed with an interviewee noting that planners can see the *"need to advance to a more environmentally sustainable form of development and form of transport"*. While ESD is embedded in policy, regulation and planning, the planning process was more focused on specific development patterns and criteria rather than applying ESD in the regional context. This was described as evaluating criteria and patterns that "*corresponded with policy work a lot of others were doing about what sustainability means - what does a sustainable pattern of development in a metropolitan area look like?"*.

Sustainable development is also reflected in infrastructure and transport plans and, in part, this aligns to the planning commitment to integrated land use, infrastructure, and transport and the nature of a hierarchy of plans. The SEQIPP 2005-2026 was initiated as the first regional scale infrastructure plan developed in response to a regional plan. It provided a program of infrastructure provision and investment that was aligned to the SEQRP 2005-2026. The SEQIPP documents examined demonstrate that infrastructure was integral to regional sustainability and sustainable communities, but that infrastructure experienced its own sustainability issues in terms of funding and provision. Sustainable transport was a key feature of the SEQIPP 2009-2031 and in subsequent state-level infrastructure plans. The language and framing in the SEQIPP documents and state level infrastructure plans emphasises cost effectiveness, timeliness and efficiency which supplants sustainability framing. SEQIPP 2005-2026 responds to ESD as a matter of efficiency and economy stating that "A central objective is a more efficient form of development and more economical use of infrastructure and resources" (Queensland Government, 2005a, p. 5). This goal is predicated on compact urban form and sub-regional containment as provisioned in the SEQRP to enable integrated and timely infrastructure development and value for money.

Significant policy work was undertaken in 2009 with the release of the SEQ IRTP, *ConnectingSEQ* 2031. This set of plans elaborated the recognition of regional pressures and framed the response in terms of sustainability, sustainable development or ESD. As such,

practices and processes of sustainable planning and sustainable transport were institutionally embedded. In committing to 'more sustainable transport', notably active and public transit, *ConnectingSEQ* (Department of Transport and Main Roads, 2011) defined a sustainable transport system using concepts such as reliance, low environmental, resource and pollution impact, access and equity, cost-effective, choice and convenience, and supporting economic activity. The regional plans acknowledge that urban development based on automobility and low-density cannot be sustained and that regional infrastructure and transport planning addressed the priorities identified in the regional plan. The plans sought to implement a regional structure and urban form that is more conducive to sustainable transport and travel behaviour and to this end *"we looked at policy interventions, working with the community to enable them to see the opportunities for changing their travel behaviours*". This provided the basis for a program of reform in transport including public transport investment and development strongly linked to land use integration and economic development.

ConnectingSEQ set ambitious targets and proposed a 'rail revolution' to engineer a shift from road-based/automobile centred transport to public transit. This included rail optimisation, major projects for light rail and underground rail as well as new and upgraded rail lines. Bus and active transport were also strongly supported together with intermodal integration and regional connectivity. These types of proposals and planning were grounded in ESD while also provided an image or vision of ecologically sustainable transport in a changing urban-region. Equity and access, rather than increasing mobility, were central principles for *ConnectingSEQ* to enable residents *"to access work, access recreation, access education, access health and all the other services that they need was in a reasonable time frame in a reasonable way from where they live."*

SEQRP 2009-2031 proposes to "guide the region towards sustainable development" and interviewees identify further refinement of the planning approach to ESD since the earlier plans: "*In the 2005 plan, there was more of an attempt to develop a sustainability framework and the 2009 plan there was more of a focus of looking at components of that rather than taking the framework any further*". SEQRP 2009-2031, recognised that *"[s]ustainability ... was cross cutting, so sustainability had to affect all areas transport, health, environment".* The regional infrastructure and transport plans informed the SEQRP 2009-2031 which affirmed ESD and envisioned that:

> SEQ is to be managed in a sustainable way by reducing the region's ecological footprint while enhancing its economy and residents' quality of life. To achieve this,

> social, ecological and economic improvements need to be made in an equitable and harmonious manner.
>
> The SEQ Regional Plan aims to protect biodiversity, contain urban development, build and maintain community identity, reduce car dependency, and support a prosperous economy. Communities are to be built and managed using contemporary measures to conserve water and energy, with buildings designed and sited to take advantage of the subtropical climate (Queensland Government, 2009a, p. 11).

Sustainable development was a desired regional outcome with specific policy implications including the maintenance of the Queensland framework for ecologically sustainable decision-making to be applied to all land use and infrastructure development. In the SEQRP 2009, a more complex view of sustainable development emerged that included planning responses to issues such as peak oil and climate change acknowledging issues of energy vulnerability. In part this is attributable to a changing policy mix in which specific climate change policy was being introduced together with policy language such as adaptation, resilience and mitigation as part of the ESD response.

The *Queensland Infrastructure Plan 2011* also acknowledged sustainability within its planning principles, noting that "[t]he way in which infrastructure networks are planned and designed also has significant impacts on Queensland's sustainability and greenhouse gas emissions". While the state level plan marked the end of regional level infrastructure planning and programming, it included priorities for each region including major public transit infrastructure projects in SEQ that had been highlighted in previous plans. The 2016 State Infrastructure Plan includes an objective of "improving sustainability and resilience" and stresses disaster resilience and reducing greenhouse gas emissions (Queensland Government, 2016b, p. 29). Sustainability in these documents developed a focus on economic dynamics such as efficiency, value for money (cost-effectiveness), and climate change impacts. Despite an awareness of and learning about sustainable development, uneven weighting of the sustainability pillars across regional and infrastructure planning prevails. Classes of infrastructure are categorised as playing an economic role, where "*if you look at ... truly balancing social, economic and environmental sustainability reasons, not in your life. It's really about economic sustainability".*

In 2017, *ShapingSEQ* and the *Queensland Climate Transition Strategy* were released. *ShapingSEQ* (Department of Infrastructure Local Government and Planning, 2017, p. 10) outlines megatrends that will impact the region as well as a planning response to them stating that "*ShapingSEQ* ... builds on the foundations of previous regional plans to position SEQ

for ongoing sustainable growth, global competitiveness and high-quality living". Unlike earlier iterations of the regional plan, *ShapingSEQ* does not include a specific and overarching statement about ESD, although does make early reference to the importance of 'sustainable growth' and sustainability.

In *ShapingSEQ*, sustainability is not specifically defined as in earlier regional plans but assumes significance in a chapter titled Sustain. In this document, sustainability addresses ecological and social sustainability including: environmental attributes such as land supply, biodiversity, landscape preservation, and food security; built environment attributes such as compact urban form and transport choice; and socio-cultural attributes such as Indigenous cultural values, safety, and affordable housing. The plan is described as not reflecting "*the equal footing of the environment and social compared to the imperative of planning and development or economic considerations"* with sustainability becoming more marginal due to its containment in a section of *ShapingSEQ*, rather than integrated throughout the document. This resulted in a sense of competition where *"different needs were all taking away from each other under this vague heading of 'Sustain'"*. The regional plans present different conceptualisations of sustainability that are principally predicated on material, techno-economic, and spatial forms.

The release of the *Queensland Climate Transition Strategy* in 2017 addresses the need for climate transition and commits to zero net carbon emissions by 2050 in response to climate change, which is integral to ecological sustainability. While the policy is not framed as ESD, it addresses ESD priorities and reinforces the need for sustainable planning, sustainable transport and sustainable infrastructure as integral for climate transition. Similarly, it acknowledges that low carbon economies, industries, and communities are generally more sustainable than those that are more carbon intensive. The regional, infrastructure, and transport plans have increased their attention to climate change over time. The SEQRP 2005-2026 built on other government policy responses to climate change and greenhouse gas emissions and acknowledged the greenhouse effect and associated global warming as well as the impacts of these phenomena on climate change. By 2009, SEQRP developed greater focus on climate change and greenhouse gas emissions stressing the need for planning and policies targeting greenhouse gas emissions reductions such as "the application of transit oriented development and subtropical design principles, urban consolidation, provision of greater public and active transport and improved sustainable housing regulations" (Queensland Government, 2009a, p. 42). This included a government commitment to the reduction of carbon emissions by 30 percent, particularly from transport. *ConnectingSEQ* refers to the need to reduce greenhouse gas emissions and environmental impacts. More

recent plans and policy such as the State Infrastructure Plan and *Queensland Climate Transition Strategy* shift their language from ESD to climate change resilience and response. *ShapingSEQ* also refers to a region that will be carbon neutral by 2067 but did not explicitly reference the *Queensland Climate Transition Strategy* which includes policy directives for land use, infrastructure and transport to achieve zero net emissions. These policy shifts potentially trigger further policy opportunities and windows.

Since 2009, climate resilience and adaptation has occupied more of the sustainability policy space and discourse. The earliest plans recognised the need for climate resilience and adaptation as necessary for ecological sustainable development. As a more recent plans, the State Infrastructure Plan includes an objective of improving sustainability and resilience that is framed exclusively as climate response in ensuring resilience to extreme weather, operating in a carbon constrained economy and carbon emissions reduction. The *Queensland Climate Transition Strategy* also proposes that addressing carbon emissions and climate transition across the state economy, including infrastructure, transport, and land use, will result in a more sustainable region. While ecological sustainable development has played a significant role in the ways that planning has changed, it remains contested subject to trade-offs rather than balancing and manipulated to serve economic and efficiency ends:

> *The biggest creative tensions around policy ... were actually around the environmental side. What do you develop; what don't you develop ... unfortunately they tend to get traded off and there are some realities around that.*

Interviewees address ESD in terms of its interaction with the planning process and expressed diverse views about the basis of planning on ESD including tensions in the understanding of sustainability and 'balancing' the domains of environment, society and economy. For some interviewees this misrepresents the sustainability task with sustainability being more complex than balancing suggests. In part this is attributable to an understanding of sustainability as intersecting rather than nested domains. However, the extent to which these are balanced or traded off is obfuscated with interviewees affirming economic priorities with statements such as "*It's really about economic sustainability. [That's] how the land use and the infrastructure is brought together".*

The plans and policies present an image of an aspirational region facing mounting pressures and challenges. The negotiation of ESD and interpretation of its principles are part of a more complex set of sustainability narratives that receive shifting attention. The regional plans, including infrastructure and transport plans, respond to endogenous and exogenous pressures

such as population growth, spatial inequality, climate change and greenhouse gas emissions, peak oil, financial crisis, biodiversity loss, and environmental degradation. The remit of these plans and policies is broader than transition but inclusive of transition. The priorities for more compact and smart growth were embedded in the 2005 plan and continued to be developed through subsequent plans and policies, indicating a significant shift for housing, transport and land use. Urbanism is more strongly imprinted in *ShapingSEQ* as a response to diverse and mounting sustainability challenges. This mix of issues necessitates a more complex understanding of and application of sustainability and sustainable development. Interviewees commented that the engagement with sustainability can be political and arbitrary with economic, efficiency, and cost-effectiveness priorities taking precedence.

6.1.3 Aspirational vision: "We're not as aspirational as we used to be"

Aspirational narratives unfold in planning and policy through language and framing that construct planning tropes, culture, knowledge, and power in relation to vision and program. A significant component of the regional plans and the related policies is the foregrounding of aspirational vision. The aspirational nature of the visions and plans is compelling for many interviewees and for some interviewees this is tantamount to *'telling a different story'* or cracking *'business as usual'*. Aspirational statements can be too diffused and lofty where "*planning cases feel more comfortable about saying aspirational things because you can't be tied down too much".*

In practice, the aspirational and visionary elements of the plan have been diluted with a sense of retreat from bold vision:

> *We are not as aspirational as we used to be and it's because we don't want to set up false expectations because the government is sort of saying 'no, we can't pay for that' ... The current regional plan ... you could argue that it's just not very visionary. You could say it is scared about setting out some ideal land use and infrastructure.*

Similarly, the 50-year vision presented in *ShapingSEQ* was described as *"more business as usual regional planning"* in which change is illusory:

> *The narrative that the plan is trying to build is just more of what we were aspiring to in the early 2000s - integrated transport, connection to nature. I mean that's not a bold 50 year vision. That's a frightening early 2000s vision. It's not vision; it's what has to happen.*

The historic dimensions of plan making have come to influence its address or imagination of the future. This impacts both the role of regional planning for infrastructure and the role of infrastructure in creating that future. This is an aspect of planning and development that planning continues to grapple with - an awareness that "*It comes back down to, I think, the planning and supply of infrastructure – and a reasonable amount of stakeholders would say that - is probably the biggest weakness in the plan.*" For interviewees the nexus between regional planning, as principally a land use or spatial policy exercise, and infrastructure provision or procurement, is integral for successful regional development.

Several interviewees commented about the style and intent of language in which specific ideas or tropes are regarded as having universal legitimacy. Planning is represented by interviewees as being relatively static despite changing context, governance, and complex conditions. In interviewee commentary this emerges in multiple ways where interviewees propose that loftier visions and goals provide greater flexibility in governance arrangements and decision-making while planning tropes, such as smart growth, which are enmeshed in specific urban discourses and policy storylines, exert a type of agency. In particular, planning is perceived as providing a high level of consistency during times of change to the extent that "*planners have been writing the same stuff for the last 30 or 40 years - some of the nuances change, the words change".*

The plans also tend to focus on, and provide a narrative for, urban development and urban/suburban development rather than regional development. That is, the urban development is located in a regional or territorial frame, but the plan charts an urbanist approach where urban and suburban development is constrained to mitigate its impact on the environmental and agricultural land uses outside of the urban context. In the plans and policies, urban development supplants regional planning with significant focus on growth fronts, priority development areas and the like. The cultural dimensions of this received some commentary from interviewees and it was proposed that regional planning and the shifts it sought to embed were *"a battle of hearts and minds – a cultural battle rather than a technical battle"*. This was further articulated by other interviewees who argued that the vision of a more compact, well serviced and urban lifestyle was central to that cultural shift, particularly the mitigation of urban sprawl and car dependence that would result in reduced emissions, resource use, and travel distances.

The advocacy of 'good planning' as integral to planning culture was repeated by many interviewees, who proposed that the plans and policies were predicated on sound planning

principles. However, for some, this was seen as a limited narrative which excluded sectoral and stakeholder priorities. Several interviewees commented that over time, interactions between planners and the environmental sector have been challenging due to conflicting ideas about environmental values and planning principles. The argument was also made that stakeholders in all the planning processes often expected planning to do things it was not designed to do, including provide environmental protections for natural areas located outside the urban footprint. An interviewee stressed that the urban footprint was a means of protecting regional landscape and farming areas, and that local authorities also had a role to play in protecting conservation areas within the urban footprint. That is, other institutional arrangements were also involved in the types of decisions sought for environmental protection. Non-urban interests were marginalised and that despite public concern for landscape and ecology, "*green stuff wasn't real planning - 60% of the submissions on the regional plan were issues for [the environmental team] ... When you talk about planning, it's urban development, housing development."* Framing was a significant issue especially where regional planning did not engage in socio-ecological measures despite its alignment to sustainable development and this was further reflected in Local Government planning schemes. In keeping with other perspectives about the tensions between development and environmental priorities, it was noted that an integrated perspective would yield awareness that "*environmental protection measures are integral to other areas, and general community wellbeing is integral to the environmental protection related issues".*

Like the tension identified between a development imperative and socio-ecological sustainability, infrastructure becomes a matter of shaping and servicing development in a policy frame that advocates compact development as a key strategy for addressing environmental impact. This has broader implications for addressing global scale pressures where "*we are so far detached ... There is just no sense of our context within the planetary boundaries of the Earth. It's a real struggle as we become more urbanised.*" This poses ongoing issues for engagement and consultation which proposes limited response to such existential issues. This disconnect has been an intrinsic problem with the regional planning and other policies because *"there was no communication of cause and effect"*.

The breadth of issues faced by the region was significantly canvassed in consultations and the narrative of zero net emissions has not fully developed in the regional planning and associated transport and infrastructure planning. Previous plans, while addressing the need to reduce GHG emissions, did not target zero net emissions. The current planning and policy envisions a zero net emissions future and interviewees tend to regard this as primarily technological rather than cultural, social and ecological. *ConnectingSEQ* and transport

planning pursued different objectives in 2009 noting that "*this plan is certainly not zero net emissions – you'd have to get technology change to enable that".* More radical technological change in relation to transport, such as robotics and artificial intelligence, has been anticipated in recent policies such as *ShapingSEQ* where "*the autonomous vehicles is a bit dropped in. [It's] partly a consequence of… saying 'We can't have a conversation about this without this issue being dealt with'."*

Socio-technical and techno-economic narratives are intrinsic to regional planning and policy. However, they seem to lack address of multiple futures and scenarios, particularly in relation to socio-technological change, instead focusing on structural adjustment and economic agglomerations or clusters. The regional plan plays a role in constructing a future narrative but fails to account for changing spatial and socio-technical dynamics of communities and lifestyles and noted that "*it's still early 2000s spatial planning ... So it's kind of obsolete already".*

Envisioning the future of the region entails examination of technology and its impact on society and spatial relations. Some interviewees perceive a failure of vision where the vision has neglected potential influences of changing socio-technical and informational conditions on planning practice. The regional plan was described as *"yet another analogue planning document".* The analogue ontology, particularly as it is embedded in planning professions, informs the visioning and the perspective offered by the plans and policies. The planning profession "*is the last one coming to the table on understanding technological disruption and the use of any data better than ABS stats … It's the same people, the same professions, with the same mindsets."* These omissions are perceived as dating the regional plan and policies in ways that will limit the impact of the plan particularly in relation to technological change and particularly based on the planning assumptions that built form and technology require integration, while contrarily not accounting for how technology changes, and the way it changes space and built forms. In 2009 this was partly attributable to 'catching up' and was described as:

> *We got as far as we could in terms of talking about integrated land use and transport ... It was really bringing ... late 20th century technologies together with late 20th century land use planning - to get it as close to its optimal form as it could be.*

The approach was grounded in, as the plans and policies specify, continuing infrastructural and socio-technical relationships that could be adjusted incrementally. In 2009, the broader

discussion about technological disruption was barely nascent, while planning was not positioned to examine the implications of momentous socio-technical change. In 2009, for example, "*there was no sitting down saying 'What happens if technology changes this radically? What would we do with the city or region?*"" More recently, a perceived failure to address the socio-spatial implications of technological change has been observed. Concomitantly, there is an expectation of technological change to occur, including electric and autonomous vehicles and other networked technologies such as the Internet of Things:

> *the urban planners are not embracing advancement in technology and data as rapidly as other professions are ... and that's kind of a problem because they're planning our cities.*

While the interviews highlight aspirational vision as a significant part of the planning, this aspiration has not addressed significant socio-technical change as a factor in the ongoing development of the region. *ShapingSEQ*'s attention to megatrends proposes innovative planning as a response to rapidly changing technology but does not elaborate either how this innovation can occur, who will nurture it or the relationship between planning innovation and regional planning.

6.1.4 Planning ideals: "urban consolidation and integration of transport"

The policy narrative in the plans, policies, and interviews also relates to improvements in planning and regional environment facilitated by planning tools and mechanisms such as smart growth, urban footprint, and land use/infrastructure/transport integration. These planning ideals are central in the planning documents with all documents emphasising greater integration of transport, infrastructure, and land use, with particular configurations proposed as offering both development opportunities and greater efficiency and consolidation, while purportedly reducing the reliance on cars and promoting active and public transport. Ideas of efficiency and cost-effectiveness (or value for money) are integral to these planning ideals of integration and improvement. Linkages between planning instruments and infrastructure program were a key element of ensuring integration and improvement in the management of settlements and population growth. The plans emphasise connectivity, access, and efficient public transport. Such aspirations are embedded in the regional vision, goals, and strategic directions. The Transition Strategy proposes that greater gains are needed to achieve zero net emissions in 2050 goal. In particular, the state proposes leveraging planning instruments and infrastructure decision-making to secure low carbon development.

Since 2005, integration has been pressing in relation to consolidation of settlements and growth management where planning and policy *"were always on about urban consolidation and integration of transport".* The regional plan then became "*a vehicle for us to try and bring in integrated transport planning into that process".* Interviewees also observed that regional planning addressed policy gaps and that, over time, as policy has been developed by State Government, there has been less need for the regional plans to include a breadth of policy objectives. The initial SEQRP was filling a significant policy gap and the development of policy over the SEQRP's iterations has resulted in a refocusing on land use where they perceived the earlier plans "*were more comprehensive and tried to lead transport across a broad range of things".*

The regional plans changed the ways and locations in which local planning schemes permitted development and planned for infrastructure and transport. However, there remained significant emphasis on road infrastructure across both state and Local Government. With the urban footprint delineated, longer term planning for infrastructure was enabled. This was in part facilitated by the SEQIPPs so that the "*the state could start guaranteeing where, inside the urban footprint, it would then start putting its infrastructure".* This would enable better linkages between development and infrastructure provision and enable Local Government to forward plan. It meant local authorities "*had the ability to concentrate their infrastructure planning in the areas that were designated for development"* rather than endeavour to service more fragmented and uncontrolled development. By creating this level of clarity, it was possible to better integrate development and infrastructure, particularly transport. The multi-level dynamics and integration were necessary for successful settlements at the "*the regional level but getting some fine grain implementation of that at the sub-regional or the local level".* Integration is related to efficiency, value for money, and cost-effectiveness through a managerialist approach which is attentive to resources, expenditure, cost-benefit, and optimisation. The linkage of land use and transport was a budgetary priority, with expenditure on public transport corridors influencing how urban forms and land use were planned: "*we had ... serious money for public transport ... You don't spend money on public transport without actually then worrying about urban land use."*

Integration has been developed over the iterations of the SEQRP and *ShapingSEQ* was described as *"the most integrated it's ever been"*. The review cycle, which has not conformed to the five years prescribed by government, enables refinement of these goals and principles which are stated in the plans. This indicates a learning process in plan making

focused on improvement and integration. In particularly, getting land use and transport integration right was essential for a "good outcome" because of:

> *so many other factors in terms of infrastructure efficiency and land use efficiency and those things. But broader implications for our economy, socially and environmentally of course. The latest one [regional plan] uses that as the foundation.*

Approaches and practices centred on integration developed over time as a mix of strategies, such as transit-oriented development, consolidation, co-location, corridor planning, and network planning, linked to high-level goals, vision, and narrative. These approaches to integration result in urban renewal, densification, and infill development that enable a more viable public transit system and shapes the settlement pattern. The regional planning triggered sectoral plans, including integrated regional transport plans, through which improvement and integration strategies were articulated. Support for multimodal and intermodal transport networks by planning are continuing to develop:

> *we've actually had variations and evolution of the key themes. They're all the same things that we wanted to achieve in the early to mid 90s. We've just got better understanding down different directions and fleshed out what they mean.*

Technological change has not impacted this process significantly because the focus was on fundamentals and to develop a *"a good solid structure, not allow conurbation and allow economic growth in a sustainable and diverse way."* The iterative nature of planning and policy making enabled policy collaboration and coordination: "*it was iterative and that's why it was always important to have a transport section of the regional plan because that will influence the next transport plan and vice versa."*

The conversational dimension of policy making and planning was highlighted in interviewee comments, with some expressing concern about silos and others suggested that relationships between government departments has also developed over time. The collaboration and integration of policy making processes are integral to other aspects of integrated planning and this capacity has been developed over time across government departments:

> *the first IRTP [ConnectingSEQ] flowed right out of the first regional plan ... Transport always understood – from their modelling – that they needed to*

understand land use. They needed to work closely with us to understand centres and patterns of growth.

Despite, as some interviewees noted, the embedding of transport planners or TMR staff in the regional planning team, a tension between different planning professionals emerged in interviews where transport planners argue that land use should follow transport and infrastructure rather than infrastructure following land use as espoused by urban and regional planners. This tension was further highlighted in relation to the new communities in PDA, some of which are designated outside the urban footprint and existing infrastructure provision.

6.1.5 Summary of Changing Planning Narrative

The introduction of regional planning in SEQ triggered a new pathway for regional, infrastructure, and transport development where planning was changing. It introduced a range of contemporary and "better" urban and regional planning and sustainable development ideas into a region that was grappling with a historic legacy of unsustainable development and significant population growth. Regional planning was introduced as a significant statutory intervention in planning involving multi-level, multi-stakeholder, and multi-scalar governance. It was supported and extended by additional planning and policy initiatives in infrastructure and transport developing a policy and instrument mix. Interviewees supported the regional plan's prioritisation of spatial restructuring through integrated planning, growth management, multimodal transport, and infrastructure interventions to support more compact development within an urban footprint. The narrative of changing planning meant changing how planning was done, what was done with planning, and who was involved in planning. Many observed some of the principles informing the planning have been compromised in response to economic priorities and extreme weather shocks. Interviewees also noted that vision and implementation has been lacking. The regional plan is also seen as a dated approach that is no longer fit for purpose because it is reliant on dated planning methods and a limited response to socio-technical change.

6.2 Narrative 2: Limitations of planning

The second narrative, limitations of planning, specifically highlights the ways in which planning both limits change and is limited in its approach. This is particularly indicated by interviewees who frame these limitations using phrases like *"planning can't do everything"*

or *"you can't anticipate everything"*. While the first narrative presented the ways in which planning has changed significantly in response to regional and exogenous conditions and aspirations, this second narrative recognises not only constraints of planning, but how change is constrained in relation to sustainable development and transition. These limitations are represented in diverse ways and are presented in this section as four discourses drawn from interviewee comments. Interviewees reflect on what planning can practically and realistically do to enact sustainable development and transition at the regional scale, consequently framing planning as both limited and limitation. Despite these limitations, planning continues to be regarded as a means by which to realise ambitious goals as is evident in the policies and plans, although some limitations are recognised. The plans express what is often described as highly aspirational visions and goals that reveal a gap between the current situation of the region and the desired outcomes over the period of the planning horizon.

6.2.1 Returning to land use: "20th Century Planning"

As a policy and regulatory framework that has developed historically, planning is highly institutionalised. It embeds diverse normative expectations and structures that underpin society; as such, it confers stability. In the regional plans, these normative expectations and structures are elaborated in spatial, morphological, land use, and socio-technological terms such as housing forms and infrastructure classes. This includes the prevalence of automobility and detached low-density housing while increasing alternative transport modes and housing typologies. The *Queensland Climate Transition Strategy* identifies spatial, infrastructure and transport policy and planning as leverage points for enabling low carbon transition.

As planning is also grounded in property markets and property development, it is also acknowledged by the interviewees as necessary for regulating and managing growth and development. The interviewees offer a nuanced view of the scope of regional planning and understand it encompasses broad policy arenas and market dynamics. For some, the planning imposes necessary limits, and for others planning limitations impose constraints on change. In relation to the former, it was observed that the "*the regional plan only does things that it can do and that it can monitor*". In redefining the relationship between state and Local Government on planning matters, the regional plan also provided needed guidance through its regulatory framework and targets. Interviewees identified the key role of the regional plan to provide a framework. In a similar vein, those involved in regional planning also recognise misunderstanding about planning which results in claims made about planning that limit its

effectiveness, particularly an emphasis on development control and regulation. Planning was seen as "*big picture process that filters down and sorts out the wood from the trees as you get through the process but we tend to go straight in and grab it by the jugular vein and say here is this new plan"*. The policy framework was essential to guide and support local planning and development: "*they can't say there's where the growth goes but then step out from an infrastructure perspective ... They've got to be out of planning but in for the infrastructure."*

In critically reflecting on the regional planning, interviewees ask *"what is a regional planning supposed to do now? What is its purpose?"* This was also encapsulated by a reference to the 2017 plan, that "*I feel like it needed a totally different approach. We didn't need a growth management thing because it's not the conditions as it once was*." This sense of anachronistic policy was echoed in other statements such as "*the unfortunate thing is ... that we've got a regulatory and cultural environment that's suited to the 20th century not the 21st century. So there is a battle going on.*" Growth management, which continues to underpin the regional, infrastructure, and transport plans and policies, is not considered sufficient as the premise and purpose of regional planning and policy in steering complex challenges. The growth boundary and spatial restructuring are acknowledged as important policy innovations that can result in positive downstream impacts such as improved and efficient infrastructure provision and access to services. This observation is reflected by other interviewees who acknowledge that population growth in the region is not occurring at the same rate as the previous decades and that socio-technical change and other pressures are mounting, disruptive or intractable.

While the regional plans are not infrastructure plans, they set out the spatial dimensions of infrastructure development with particular emphasis on shaping settlements and land use and infrastructure integration in consolidated or compact settlements. However, this aspect of the regional plan is not convincing for interviewees who propose that the plan does not offer appropriate guidance on infrastructure provision. For example, "*there is no infrastructure plan within the regional plan. So I don't know what the plan wants me to do or think*." Further, green space and landscape were also considered to be infrastructure necessary for quality of life and intergenerational equity. Planning did not fully acknowledge this because "*our planning for infrastructure is blinded and traditionally based"* which will erode quality of life and liveability for future generations. In proposing a broader interpretation of the infrastructure required for the region, a more metabolic perspective was proposed.

The role of the regional plan as a framework in which state priorities are asserted is regarded as constraining or incomplete by some interviewees, who are also questioning the type and efficacy of the framework for a VUCA world (volatile, uncertain, complex and ambiguous). In relation to the constraints planning imposes institutionally, concern was expressed about the "development imperative" with specific reference to the 2017 plan, *ShapingSEQ*, and other planning reform which they argued entrenched *"an assumption of development approval"* that overrides environmental concerns. This meant that other planning considerations, such as community and environment, were not given appropriate priority.

Interviewees also noted an expansion of complex problems – such as the megatrends noted in *ShapingSEQ* – as well as a contraction of policy scope in the regional plans which saw the plans more focused on land use. As problems become bigger and more complex, planning becomes more grounded in land use. A return to land use planning is contentious among interviewees who perceive this as limiting the strategic intent of regional planning and the planning profession. This has bearing on perceptions of agency where "*Planning has never been weaker as a profession. It's just a land use regulator*." Similarly, it was perceived that the regional plan did not contribute significantly to transitional arrangements in transport, such as the introduction of active transport infrastructure, because of the focus on land use: "*it's ... really a land use plan with infrastructure sometimes forgotten, sometimes left out or added in*". The perception of a focus on land use is seen as a political and professional constraint on the strategic impact of regional planning. This curtailed the influence of the regional plan because land use was a response to strategy rather than strategic:

> *By 2009 it was clear that one way that the stakeholders were trying to control the impact of the plan was put it back in a box and say 'it's just a land use plan' ... It makes it more of a responsive plan than a plan that really sets direction.*

Further comments were made by other interviewees who observed the conservativism of planning, that planning functions are being eroded, and that planners and plans are losing agency within institutionalised multi-stakeholder, government led arrangements in which techno-economic priorities prevail. Interviewees attribute some of the loss of agency to a misfit between the scale and complexity of regional planning and institutional inertia: "*The planners often misunderstand their importance in the system. And maybe some of them understand it and stay in the profession anyway - do the best job they can,".* A narrowing of focus and scope of *ShapingSEQ* was acknowledged as intentional:

> *[it focuses on] issues which could be materially affected at a regional scale. There was a conscious decision ... to narrow the policy focus and to be more deliberate around the linking of implementation to those actions.*

The critical issue was to consider "*what can the planning department and the government enact under their legislation? They couldn't really do much."* In recognising this constraint, a greater awareness of the limitations of the planning was imbued in the plan, imposing a more constrained sense of legitimacy. This is also reflected in the changes to the planning agency where *"it's gone from being a broader planning agency to fitting under the land use banner ... It doesn't have to be that way.*" The tension between the regional plan as a strategic or land use plan has significant implications for planners and government departments. It also shapes other policy, program, and fiscal agendas:

> *You need these matching documents: one which is long-term thinking and one which is more substantive about what we are going to do about that now, in our next budget for the next five years etc. You find that politically everyone wants to jump on a 20-30-50 year plan.*

In relation to planning as a vehicle for change, some interviewees were sceptical and critical, observing that "*the planning process is inherently quite conservative. There is a tendency to do things that way you've always done and so you get the same results.*" Similarly, "*planning is best for iterating what it knew rather than making big steps ... I think planners are pretty nervous at making the next jump and getting it wrong".* Such comments address questions of legitimacy, learning and inertia in a context where there are *"more decentralised self-reliant and innovative communities as a result of the technology that's emerging."* Yet planning and policy continues to approach communities *"as if they're centrally supplied with infrastructure and we do it the old way".* The limitations imposed on planning are resulting in greater focus on regulation and statutory control which also impacts legitimacy. The attention on regulation and development control evinces *"we've got a fixation with planning regulation so the problem that we've got is that's part of the system but it's not actually what planning is about."* Such a top-down approach, which is residual from 20th century planning, can lack momentum:

> *All regional plans and the way we do them in Australia is that they are what I call 'DAD plans'. They Design, Announce, Defend ... It's very top down ... Australia is the only country that retains this state led, top down model.*

Interviewee commentaries that identify a return to land use planning in the regional planning process are consistent with an assertion of *"analogue planning"* that has failed to address the pace and complexity of change in social and technological relations. They suggest that the regional planning approach, while necessary and innovative at the end of the 20th century, is limited in its application to complex and systemic problems and pressures at the beginning of the 21st century.

6.2.2 Organisational dynamics: "Institutional arrangements are not there"

The aspirational nature of the regional planning and the need for 'big plans' was perceived to thwart the effectiveness of regional planning as the aspiration was not matched by the institutional capacity for change or implementation. Consequently, planning failure emerges as an issue that the interviewees address, not only from the perspective of specific failures such as environmental and social protections, but also in terms of institutional weakness. This is evident in relation to the power of vested interests and trajectories of socio-technical change. Regional plans are developed through collaboration between State and Local government as well as consultation with other stakeholders and interdepartmental interaction. Such organisational dimensions are a statutory requirement. This introduces a range of limitations that are linked to political and stakeholder interests and the capacity to negotiate priorities and attend to longer term horizons and visions. Interviewees were complimentary about the relationship building when the OUM took carriage of the process that resulted in SEQRP 2005-2026. Under the OUM in 2004-2005, regional planning had greater autonomy and resources that enabled a broad policy process. OUM was eventually closed despite (or because of) its perceived success and impact:

> *There's always the perception [from government] of a group out there that are running amuck and need to be brought back into the fold in some way ... [t]hey get pulled back into the department and inevitably that cuts down the ability to really innovate or think outside the department's policy envelop.*

The closure of OUM was perceived and experienced as a loss by interviewees who recognised the importance of a core agency to facilitate interaction with State Cabinet and other government departments. Interviewees propose that situating a planning agency close to political power provided benefits such as protection and authority. Other agencies were observed to expediently undermine the regional plan where "*they don't have to spend a lot of time justifying themselves against the existing regional plan. You just found them circumventing the plan or going around the plan."* In practice, the regional plans were not as

binding as regulation and policy indicated which resulted in different government departments pursuing their goals via multiple avenues.

In developing the 2009 and 2017 regional plans, resource limitations were reported by interviewees such as constraints of a small team working to a tight timeframe of six months in both regional plans. The loss of the OUM significantly impacted and limited the planning process and ability to negotiate across departmental and stakeholder interests. The 2005 plan involved 'cross-pollination' across government agencies to develop the policy framework and undertake research. However, "*by 2008/9 that had all gone ... it was a shoestring budget. It was just tight as.*" Further, the 2009 SEQRP planning process also involved a review and "*we had to do this in really less than six months and a regional plan review had never been done in that timeframe".* In negotiating those constraints, there was a need to undertake policy development that established a framework that could support new approaches so that "*if someone wanted to do innovative stuff, and we were talking to people that did, we'd hopefully have the hooks and the policy framework and actions for them for that to be followed up straight after the plan*".

The development of *ShapingSEQ* also experienced a tight timeframe as well as organisational change resulting from a change of government. Time constraints meant that some aspects of the planning could not be addressed fully but, as with the earlier iteration of the plan, set up for further inquiry. Interviewees aspired to a better resourced planning process but acknowledged *"the greatest challenge for government and community in regional planning is the investment needed to do a thorough job"*. They noted different levels of resourcing and access to expertise in the 2005 and 2009 SEQRPs which impacted the capacity to innovate in the planning process.

Between the regional plans of 2009 and 2017, significant technological change has occurred with a need for planning agencies to develop these capabilities and understand their implications for planning. There was a need for *"data and intelligence gathering ... to have a level of situational awareness which we've never had".* The role of big and open data is developing but time and capacity constraints meant these capabilities could not be fully developed for *ShapingSEQ*. While regional indicators and land supply monitoring are included as actions from *ShapingSEQ, "the aspiration is that [the data is] released manually but I don't think it's that far away where you'd almost have real time measures"*. This shift can make a significant difference to the way in which planning is undertaken. Planning is informed by projections produced by Queensland Treasury which make an assumption of growth rather than exploring scenarios and other forecasting methods.

Organisational constraints were also evident in the accounts of collaboration among government departments and agencies. The problem of silos in the public sector and their impact on policy planning was reported. Other agencies were not willing to participate in the review of the plan in 2009 because their view was *"we've got what we want in this part or that part ... most of the agencies just wanted to roll it over".* There is also some disjuncture between government agencies where there are conflicting dispositions in relation to *"getting on with things"*. It was suggested this was a contradiction of the plan where the policy ambition was not matched by coordinated action across diverse agencies. Regional open space and conservation areas are complex and require attention from multiple agencies. In these circumstances, the opportunity to address the problem can be lost: *"these things [like regional open space and koala habitat] are of their time and there's lots of battles, ongoing battles"*. That is, planning does not absolutely put some tensions and issues to rest and entails ongoing negotiation and advocacy. The regulatory environment and interdepartmental relations and interactions through which planning and policy occurs can be constraining and antagonistic.

The broad policy scope of the regional plan was also identified as a challenge and also a limitation in that the planning process itself often did not play a significant role in implementing some policies. As strategic policy the regional plan contained high level policy content which was the remit of other government agencies. The intention of this is to develop a comprehensive and strategic regional plan but this also imposed challenges in terms of agency responsibility for which actions are implemented and how these are to be monitored. The planning seemed to work better where there were direct relationships between the regional plans and other policies rather than contained in the plan. While this has been perceived as reverting to land use planning in *ShapingSEQ*, benefits and innovations have been observed such as "*the linkage between ... the regional plan and state infrastructure plan was groundbreaking at the time and I think it's still a model*". The scope for planning agencies globally had changed and this was evident in the Queensland context with the planning agencies becoming "*much thinner in regard to their direct influence"* and their remit becoming more focused on land use planning. This was identified in relation to *ShapingSEQ* as well, where the policy scope of the plan was considered to be too broad. The role of development agencies and planning agencies has become significantly focused on land use regulation and development control or approval. Interviewees propose this is a limited view of the role of planning and prompts responses such as "*when I look at those sorts of regional plans from other countries you think 'well, is this all we can do?'"* This

ascendency of land use planning has limited the remit of regional planning to set strategic and sustainable development regional outcomes.

Institutional arrangements and relationships are also identified as an issue, particularly in relation to implementation. While institutional arrangements exist in Queensland, "*they don't apply them to actually create something different".* Coordination across agencies and departments remains a complex challenge especially in relation to infrastructure funding and delivery. Planners experience these dynamics and the power relations inherent in planning processes in ways that impinge their agency. Institutional constraints are attributable to the organisational cultures and legacies of specific departments, such as the TMR which was described by interviewees as a powerful and big budget entity primarily focused on roads, with other modes, integrated land use and transport models (e.g. transit oriented development) and infrastructures more marginalised. For example, in describing a willingness to innovate, other agencies were necessary: "*we could throw those ideas around as a planning agency but really required the doers - the transport agencies etc - to take those on board as well*". Some planning processes have embedded staff from the TMR. Interviewees were also critical of TMR as a *"roads organisation trying to run heavy rail"*, further describing these arrangements as *"organisational failure"*. Organisational bias, potentially coupled with political sensitivity, still result in road-oriented solutions to transport problems such as congestion. The attitude to road-oriented solutions is shifting with practices such as road widening on major roads seen as short sighted, in part attributable to funding arrangements between Federal and State Government. Even so, interviewees noted that "*the conversation is still about widening the motorway"*. This left public transit in a secondary position where efforts *"to extend the busway in a meaningful way and integrate it into a town centre and high-density around the bus station is just not happening"*. However, over iterations of the plan, greater emphasis has been placed on this kind of integration.

In dynamic agency relationships decision-making can be opaque in relation to institutional and cultural differences in relation to planning, funding, and delivery. In particular, a disconnection between regional plan and infrastructure provision is evident where *"transport agencies traditionally have one of the biggest budgets in government. They're a very powerful agency and they have a certain amount of inertia and they have come from a long history of 'road building is the answer'."* The institutional inertia, across planning, infrastructure, and transport agencies, can take several iterations of political conversation and policy to shift. The lack of an autonomous or semi-autonomous and well-resourced public transport authority is also identified as a limitation in transport planning. The existing body, TransLink, is seen as relatively powerless and curtailed. It was suggested that "*TransLink*

can't be the champions of public transport that they need to be. We need an organisation out there - Public Transport Queensland - that really is a champion." Perceptions of fragmented organisational arrangements contributed to inconsistent transport decision-making and network development where "*we've got a whole lot of different organisations – BCC, Queensland Rail, TransLink, TMR - all with big communication issues - they're all in silos".*

There is a perceived link between organisational arrangements, planning, and outcomes in the region. The lack of bus and rail integration in the region is directly linked to both its historical development and the *"poor organisational structure we have to deliver public transport".* Interviewees offered both appreciation and criticism of TMR in terms of their capability to engage with policy processes that can drive change in terms of sustainable and active transport. Without support of the transport agencies the types of transport integration and opportunities identified in regional planning processes will have limited implementation. *ShapingSEQ* on the previous plans to further strengthen the integrated transport and land use outcomes. The linkage between regional planning and transport was marked by an *"absence of policy from [TMR] around a whole range of issues or meaningful policy for regional planning"* in 2016/17. This meant that the regional plan was *"the only thing out there talking about transport policy for southeast Queensland"*.

TMR has developed regional and statewide transport policy, as well as examined scenarios and mobility disruption (Department of Transport and Main Roads, 2019). The approach to disruption to transport systems differs across Australian states and the State Government was *"wary of being Ubered again"*, referring to a lack of preparedness in managing the impact of the ride sharing platform, aiming instead to anticipate and regulate for technological change in the transport sector. For example, different transport solutions and mixes were warranted for low-density areas on the outskirts of the main urban areas in SEQ that were poorly serviced by public transport but this is not reflected in *ShapingSEQ*. It was suggested that *"these people need to have a minimum service level requirement – you need to provide something for them. So I would have thought it'd be worth investigating."* Timing and certainty were significant factors for politicians and policy actors: *"they like to talk about things like autonomous vehicles but they wouldn't want to spend a dollar on it unless it is guaranteed which means 10 years too late"*. Consequently, the regional and other planning is perceived as not providing timely spatial solutions for transport and infrastructure.

6.2.3 Planning is political: "Subject to direct political interference"

While the regional, infrastructure and transport plans highlight specific policy and political priorities, including the address of sustainable development through managing growth, the interviewees identified political dynamics that impacted the planning and policy process. This has resulted in interrogation of the role of planning and its impact particularly in an overtly politicised context where, as several interviewees commented, parliamentarians were concerned with adverse press coverage. This is exemplified the observation that *"the ministers get sucked into overwriting plans and trying to over-plan them or over-including them so that they look like they are in control"*. A recurring commentary emphasises the need for political will and leadership in achieving aspirational goals. The problems of political interference in which planners, in particular, are disempowered are acknowledged: "*you know from a best practice, theoretical point of view what is needed, but certain agendas might change that. There's a political narrative for what's important politically at the time."* The issue of political interference as a limitation experienced in policy and planning where:

> *The planning is subject to direct political interference ... and planning priorities change depending on the complexity of the government in power at the time and who is influencing that government in a general sense.*

Interviewees also noted that Ministers and political representatives of the day, such as Mayors, shaped the planning agenda with some identified as demonstrating leadership in areas such as infrastructure and transport, particularly public transport. When a senior minister presided over the planning portfolio, such as a Deputy Premier or Treasurer, this was regarded as advantageous for regional planning and infrastructure at the state level. More engaged and powerful ministers were able to provide leadership and broker interdepartmental, multi-level and ministerial exchanges: "*if you haven't got a senior minister it really struggles and the reason for that is because it needs the cooperation of so many other agencies and government departments which means other ministers"*. Ministerial leadership was integral to shaping the strategic direction of the regional plan: *"I was determined, as the team was, and the minister at the time to ... try and get a shift in thinking and form ... It was a pretty deliberate process."*

Multi-level government dynamics are at play, with several major public/mass transit projects the subject of interference and powerplay from Federal, State and Local Government through consultation, funding, and other policy agendas such as privatisation, infrastructure recycling

and the like, some of which have not withstood changes of government. The regional planning process was significantly an intergovernmental undertaking between state and Local Government. Interviewees identified the need to manoeuvre through changing policy priorities where "*the government of the time might have a certain view about certain policies which might not be best practice or might contravene other policies or agendas"*.

Interviewees observed the relationship between state and Local Government as being collegial and consensus based yet highly contested and conflicted. Regional planning was seen to placate local councils in ways that undermined and weakened the regional plan observing that "*a lot came down to the issue of the State Government not wanting to step on the toes of Local Government".* Other political dynamics were observed as playing a role in undermining planning objectives to withstand challenges resulting from changes in government that also herald significant disarray in planning direction and aims. The impact is that "*regional plans can then become even higher level and vaguer because they try and withstand these changes of governments that occur very regularly".* This could result in greater disconnection between aims, purpose and implementation:

> *"What is the role of the plan when all that stuff changes all the time and it becomes a pretty big football? It can end up being written in a lovely way in which there's lots of lovely words but no real actions in them."*

Despite the medium and long-term outlook of the regional, infrastructure, and transport plans and policies, interviewees also perceived a lack of long-term thinking and decision-making. They observed that politicians were more focused on the election cycle and vote winning through popular but expensive road projects. The focus on election cycles and election-led decision-making undermined planning as projects emerge from populist expressions rather than clearly defined need. This resulted in political actors committing to projects without business cases and other assessments to inform decision-making and consequently "*if they get elected then they want to deliver on that and then you're almost backfilling. That can be a real problem."* Other commentary about the nature of political capital yielded by infrastructure construction identified issues associated with delaying new infrastructure ('sweating the assets') and ongoing costs. The planning and policy commitments to 'sweating the assets' are not always supported by *"politicians who like to announce shiny new things"* which has implications for budgets and ongoing costs. There is a tension in the infrastructure and planning agencies where "*you're fighting against a desire to build new things in the same frame as agencies aware that they've got a limited budget to deliver services within"*.

Such conflicts of priorities were also evident in infrastructure planning where the need for infrastructure outstripped the government's ability to fund it, even with proposed pipelines and funding programs. Local and regional planning revealed significant gaps, particularly in relation to designation and consolidation of centres and development of Priority Development Areas, *"the State Government just saw this list adding up all the high level infrastructure and they just said well this is just giving commitments that we can't possibly keep".* Despite this, government did deliver on significant infrastructure funding, particularly in relation to public transport. In relation to road announcements, it is acknowledged that this counters the professional wisdom and agency of planning in which constant road building exacerbates issues like congestion and pollution:

> *As planners and people looking at the urban fabric more closely we recognise roads don't solve the underlying problem. It just delays congestion in a component of a transport network for a small amount of time.*

Vertical fiscal imbalance is also at play in the politics of infrastructure. Infrastructure funding from Federal to state governments supports road building in the national network, sometimes to the detriment of major public transit projects. Federal government is perceived as significantly influencing state infrastructure projects and Federal government policy decisions impact infrastructure projects such as the Cross River Rail. State and Federal government were in conflict over this project for several years, particularly in relation to funding. While the state government declared this project a priority and a key piece of the *ConnectingSEQ* strategy, "*the state essentially had no choice but to fund it itself or back away from its statement that it's the number one priority. Can't keep saying it's the number one priority [and] not funding it."* The political and policy context is particularly important due to the need to align policies and plans across multiple levels of government to budgetary commitments to infrastructure expenditure. Prior to the Global Financial Crisis in 2007, Queensland was a key beneficiary of the mining boom which resulted in significant revenue enabling investment in infrastructure. Government response to this situation is sometimes viewed with scepticism. Financial constraints have resulted in a lack of creativity and problem solving:

> *No one's got any ideas because they haven't got any money. I mean the market led proposals that Treasury has been running. I describe market led proposals as something you do when you've got no ideas and no money.*

Together with funding considerations, a further aspect of limitation relates to decision-making processes, which are perceived as inherently political. Many infrastructure projects are included in plans without cost-benefit or other feasibility analysis. Consequently, there is an ongoing implementation challenge in which funding and value for money are strongly aligned to ensure delivery. However, interviewees expressed concerns about capacity to support new development designated in the regional plan, particularly the growth fronts. In such complex fiscal relations, State Governments were tied to projects and development that locks it into escalating servicing commitments. These were made at a time when the State Government revenue was stronger, and it was committed to 'leading development with infrastructure'. However, that commitment, as expressed in the regional plans, has changed over time. In recognising the political decision-making and short-termism involved in land releases, some interviewees were unable to reconcile the PDAs to their constructs of good planning: *"it staggers me [that] government's making decisions to allow these particular developments [PDAs] knowing that it's going to have to wear an enormous cost down the track to provide infrastructure"*.

While assessment processes are in place, the political context can manipulate prioritisation. Interviewees cited specific projects – such as Gold Coast Light Rail, Cross River Rail and Redcliffe Rail Link – in which political interference was at play from all levels of government. The perception of highly politicised decision-making and funding has resulted in a cynical view of how politicians in all levels of government leverage infrastructure investment and projects for political gain resulting in the agency of planning and planners being weakened or marginalised. This means other, more cost-effective infrastructure and transport improvements, such as bus network reform, may not receive sufficient evaluation: "*because it's so politicised the politicians need to have the big moment. You talk about simple bus network reform and their eyes glaze over ... They don't do it because it's tough politically."*

The financial and political climate is also interpreted as having bred *"risk averse"* and conservative approaches to decision-making which inhibited change. A lack of boldness and courage in political decision-making was described as "*so incremental and ... so knee jerk ... The leadership's not there and they're all fearful ... So, it's really strange to have fearful people in positions of leadership."* This perception of a need for leadership translates into an inability to craft clear messages about the region's future and engage with stakeholders and communities about the longer-term benefits of growth management and regional planning. Concern was also expressed about which stakeholders are better positioned to influence

government decision-making because *"professional planners rarely have the ear of ministers"*, while other stakeholders and vested interests can exert influence more directly:

> *Who does a planning minister see a lot of? [They] see a lot of mayors definitely. [They] see a lot of developers because they come to [their] door all the time. I used to see this with ministers that I've worked more closely with.*

Stakeholder engagement in the regional planning was characterised by interviewees as politically manipulated. Vested interests, such as developers, were perceived as exerting influence over politicians as well as the planning process. For example, the designation of PDAs was regarded by several interviewees as contentious and intended to placate developers who had invested in greenfields, or were seeking higher zonings, putting them in conflict with communities that rejected more development:

> *there's a lot of pressure on government from those sort of stakeholders [development companies] - not felt so much that at the officer level but certainly would be at the politicians' level - where they get the CEOs of these corporations ... trying to progress their patch of land.*

Other interviewees expressed awareness that some stakeholders, particularly private interests, were better positioned to advocate for their priorities while others, such as environmental groups and resident action groups were regarded as adversarial. Planners were not the key decision makers in planning and policy, which was reliant on connections: "*the development industry and the politicians and typically those two are very well connected because the developers make sure they're well connected."* As a multi-stakeholder process, tensions between the private and public sector in relation to planning were identified as were issues of vested interests, developer influence and power imbalances. For some this resulted in the political and commercial world being significantly entwined in ways that favoured developer interests and gave the impression that planning was captured by the development industry. Others acknowledged that the roles of government and the private sector required greater negotiation in order to support institutional change. The nature of complex stakeholder dynamics in planning was changing which necessitated a clearer understanding of the role of regional planning and the roles of public and private actors:

> *There's a tension in planning between acknowledging the role of the private sector, the role of innovation, private financing and a whole range of new things coming through and the role of State Government as a central planner.*

Further to concerns about influence, it was observed that environmental and community interests were not listened to because those stakeholders did not specifically support development. This resulted in inequitable consultative approaches which "*segregates all the interests and then [doesn't give] anyone enough time to speak even in that space ... We need people in that department who are good at consultation – at least running a process where you feel listened to."* A systemic problem associated with the politics of consultation and the failure of formal processes to engage was identified. The consultation process was described as *"toxic"* and *"broken"* where *"there is this wicked problem and wicked connection between politics. Have your say, and then what plays out in plans?"*

6.2.4 Maintaining stability: "Effectively the same plan"

Regional level planning commits to managing growth through incremental improvements in spatial, transport, and infrastructure development over time. It was acknowledged that the planning process was slow but that significant changes had occurred in SEQ, which *"is quite a different place than it was 10 years ago, 20 years ago. So people lose sight of the fact we have actually come a long way"*. Based on the preceding Growth Management Frameworks, the regional plan framework is perceived as basically unchanged since 2005 with adjustments to the urban footprint and policy development. Interviewees were cognisant that the framework is robust and has survived several iterations of the regional plan as well as informed infrastructure and transport planning. This consistency had not enabled enhanced elaboration of major constraints where "*there are nuances but it is effectively the same plan and it's still constrained by the same issues of what are the key priorities and where's the money going to come from"*.

Interviewees also note decision-making that has resulted in new problems or exacerbation of problems in the region, particularly in relation to sustainable development and unpredictable climate change impacts, such as floods. Interviewees identified challenges to planning objectives especially where the pattern of low-density, car dependent development prevailed and remains the most dominant form of development. The interviewees identify several patterns in which sprawl-type conditions were enabled. This includes building along major road corridors and developing growth fronts in the region where new townships are established outside of the growth boundary, and without sufficient transport connectivity or choice. Such patterns do not result in the social inclusion and liveability that the planning aspires to; in relation to infill, *"there is nothing in the planning process that enables us to build complete communities. We're just letting buildings happen."*

Several interviewees commented that while the planning system seems to be geared towards perpetuating sprawl, even as infill development increased, this is not partnered with a commensurate commitment to infrastructure provision. This is partly attributable to other aspects of the planning system and policy mix such as arrangements for developer infrastructure charges. Suburbanisation was projected to continue and this was interpreted to mean "*we're not serious enough about ... sprawl. If we really didn't want it, we wouldn't be doing it, but we just keep doing it*." Interviewees identify an ongoing misfit between urban, suburban and regional land use and transport integration which negatively impacts economic and social opportunity. Those areas which interviewees identify as sprawl, including growth fronts and late 20th century forms of suburbia, are more difficult to service with transport yet continue to dominate development patterns. This is seen as a failure to adopt learnings from earlier planning processes. The growth boundary, while regarded as important for shaping settlement, is not sufficient for eliminating sprawl, relying on a longer-term cycles of development and renewal. Other measures required to better manage spatial and built forms including funding mechanisms for infrastructure:

> *Urban sprawl is not self-funding. It needs to be subsidised if you want the right infrastructure. But then we keep approving the urban sprawl and somehow hoping that we will be able to provide the infrastructure.*

Motorway development in SEQ is particularly contentious and results in changes to travel behaviour with major highways and roads acting as attractors for increased traffic. With reference to a major highway between Brisbane and the Gold Coast, the M1, "*people shifted their cars to the M1 and now the M1 is a car park and everybody wants another M1".* With plans to develop a second motorway, the M1 corridor triggered *"massive urban development"* and strip development between Brisbane and the Gold Coast. Interviewees observed that this altered the urban structure and consequently *"people's expectations of what they would be able to do changed and it changed to turn that into just a major thoroughfare for vehicles that is not its intention".* Rail connectivity between Brisbane and Gold Coast has been improved with interchange between heavy and light rail. Sequencing land release, infrastructure, and transport in growth areas has resulted in social and transport disparity where *"if there's a land release ... that [development] will go ahead well before any transport is considered".* Transport is not always delivered in appropriate timeframes or sequenced with development and community growth, and the result of car-based commuting can be that it becomes *"really separated and socially disadvantaged"* and counter to the goals of sustainable planning and sustainable transport.

Interviewees were concerned about PDAs which they perceive will be socio-economically isolated due to geography and transport. A perception of a lack of infrastructure and lack of funding for infrastructure is regarded as a significant obstacle to effectively managing and developing the region:

> *The state is fundamentally underfunding infrastructure dramatically. For councils to achieve their building supply benchmarks, it's not just about land use and zoning – the state has to put in interchanges at schools and public transport. And they're not funding it and will actually [need to] put some metrics around.*

Interviewees also identify the absence of transport and infrastructure supporting PDAs, noting the lack of transport options connecting them to other centres: *"your [government] planning decision allowed this to happen - where is the infrastructure spend? That's a good thing because it's putting metrics around the policy challenges we've got."* The interviewees recognise that planning is a limited practice within a policy and governance system: alone it cannot deliver results or make the changes it articulates or narrativises in the plans and policies. Interviewees propose that planning needs metrics and should be undertaken in conjunction with implementation and monitoring as well as grounded in political and fiscal priorities and trade-offs.

Interviewees also express the limitations of planning in providing solutions to complex problems, delivering behaviour change or facilitating carbon reduction: "*I get a bit frustrated ... with an expectation that planning can resolve issues. Planning plays a role and it has to play a role but it can't deliver a whole bunch of things".* The sense of planning as a problem framing and solving platform is constrained where *"planning has a role to play in carbon reduction, ... but can it really change, in a material way, the amount of carbon produced by society?"* Interviewees also proposed the need for problem-solving beyond normative planning propositions. The reach or impact of some of the solutions offered in response to socio-technical systems pressures were discussed cautiously by interviewees. Some spatial configurations, such as integration, become institutionalised responses for many issues but without sufficient interrogation of problems. *"Getting it right"* is important for a *"good result"* but the language of the regional plan does not sufficiently reflect decision-making or problem-solving processes with greater emphasis on efficiency and effectiveness:

> *The question is 'how does that occur spatially?' when things start to hit the ground and hard choices need to be made. I think the plan falls a bit short there - so it talks*

about all this integration, and it's right to talk about that, but you've also got to have processes to actually do it.

Failings in relation to spatial, technological and infrastructural integration are also identified. Integration was not sufficiently resolved in relation to fitness, funding and timing where "*the number one area of criticism of the regional plan is - the infrastructure just isn't going to the places that it needs to go".* Concerns were also expressed about the regional, transport, and infrastructure planning and policy creating false expectations that infrastructure and transport links would be developed, although in practice these links can take decades to reach fruition. In relation to teleworking to address car use and congestion, several interviewees identified this as an option for a limited number and type of worker or business operator. Other interviewees suggest a failure of problem-solving and lack of innovation despite statements about "innovative planning" in the regional plan.

For some interviewees, reframing problems is necessary for establishing alternative pathways and innovative planning. Such reframings include making the cost of sprawl and car dependence explicit, exposing myths about funding for infrastructure, interrogating normative economic rationales, and recognising and accounting for the social and environmental costs of built forms. *ShapingSEQ* stresses that the "business as usual" approach to transport is not an option and outlines a sustainable transport program based on public and shared transport models rather than automobility technologies such as electric vehicles and autonomous vehicles. Reflecting on policy research, interviewees expressed concerns about the potential impact of these technologies and the planning challenges they present in terms of travel behaviour, length of travel and number of trips. A misfit between emissions reduction from electric vehicles and other sustainability considerations was noted where "*growth and development [pushes] further out because people can sit in their car and work or whatever".* The introduction of such technologies could trigger the introduction of other policy settings, such as congestion charging. However, these policy agendas are beyond the remit of planning. Interviewees acknowledge that automobility requires significant redress through innovations and reconfiguration in public transport rather than a singular technological disruption such as autonomous vehicles. The planning process was inhibiting this type of technological change:

We asked 'are we doing anything here that would undermine the potential benefits of autonomous vehicles?' and we convinced ourselves either rightly or wrongly that we weren't. But equally too we didn't want to grab hold of it as a particular policy outcome that we wanted to take forward.

Socio-technical change in the transport arena has implications for the remit of regional planning and planning can impose constraints which influence regional pathways and selection environments. Interviewees suggested that aspirational statements in plans can define future directions, including not eliminating possible windows of opportunities as with autonomous vehicles, but also questions "*what can planning practically change in terms of culture shift or budget shift or regulatory shift to deliver [an aspirational] outcome?"*

6.2.5 Summary of Limitations of Planning Narrative

The sense of limitation in planning expressed in the planning and policy documents as well as through the interviews is multifaceted. Examination of the data revealed significant narratives and discourses that elucidate a sense of limitation that permeated the planning process and practice. Where the first narrative – changing planning – establishes that planning has some degree of plasticity in that it can and does change to promote and steer more sustainable regional and urban development trajectories, these limitations act as constraints on action and change. The limitations are not always imposed by a force of power exerted on or against planning, but also through professional and agentic ideas and practices of what planning and planners should and can achieve or do.

6.3 Narrative 3: Anticipating Transitions

The third narrative identified in regional planning and policies acknowledges that transition is emerging or underway. The plans and policies anticipate that transition is occurring or will occur. Regional planning proposes transition to a low carbon future and sets some frameworks for supporting this transition through urban forms and spatial relationships. However, transition is not terminology that is widely used or understood in regional planning, which tends to affirm normative framings of sustainable transport and sustainable planning. It also acknowledges transitions in terms of microeconomic reform rather than socio-technical or sustainable transition. Ideas related to sustainable transition are evident in interviewee commentary and are articulated through four discourses acknowledging a low carbon future, system reconfiguration, planning innovation, and reflexivity in planning. These sub-narratives are focused on changes in the current planning system. In acknowledging that planning experiences limitations, interviewees also shared ideas about how and why to make changes in planning processes to achieve aspirational goals and

targets. In considering transition in the planning process, a tension between narratives of change and narratives of limitation is evident.

6.3.1 Framing the low carbon future: "remodel, remake, revision"

Since 2005, regional planning has included strategies for addressing greenhouse gas emissions, environmental protection and the environmental impacts of development while also including measures for social inclusion and equity. The forward projection of a low carbon future was included in the SEQRP 2009-2031 with subsequent provisioning in infrastructure and transport plans. Until the introduction of the *Queensland Climate Transition Strategy*, the focus was on reducing GHG emissions rather than transition. Regional, infrastructure, and transport planning and policy are yet to specifically address the targets of *Queensland Climate Transition Strategy*. While a recent statewide transport policy draft, released in 2019, proposes a range of system and technological innovations as well as building on multimodal networks that reduce car reliance. The *Draft Queensland Transport Strategy*, which was not examined for this study having been released in 2019, proposes five outcomes: access and convenience; safety; personalisation; efficiency, reliability and productive transport; sustainability, resilience and liveability (Department of Transport and Main Roads, 2019, p. 9). As part of the last outcome, the *Draft Queensland Transport Strategy* articulates the following future direction:

> Transitioning to a net zero emissions transport system: We will support the transition of our transport system to net zero greenhouse gas emissions by improving efficiency and enabling new vehicle technologies and infrastructure solutions (Department of Transport and Main Roads, 2019, p. 53).

The specific actions it advocates include implementation of the *Queensland Electric Vehicle Strategy*, development of zero net emissions roadmap in collaboration with industry and other stakeholders, adoption of whole of life approach to transport emissions (including planning, design, delivery, operation, and maintenance of infrastructure and services) and use of real-time management of the transport network to minimise emissions. While this strategic direction responds to the *Queensland Climate Transition Strategy* other directions respond to planning and infrastructure priorities including enhanced land use and transport integration, active and public transport, and climate change resilience. A shift arising from this policy is acknowledgement of the role of the public sector and government in *"enabling mobility"*, where previous plans, like *ConnectingSEQ*, addressed access. *ShapingSEQ*, for example, addresses the need for greater connectivity. In its section titled 'Connect',

ShapingSEQ aims for "Moving people, products and information efficiently" (Department of Infrastructure Local Government and Planning, 2017, p. 30). This includes ensuring a land use plan to underpin transport planning as well as prioritising active and public transport in urban areas, improving intermodal connecting, and advancing technological solutions and other innovations that reduce infrastructure need.

Consideration of the transport mix is underway with trials of demand responsive transport in place. As the mix changes or new modes enter the market, the priority placed on public transport may change: "*we are not going to stop running buses any time soon but we might need to make room for these alternatives ... the technology has changed now. The regulation is changing and that's a huge step."* This type of change is yet to translate as policy learning across the policy system and consequently planning frameworks are perceived as dated and lagging. The conceptual framing of the regional plans was not sufficiently addressing the social and technological challenges SEQ is experiencing. With the growth management paradigm losing relevance and more contemporary ideas, such as smart cities and regions, it was suggested that "*you've got to retrofit the region ... It's hard to speak to low carbon and transition when your model of growth is just anything but that".* The existing approach to creating additional dwellings, mixed use and transport integration through infill is not sufficient to constitute retrofit which potentially addresses the ways in which urban and regional systems are designed and function. At the time growth management was introduced, the region was facing pressing needs for housing and services. The growth management response had its moment as a response to population growth and the need for physical infrastructures:

> *It was a knee jerk reaction but necessary response to ... the rapid pace of growth. So it was a real physical thing back then … Back in 2004/05 the momentum was very much about 'let's get this right'. We've got an issue with urban growth around the fringes without good infrastructure and we need to move forward in that process.*

For many interviewees, the concept of sustainable transition was new and they expressed difficulty in situating it in relation to the sustainability principles established and applied in planning. Several interviewees were not aware of the *Queensland Climate Transition Strategy* or its implications for regional, infrastructure and transport planning and policy mix. Responses to ideas of transition included:

> *I can assure you, I can actually tell you, that at no point did I ever use or did I know people who used 'transitional' or 'sustainable transitional' - any of the theoretical*

words.

I have a bit of a problem with the term 'sustainable transitions'... that term sustainable transition doesn't mean much to me but transition to a more sustainable something or other would mean more.

Some interviewees proposed alternative framing, such as "regional retrofit" as having bearing on transition and fundamental system reconfiguration, and others questioned whether planning is capable of exerting significant influence or power in sustainable transitions. Other interviewees proposed metabolic functions in the urban context to address changing socio-technical relationships including addressing heat island effects, enhancing CBD parkland, and *'de-roading'* to create green streets. Stronger linkage to strategic intent and timing makes the regional plan relevant for transition, particularly during lead time for SEQRP reviews. Different approaches to planning may require *"refresh of the regional planning process to give effect to the question of transition will require a bit of a remodel, remake, revision".* As identified in a previous section, the increasing focus of planning on land use has inhibited the types of negotiation that are possible within policy contexts in relation to low carbon futures and sustainable transitions.

6.3.2 Reconfiguring systems and relationships: "what we did was develop for the first time a multimodal transport model"

The references to transition in plans and policy has implications for the ways in which different types of transitions are conceptualised. The planning imaginary is limited in terms of projecting this future with interviewees proposing that it is vital to continue to build on the foundations of a more compact and integrated urban form. Interviewees reiterated planning principles as foundational to creating a more sustainable and lower carbon environment in relation to transport with the planning process engaged in "*trying to do whatever we could to stop or to restrict the cars".* A tension is perpetuated in the planning, particularly in relation to greenfield development and growth fronts and the disconnection from sustainable urban form and transport. Interviewees observe that sprawl patterns prevail and this inhibits radically reshaping transport and infrastructure systems in a planning system that has limited options for funding infrastructure. If this is to be achieved in less than 50 years, it requires concerted action. They suggest "*if we wanted to solve our transport woes we'd have to break that nexus in South East Queensland with the way we approve sprawl ahead of the infrastructure and then hope that it will happen."*

Trajectories promoting sustainable planning and sustainable transport are intrinsic to planning and policy for transition: "*Where we start from is that if you can integrate land use and transport, effectively you will deal with the transition".* For some interviewees this overlooks the need for a further integration with ecological systems and a metabolic framework for infrastructure planning grounded in ecosystem services and acknowledgement of *"the natural infrastructure that provides ecosystem services [is] critical infrastructure and that's what we should be basically managing".* This has implications for the ways in which infrastructure systems are planned and designed especially in terms of maintaining regional scale and extraterritorial ecosystems and their interaction with build systems. In particular, the emphasis placed on ideas of compact urban form dominates planning as a response to many socio-ecological and socio-technical system challenges and reconfigurations:

> *The thing that's going to make the biggest difference is going to be in relation to supporting a more compact urban form and the benefits that delivers in terms of the transit task and the benefits it delivers in terms of the lower impact on land use and lowering the potential and the requirement for land clearing that's going to reduce the capacity of our eco-system to manage.*

Regions are comprised of dynamic socio-ecological-technical systems that all contribute to the viability and sustainability of urban and regional environments. In affirming an urbanist approach in *ShapingSEQ*, other ecosystem relationships have been marginalised and traded off, although *ShapingSEQ* proposes a mutually supportive relationship between rural and urban areas. With planning horizons extending to 50 years, the urban footprint was not significantly changed and is subject to five yearly review, although infill development is prioritised. Land supply monitoring is predicting significant urban expansion and intensified land use over this timeframe. This further establishes a tension between urban and suburban localities in terms of the servicing and infrastructure required to sustain transition. As the regional planning framework has remained consistent since 2005, this has become a foundation or frame for innovation and change. Some issues, such as congestion may be intractable:

> *people think that you can solve congestion - it's a nonsense. If you supply enough space people will use that space and they'll use it to its capacity ... Part of housing and transport integration is actually creating more housing choices in most areas.*

Development and expansion of public transport is a significant element of transport policy and planning with interviewees also recognising the importance of shifting to a multimodal and intermodal transport system. The fortunes of public transport have changed over at least two decades and *"there is overwhelming public support for a good quality public transit system - that's been a real transition".* With the expansion of public transport and a focus on access, regional, and transport planning emphasised the need for better public transport networks and *"a much more ambitious multimodal system"* embedded in SEQRP 2005-2026, *ConnectingSEQ*, SEQIPP, and state infrastructure plans. Some interviewees regarded this as groundbreaking: *"what we did was develop, for the first time, a multimodal transport model for South East Queensland"*. This necessitated cultural shifts in policy and planning agencies that resulted in *"shifting the focus from roads to providing public transport"*.

The regional planning also advocates for more efficient configurations of infrastructure, such as infrastructure corridors, that are aligned to land use. However, these configurations are subject to procurement conditions and partnerships which can result in fragmentation. Different types of procurement and investment could enable *"inclusive infrastructure investment"* and *"infrastructure innovation"* so that *"the best and most significant community benefits coming out of every dollar and every infrastructure project".* They observed a tendency where *"infrastructure might only be used for one benefit, like a tunnel, or transport"*. This approach to infrastructure procurement warranted greater integration and flexibility, as in international contexts, *"where one piece of infrastructure and one little corridor of land is used for 40 purposes, not one, and all of them are coordinated."* It was also suggested that these innovative approaches were not possible in Queensland due to the siloed nature of transport and infrastructure agencies.

6.3.3 Innovation in Planning: "different ways of getting things done"

Since prior to the introduction of statutory regional planning, the state has relied on planning mechanisms, such as smart growth and urban consolidation, and embedded them in planning and policy documents to deliver better performing development in SEQ and other regions. Each of the regional plans responds to changing circumstances by recognising more complex or wicked problems and the challenges associated with rectifying those. While earlier plans articulate the benefits of sustainable development and "a better way", *ShapingSEQ*, in particular, presents a need for innovation in the planning response to megatrends which have been identified by the CSIRO. The regional plan does not elaborate the strategic and regional scale implications of innovation in planning. For example, in response to increased urbanisation, *ShapingSEQ* proposes "as the region experiences further significant growth,

innovative planning and design can help deliver attractive, compatible and sustainable urban places" (Department of Infrastructure Local Government and Planning, 2017, p. 10). *ShapingSEQ* also proposes that planning play a role in:

- food security and ensuring finite resources are managed sustainably for current and future generations
- ensuring people have access to necessary services, local employment opportunities, housing and transport choice, irrespective of where they live.
- adopting new ways of thinking about how we work, move and live
- enabling new models of living, services and lifestyle, including inter-generational living and the ability to age in place.
- protecting [ecological] values and ecosystems.
- limiting the adverse impacts and better manage our climate risks.
- unlocking the region's potential and creating new, globally competitive and value-adding industries and business. (Department of Infrastructure Local Government and Planning, 2017, pp. 10–11)

Such a wide range of demands on planning requires significant capability for learning, innovation, and transition at the regional and local scales. Interviewees acknowledge that solutions are needed to such problems and challenges, but "*government resorts to planning for a solution for just about everything ... I get nervous about saying planning or a regional plan has to deal with these issues in a really detailed way because what can it materially do?"* Each regional planning activity has featured greater recognition of complex and intractable problems such as social inequality, ecological degradation, oil vulnerability, and climate change. The response to emerging issues often tested the capacities of other agencies and SEQRP 2009-2031 sought to strengthen integrated land use and transport in response to peak oil and oil vulnerability in conjunction with other state agencies where "*[we were] very keen on trying to make sure it came through in the way the conversation was discussed and planned better".* This 2009 plan also included a more refined response to climate change including disaster response, mitigating and reducing GHG emissions. Interviewees generally observe that the greatest contribution of the regional plan is the urban footprint and its relationship to sustainable transport and integrated planning.

The plans are directed towards different targets and approaches that address the issues in greater complexity drawing on diverse policy process approaches. Each of the regional plans includes new elements and priorities. Not only is the SEQRP2005-2026 positioned as a

'better way' or 'new approach', which elaborates generally accepted sustainable development and planning principles, but each successive plan seeks to refine and build on these. That is, the baseline for each plan is the previous plan without significant opportunity for review and evaluation. Additionally, those interviewees whose policy and governance role is more institutionalised, such as planners, policy officers, and elected representatives, do not discuss adaptation and transition as urgent. Non-government and non-profit based stakeholders tend to acknowledge urgency in relation to these issues. SEQRP2009-2031 elaborates issues associated with climate change, greenhouse gas emissions, and peak oil. *ShapingSEQ* sets out a regional planning agenda that also builds on past plans and articulates initiatives that distinguish it from previous plans and catalyse change.

Several interviewees noted that innovation in policy process or policy innovation can be challenging in time and resource constrained environments, or observed a failure to undertake new approaches in the planning process. For some interviewees the issue of the structural, political, and institutional support for innovation is pressing, noting that when support is offered new approaches occurs. Interviewees were not averse to innovation and noted that *"it doesn't just happen"* and needs facilitation:

> *You need informal arrangements where people regardless of where they sit in your organisation need to interrelate with each other Second thing is organisations need to be able to embrace risk which is empowerment. It's challenging in public service if you have a culture of fear.*

In relation to innovation, problem-solving was regarded as a core feature of regional planning where *"you can't do regional planning unless you can acknowledge there are some problems you have got to work on."* For example, many sub-regional areas are highly constrained in terms of transport and trials of demand responsive transport were implemented to examine opportunities for localities that are difficult to service with public transport. These types of experiments were triggered by regional planning and created opportunities for local government. A strength of the regional plan was its ability to direct local level planning or "provide hooks" for those seeking to innovate while also acknowledging that planning alone is not sufficient for addressing local and place-based considerations. The private and community sector were acknowledged as the more likely sources of innovation so that *"planning needs to set up frameworks for things and get out of the way to let the private sector, innovation and other things happen"*. There is a need for planning be more open to innovation:

> *we need to open up in the early phases to much more innovation and ideas from the community and the private sector ... there's a million things out there now that are coming along that are going to structurally change the way in which we live in, view and need to plan our cities ... the world's changed now and the processes need to change along with that.*

Interviewees observed that the planning, while attentive to community consultation, often did not embrace more reflective and deliberative methods. Community consultation has been a feature of all the regional plans, as is required by regulation, and interviewees noted approaches they perceived as innovative, collaborative or extensive. Concerns about 'tick and flick' approaches were expressed. Alternative propositions for methods such as scenarios were regarded as more beneficial for scoping *ShapingSEQ*'s 50-year planning vision and horizon and the significant and complex challenges shaping possible futures. Other interviewees also identify community engagement as providing significant opportunities for innovative policy process and changing power dynamics in planning. However, some data-based innovations in monitoring land supply and performance indicators were initiated with *ShapingSEQ* as supporting decision-making and ongoing planning.

Better use of funds and other resources was noted by interviewees as an area for innovation particularly in terms of aligning land use, servicing and procurement:

> *We have to look at different ways of getting things done and calling those who are in a position to use funds in the right way, to actually be transparent and use funds in the right way, for the right purpose, for the maximum output, maximum benefit, optimum benefit.*

Learnings from other arenas, such as disaster reconstruction, were applicable to infrastructure and servicing. The current constrained financial environment could mean that *"perhaps in many ways the current strategy around sweating the assets, doing more or less, could drive innovation in itself"*.

6.3.4 Greater Flexibility and Reflexivity: "A more fluid way"

While regional planning and policy involves significant consultation and cooperation, it is not regarded as flexible or reflexive beyond its statutory function. The state has introduced and maintains a hierarchy of plans across different levels of government and spatial scales.

These connected and consistent policies are valued by interviewees: *"the pathway forward should be for all agencies to mirror their policy making in their decision-making and their planning processes to mirror the Regional Planning".* Alignment between policies was seen as especially important for implementation.

Interviewees stress the important role regional planning has played historically, proposing that it has enabled a more collaborative, consultative and cohesive approach to planning. The framework of the plan has also remained consistent since 2005, and that is also seen as a strength of the planning process. Compromises of the regional plan, particularly in relation to the urban footprint, are regarded as diluting the strategic intent of the plan and creating problems in terms of infrastructure for greenfield development. There is some resistance to dramatically changing the urban footprint due to the implications for a range of stakeholders. While the review of the regional plans has provided a platform for introducing new or adapted provisions, interviewees advocate for greater flexibility in the preparation and implementation of the plan. Regional planning is regarded as an arena with significant scope and flexibility particular if undertaken in "a more fluid way". This would necessitate different consultations and collaborations:

> *Regional plans have to be fluid to actually work well ... it really has to flip on its head from being about doing a plan to being about effective management of a region. So it's a different type of conversation, a different type of governance, a different type of structural way to deal with that within agencies.*

The proposal for an alternative approach with greater flexibility and performance orientation, and less reliance on regulatory or zoning mechanisms, suggests different institutional arrangements in which planning has greater legitimacy and reach. Unrealised innovation and transitions opportunities in the planning process were acknowledged:

> *there's a lot of opportunities there in terms of spatial planning and innovation that could be done if not for [this] Regional Plan ... then in the next one. There would need to be an appreciation of how we reinvigorate the planning process.*

Concerns about the influence and efficacy of planning in noted that "*planning has no influence - I think you could argue zero influence - that high-level planning has zero influence on the prioritization of transport to the next level*". This assertion that planning has limited or no influence compounded by the observation that regional plans are *"not used in the right way"*. Infrastructure decisions warrant deeper and longer-term assessment and

providing ways of addressing change: "*how do we make it robust enough to deal with change we don't even know will happened in the future? That's the thinking that falls though, that's all too hard."*

Interviewees have also identified how the planning process has enabled better relationships and resource sharing across government agencies and departments as well as better planning. In particular, the need for the transport and infrastructure agencies to liaise or collaborate with the planning agencies is stressed:

> *Transport and Main Roads have learned that via collaboration they've achieved better outcomes and they've achieved better planning ... They've now become better collaborators because they haven't had the same resource advantage that they had previously. The process has improved their outcomes.*

This relationship between the agencies becomes more pressing with technological and system change. Opportunities to discuss alternatives and problem solve enabled a different transport mix and prioritisation. In facing new technological challenges in transport, a more reflective approach was proposed where *"the autonomous vehicle future changes our mindset and allows us to reassess, allows us to give ourselves the permission to reassess". ShapingSEQ* advocates for an end to 'business as usual' in transport and proposes that transport mixes need reconfiguration with particular emphasis on public, active, or shared forms of transport including rideshare. There is some scepticism about electric vehicles and autonomous vehicles which suggests that the planners have not had the opportunity to examine the implications of these innovations in relation to urban and regional transport. Issues around new technologies need to be explored in greater depth with more awareness of potential and unintended impacts. Autonomous vehicles present a different set of challenges for planning which aims to address congestion:

> *if left to the market to deliver [autonomous vehicles] will just cause carmageddon. It's really hard to convince myself that all of these big companies are investing so much money on autonomous vehicles because they want to sell fewer cars.*

Such comments indicate uncertainty about the future of technological change. An adaptive approach is warranted in relation to system change where

> *we literally can't make the bet that autonomous vehicles will be here in 15 years and we can't stop building the motorways on the basis that they won't be needed because*

we can't make that judgment ... So we just have to have an adaptation mindset so we can respond to things.

The five year review cycle does not change the regional framework or outcomes significantly, while infrastructural shifts are becoming evident and desirable. While uncertainties about transition emerge, interviewees are grappling with how to negotiate complex pathways: "*we know we've got to transition to something which is creating better choices for everyone in the city in terms of how they can get around and where they can access employment and so on".* The comment, while alluding to the incremental nature of planning, also suggests that planning is not significantly attentive to shaping socio-technical systems. Consequently, it becomes a limited toolkit, as a previous narrative acknowledges, emphasising planning principles aiming to constrain resource use yet through which complex problems and systems are to be resolved or ameliorated.

6.3.5 Summary of Anticipating Transitions Narrative

Transitions are weakly articulated in the regional policy and planning, with more recent policies articulating transition commitments, particularly in terms of decarbonisation and sustainable development. Regional planning and policy is yet to fully engage transitions and continues reliance on planning ideals such as sustainable transport to address the multi-scalar implications of the changing socio-technical system. However, there are indications that the current planning system is both not supportive of innovation within its current institutionalised situation and presents opportunities for innovation in and with planning to address complex problems. Transitions thinking is emerging with emphasis on planning approaches and indications that ongoing learning is needed, not only to enable the scale and scope of transition proposed in the *Queensland Climate Transition Strategy* but also to adapt the current planning system.

6.4 Conclusion

The findings of this study are presented as three narratives, each of which produces four discourses. The findings suggest that the planning system developed over time in response to specific local/regional conditions and has generated a system of culture, meanings, structures, and practices. While policy statements, such as the SEQRP and associated policies, introduced and stabilised development trajectories anchored by sustainable development, interviewee commentaries have elaborated how these have been institutionalised and interpreted. These narratives are formed through interplays of

characters, actions, plot settings and moral. The narrative of *changing planning* reflects the historic reforms and actions that led to the introduction of regional planning and other planning reforms that projected a "better" and more sustainable development pathway for SEQ. The *limitations of planning* narrative establishes that while this better way is realised through planning ideals, regional planning offers stability and is constrained by changing policy scope, institutional relationships, and political interference (Table 7).

Table 7: *Summary of policy narratives and sub-narratives*

Policy Narratives and Sub-narratives	Summary findings
Changing planning • Towards sustainable development • Planning ideals • A different path • Aspirational vision	The regional plan represents a first. The planning system was changing and becoming formalised through regulatory reform and collaborative processes. It also triggered and consolidated the development of a regional level policy mix that necessitated interdepartmental cooperation. This resulted in best or good practices being introduced to steer regional and urban development along a different – more sustainable path – in addressing pressing and complex issues facing the region. The aspirational, medium term vision presented a significant intervention for framing the development pathway, but these aspirations were also curtailed by trade-offs and compromises that undermined planning principles and ideals of good planning and sustainability.
Limitations of planning • Organisational dynamics • Maintaining stability • Return to land use • Planning is political	Despite significant aspiration and collaboration in regional planning, the planning system experienced and imposed a range of constraints and limitations including tensions regarding the strategic and land use purpose of the regional planning and the integration of infrastructure. Organisational dynamics reflected inadequate institutional arrangements to enable interdepartmental collaboration particularly in relation to infrastructure systems. While regional planning was reliant on a degree of political protection, it was also subject to political interference and short termism that undermined sustainability and collaborative intentions.
Anticipating transition • Reconfiguring systems and relationships • Framing the low carbon future • Innovation in planning • Greater flexibility and reflexivity	The regional plans present an interpretation of sustainability for the region which included enhanced sustainable development and housing, environmental protection, sustains. In 2009, the regional plans also referred to transition to a low carbon economy which alludes to significant reconfiguration of regional and urban systems. As an emerging narrative, the potential of this reference to trigger change and innovation in the planning and policy system is yet to be realised. The role of planning in transitions – or what planning can do - requires greater consideration particularly in relation to the legacy and limitations of the planning system.

These narratives, as research findings, indicate that planning remains highly contested and conflicted in terms of foundational ideas of sustainable development and power. Despite this, demands continue to be placed on planning to address changing and complex socio-ecological and socio-technical issues. A *transitions narrative* is also developing in the regional planning and this is particularly relevant for socio-technical systems. These narratives indicate that transitions are anticipated to fit into existing planned sustainable development, however contested, pathways. Having articulated a need for low carbon transition, the regional plans are challenged by recent *Queensland Climate Transition Strategy* to meaningfully chart a pathway to zero net emissions. This significantly changes the regional planning task in relation to system dynamics and relationships beyond spatial considerations. Due to constraints experienced in and by regional planning processes, potentialities for innovation, learning and reflexivity are also unrealised. In the next chapter, these findings are discussed in greater detail applying the MLP as an analytical framework to these narratives.

Chapter Seven

DISCUSSION & ANALYSIS: A MULTI-LEVEL PERSPECTIVE ANALYSIS OF POLICY NARRATIVES

This chapter analyses and discusses the findings of the interpretive policy analysis through an application of the MLP. This analysis elaborates the relationship between regional scale planning and policy, and sustainable infrastructure transitions by analysing the narratives and sub-narratives for sustainable transition as boundary objects. This discussion elaborates the meaning of these narratives for transitions in terms of their relationship to landscape, regime, and niche levels of the MLP. As policy narrative and discourse is constitutive of transition pathways and socio-technical systems, it is also co-evolving. The analysis acknowledges that policy and planning systems are significantly regime bound while also exposed to landscape pressures and niche experiments.

The discussion and analysis of the findings is presented in three sections corresponding to the levels of the MLP: Landscape, Regime and Niche. The discussion is based in the multi-level dynamics and implications of the findings in relation to transitions. This examination of the policy artefacts suggests complex relationships across the interacting and permeable levels (Moss, 2017). The mode of interpretive analysis, for purposes of discussing policy narratives through a transition lens, by extrapolating:

- how multi-level dynamics are reflected in policy narratives?
- what are the implications of these narratives for sustainable/socio-technical system transitions?

Shifts in narrative may direct the role of planning in, and its interaction with, sustainable transition. Inherently, landscape and niche are interacting with regime with the possibility of regime change or regime destabilisation, some aspects of which are already underway.

This analysis and discussion draws on Kern's (2012) and Kivimaa and Kern's (2016) policy analysis frameworks, which are refined for this discussion of the SEQ regional policy

context (Table 8). These refinements and reframings include acknowledging socio-ecological trends, niche policy process dynamics and social innovation. It also asserts that while aspects of pricing, markets, and support networks are important in technological innovation, they are not readily identifiable in a regional planning context even though planning influence markets such as housing and vehicles. This approach extends the application of Interpretive Policy Analysis by identifying what specific meanings, discourses, and conflicts in regional and infrastructure planning mean in relation to socio-technical systems and sustainable transition and how they support reframing policy and planning.

Table 8: *Framework for analysing SEQ regional planning policy narratives Adapted from Kern 2011*

Level	**Attributes**			
Landscape	Macro-economic trends	Socio-ecological trends	Macro-political developments	Deep cultural patterns
Regime	Rules	Social Networks	Socio-Technical Dynamics	
Niche	Policy learning	Policy direction	Policy niche	Social innovation

The first section examines how landscape dynamics are addressed in the planning and, particularly, whether they are exerting pressure on regimes, recognising that land use, transport, and infrastructure are multiple but connected regimes. Second, the socio-technical **regime dynamic** of policy narratives in the SEQ regional, infrastructure, and transport context is discussed. The final section examines **niche dynamics** through which policy innovations are intended to radically change regimes emerge in the policy context.

7.1 Landscape

The planning and policy documents identify landscape pressures and outline a response to them that includes regime change and regime-based innovation in spatial and related planning and policy including infrastructure and transport planning. The nature of landscape dynamics is that they are exogenous and stable. When undergoing change, they exert pressure on socio-technical system regimes that are relatively path dependent. Because landscape dynamics are slow changing and relatively stable, they also support and promote stability in socio-technical regime patterns. In relation to transport, infrastructure, and planning, this can include trends and paradigms as diverse as macro-economics and structural adjustment, private ownership, spatio-temporal acceleration, suburbanisation,

cultural dynamics, symbolic meanings, geopolitics, and neoliberalism (Zijlstra and Avelino, 2012).

The socio-technical landscape includes obdurate forms and systems such as infrastructures and other physical features of the environment; including those major infrastructures that have been implemented more recently for settlement shaping. While such conditions are embedded in plans, they are not extensively discussed by interviewees or yield specific policy narratives. In relation to sustainable transition, landscape level dynamics include exogenous pressure and shocks. The exertion of pressure can be intentional or unintentional (Morone et al, 2016).

Problem framing was critical for proposing a "better way" for growth management in the region and developing plans and policies that were aligned to smart growth and sustainable development principles in SEQRP2005-2026. The extent to which these changes in the planning system achieved their strategic goals or influenced landscape change is not examined in this research, but these changes have instigated a pathway which plans, policies, and interviewees propose or understand as sustainable development. While socio-technical landscapes can seem impenetrable or unchangeable, they are closely entwined with regime and niche dynamics. The ways in which landscape, regime and niche interact in a place or region are historically contingent and determine the type of transition pathways that may emerge.

Planning and policy are embedded in regimes, yet also bound to those contextual landscape dynamics in ways that enable a patchwork of regimes to develop. In the findings, the landscape dynamics are not explicitly discussed except in general terms such as sustainability, culturally entrenched housing and transport patterns, competitive cities, and changing infrastructure markets. Landscape dynamics are unavoidable even when they are not explicit. This is the case in the findings where policy narratives and sub-narratives allude to or infer landscape dynamics rather than explicitly explicate them.

7.1.1 Macro political developments

Landscapes can entrench unsustainable patterns of growth and development. Landscape dynamics converge in the SEQ regional planning context to produce tensions in relation to sustainable development and sustainable transition. The policy narratives highlight landscape tensions and conflicts, including megatrends and meta-policy (Naughtin et al, 2017), that are resulting in challenges for planning in addressing infrastructure transition. Narratives

indicate that the political dimensions of sustainability present significant challenges for pursuing change, and that this has global implications, particularly in relation to tensions between neoliberalism, growth ideology, and sustainability.

The findings and policy narratives indicate landscape dynamics as prevailing and culturally embedded patterns of housing and transport and market dynamics, which drive and attract international flows of capital and investment decisions at a level which is generally invisible. The major construction and infrastructure development companies, for example, are competing and investing in international markets. Interviews described policy transfer, policy entrepreneurship, and study tours to better align the region's development trajectory with international political and economic centres, particularly where planning can facilitate public-private investment in infrastructure and enhance regional competitiveness. Planning plays a role in facilitating development and providing stability for markets including global infrastructure and property development markets as well as consumer goods and services. Throughout Australia, planning is a mechanism for facilitating private sector investment, which increasingly flows internationally, in the built environment and property sector (Searle & Bunker, 2010). In their references to property investment and other financial flows, awareness of this relationship is demonstrated together with the ways in which neoliberalism conditions and imposes limits on planning.

Landscape level dynamics are significantly at play in the political-economic structures and mechanisms that embed types of housing and transport modes (Næss & Vogel, 2012). In SEQ, the introduction of the urban footprint set a path of spatial restructuring aligned to other types of structural reform significantly influenced by global dynamics of urbanisation and/or regionalism. In adhering to planning ideals, policy narratives acknowledge that while seeking to spatially constrain sprawl and consolidate urban development, planning continues to align to the neoliberal ideologies that underpin the political power of world cities and competitive regions. Planning interventions like the urban footprint support growth and competition priorities and can be understood in terms of neoliberal priorities and management (Caprotti and Harmer, 2017, p. 134).

In relation to policy learning and meta-policy, the policy narratives also reflected on practices such as study tours, policy transfer and best practices from acknowledged global cities and regions to project alternative possibilities for SEQ. Planning is constructed and understood through global practices, institutions and discourses in which types, symbols and politics of urbanism and regionalism are imprinted and through which globalisation and freezone is exercised (Easterling, 2014; Sassen, 2005). Historic and international patterns

prevail in planning and align to theoretical and political trajectories of planning models, potentially as meta-policy. Responses to climate change can also operate as a type of symbolic meta-policy which do not catalyse action (Bache et al., 2015). Planning can be similarly symbolic especially where significant changes are projected but disconnected from implementation and which promote urbanism. These are macro-political and macro-economic shifts that propose urbanism as commensurate with sustainability and transition.

In practice policy transfer, intermediaries and entrepreneurship ensure that specific models and frameworks for planning are disseminated globally (Medd and Marvin, 2007; Mintrom and Norman, 2009; Peck and Theodore, 2010). The policy narratives indicate that the language of smart growth and other planning models have diffused through planning systems as meta-policy, indicating a high degree of policy mobility and policy transfer through which planning frameworks and policy homogenise. In part, this is driven by framings of the competitive, world and/or neoliberal city or region which inflects in policy narratives. It aims to attract and retain mobile professional labour, investment and innovation to establish competitive advantage. Transport and infrastructure priorities align to contestable ideals of 'best practice' which affirm liveability and wellbeing in ways that enhance competitiveness while potentially subjugating more localised ideas of place and community (Roy, 2009). A macropolitical landscape tension is encapsulated by tensions between local and global dynamics and flows.

7.1.2 Macro socio-ecological trends

ESD played a significant role in shaping the planning response to diverse challenges, especially with the escalation of complex problems. Policy narratives acknowledged global and landscape conditions as complex and volatile. As a growing urban region, SEQ's vulnerability to extremes, including those catalysed by climate change (IPCC, 2007), were addressed in detail in SEQRP 2009-2026. Over the course of the three regional plans, SEQ experienced multiple environmental shocks. These include extreme weather shocks, such as flooding, drought, and firestorms, and subsequent disaster recovery coupled with resilience and adaptation actions. While the regional policy and planning was primarily responsive to the issue of population growth in the SEQ region, other issues were also acknowledged since the first regional plan. In 2017, the regional plan foregrounded eight megatrends drawn from CSIRO research that challenge structural and systemic stability, including megatrends that have bearing on sustainable transition. Several socio-ecological trends are constitutive of landscape conditions that have bearing on planning, infrastructure, and transport. These include climate change, environmental degradation and bio-diversity loss, and social

inequality. While these include potential shocks and threats, the response to them is measured and understated in the planning. For example, the plans do not express climate change as an existential threat in the event of higher than 2°C temperature or rising greenhouse gas emissions (Steffen et al., 2018). Policy narrative revealed that the regional planning was addressing sustainability in a global and political sense through ideas of sustainable development. Tensions and conflicts within the narrative indicate uncertainty about whether this was sufficient or whether planning was able to achieve more. Asserting limitations provides certainty even when those limitations are resistant to changing conditions.

Population growth in the state's most populous urban region is also an indication of the global trend of urbanisation. With the SEQ region having developed in a fragmented, low-density, and car dependent settlement pattern, governments were (and are) under pressure to provide adequate infrastructure and services while also managing built environment pressures, such as housing affordability and congestion, that conceptually and practically structure urban and regional livability and global competitiveness (Rohracher and Späth, 2017). Awareness of these pressures is embedded in the plan and reflected in the policy narratives. In a reactive way, they are negotiating and straddling the interactions of landscape and regime levels to create and respond to pressures. The visions elaborated in the planning and policy documents point to the priorities of choice, liveability and quality of life shaped by the interplay of environmental, technological, social, and economic factors.

The intention of the regional plan is to position the region and its urban centres as national and international hubs of diverse economic activity and innovation. System and niche innovations can be the result of landscape level pressures as well as regime disruptions such as rapid population growth. For example, the word 'transition' features more commonly in ShapingSEQ in relation to economic transition, or structural reform, than in relation to sustainability and climate change. In the SEQ context, where the settlement pattern is understood as constitutive of landscape conditions, regime pressure was evident in multiple ways during a period of population growth including the inability to meet infrastructure and service needs of outlying greenfield development, loss of agricultural land and natural ecosystems, and mounting pressures on existing infrastructure systems and configurations. These conditions are addressed through the planning models and ideals that are intrinsic to the planning process.

Rising inequality is another landscape pressure which has resulted in socially and spatially stratified cities and has implications for socio-technical systems like transport. In Australia

wealth and income inequality have increased (Australian Council of Social Services, 2018; Jomini et al., 2018). Socio-spatial inequality is a legacy of dynamics such as neoliberal planning and service provision and related to other vulnerabilities such as austerity and financial shocks that plans aim to address. Policy narratives indicate that communities are alienated from planning processes in ways that suggest post-democractic and neoliberalist policy making. Planning in the Australian context becomes a microcosm of global dynamics whichih highlights the extant politicisation of planning through neoliberalist ideals of economic competitiveness which negatively impacts socio-ecological dynamicism (W Steele & Gleeson, 2009).

Spatial inequality also has bearing on issues associated with transport and energy and the SEQRP2009 and *ConnectingSEQ* responded to these issues on the basis of the VAMPIRE Index and oil vulnerability (Dodson and Sipe, 2007) which identified the level of vulnerability of mortgage and energy stress in cities. Historically, lower income outer suburban areas are not well serviced by public transport in Australia and urban and metropolitan strategic planning has responded slowly to the evident need to change the post-war development model (Dodson, 2014; Dodson, Li, and Sipe, 2018). Transition is multi-faceted and will occur differently in the varied spaces of the region: urban, suburban, exurban, and non-urban areas (Dodson, 2014). Socio-spatial inequality is fuelled by historic and current trajectories of settlement patterns, socio-technical systems, planning models, and reliance on market processes at local and global levels. Social inequality and demographics changes are addressed in the plans and policies in terms of housing and transport choice that imbues multimodality into transit and urban form. These appeals to multi-segmented audiences or markets are consistent with current neoliberal economic ideology and resource depletion to meet consumerist priorities rather than human needs (Næss and Vogel, 2012, p. 48).

7.1.3 Macro-economic trends

Macro-economic trends impacting regional planning are diverse and the planning seeks to accommodate the investment context and infrastructure markets. Policy narratives acknowledge the role of planning in creating an environment conducive to investment and interviewees recognise that many of the investment decisions made in relation to property, automobile manufacturing and infrastructure are made in international financial centres by major corporations. Planning plays a role in these economic and investment relations and markets. Technological change, which is addressed marginally in the policy narratives, expressed scepticism about the promise of electric and autonomous vehicles in part because

"car makers just want to sell more cars". Such statements acknowledges the scale, scope and systemness of automobility, and markets for other commodities, at a macro level (Boons, McMeekin, & Wells, 2019).

The Global Financial Crisis (GFC) in 2007/8 is particularly emphasised in policy narratives as a shock that resulted in a significant shift in planning priorities. Shocks have an immediate impact in that they instigate crises that can lead to structural and systemic changes which may not necessarily steer in a sustainable direction (Loorbach and Huffenreuter, 2013). They also included the macroeconomic shock of the GFC and subsequent downturns in construction and commodity prices coupled with economic stimulus through government infrastructure investment. Such shocks may be considered as symptomatic of unsustainable macro-economic and/or macro-socio-ecological trends and are occurring with greater frequency and ferocity. Some shocks are anticipated in planning and policy with provisions for mitigation, resilience and adaptation, while spatial inequality which can be reproduced in in planning is exacerbated during economic shocks. Since the GFC, the state government has driven an efficiency narrative in the planning and policy that posits a constrained fiscal context and public investment. The SEQRP 2009-2031 also anticipated resource scarcity risks, such as peak oil or oil vulnerability, which can result in shocks but which have not driven urban or regional spatial or structural reform.

Regulatory reform in response to financial pressures and shock has sought to expedite development and support construction and infrastructure sectors (Steele and Dodson, 2014). Economic pressure also resulted in a mix of responses that supported increased participation of the private sector particularly in relation to financing and delivering infrastructure, including rebuilding infrastructure damaged or destroyed by disaster events. The GFC impacted the priorities of the regional planning and infrastructure development including some planning ideals. It catalysed a need for economic and employment stimulus and growth which compromised other provisions of the SEQRP 2009-2031 such as the urban footprint. Government and the private sector sought to expedite development to stimulate the economy and reform the planning framework where, as an interviewee observed, "*the urban footprint and consistency of how it was used started to drop off dramatically".*

Shocks resulted in shifted responsibilities to stimulate regional development where problems of population growth and housing affordability were addressed through exurban development and lack of transport access. Planning rationales and ideals also appeared compromised by the approval of major greenfield developments (Priority Development Areas), for which populations of up to 50,000 people are projected. Such developments

facilitate investment and economic development but lack public transit and are reliant on motorway corridors. The planning narratives identify such fuzzy decisions as further corrosions of an increasingly sceptical planning framework. The GFC impacted State Government revenues with policies and plans iterating the need for innovative financing arrangements and relationships for infrastructure. In the state and regional infrastructure plans, issues of value for money, innovative financing and partnerships figure prominently, including market-led proposals (Queensland Government, 2016b). Multilevel governance and funding arrangements for road building is significantly funded by the Federal Government, but neglects to anticipate windows of opportunity that can steer towards transport transition, which by 2007 was steering towards networked multimodality. Naess and Vogel (2012) argue these shock responses can hamper sustainable development and sustainable transition by enabling expedient or opportunistic unsustainable responses. Shocks have not necessarily translated into transition pathways or system learning and this has resulted in granting the private sector greater concessions for land and infrastructure development, a trajectory that was already imprinted in policy (O'Neill, 2010). In turn, this has not resulted in novel planning approaches that address regime level price and performance improvements or socio-technical innovation at the regional scale.

7.1.4 Deep cultural patterns

Deep cultural patterns at the landscape level offer stability for regime development. In the regional context, these manifest as spatial and built forms which are long-lived. As material manifestations of historical and cultural preferences, these spatial and built forms exert influence in planning as sunk investments that shape path dependence and lock-in. Cities and regions change and adapt slowly. Shocks can present opportunities for a more rapid change but these require purposeful and meaningful policy direction and implementation so that old and new technologies or infrastructures co-exist as new technologies and infrastructures become preferable and gain dominance. The policy narratives identify tensions between urban and suburban forms and infrastructures through which to manage urban development and mobility. Suburbanisation and suburbanism, under the rubric of ideas of "global suburbanisms", are also significant landscape patterns in which infrastructures impact social, cultural, and political dynamics (Filion, Keil, & Pulver, 2019; Young & Keil, 2010)

The planning documents are enmeshed with landscape dynamics that have historically affirmed transport regimes, such as private vehicle dominance, while also seeking to restructure them, notably to intervene on suburbanisation and suburban sprawl and reconfigure the transport mix. Global trends such as 'peak car' and automobile saturation are

not articulated in plans despite observations of lost appetite and political appeal of major and costly road building programs and projects (Cohen, 2012; Driscoll, 2014; Newman and Kenworthy, 2011). In relation to compromised planning ideals, the policy narratives identify conflicts about the undesirable and unsustainable relationship of development approval for suburban sprawl and the provision of services and transport. The planning documents discursively construct landscape pressures as urgent yet manageable through changes in planning processes and priorities. Not only do they articulate a planning response, they also propose that planning is integral to the broader policy and governance response, with the regional plans setting a direction for spatial, infrastructure and transport planning and policy. The introduction of the urban footprint or urban growth boundary is upheld by the regional plan as a significant regulatory intervention and planning ideal that has redirected historic landscape conditions through property development and investment. Any change to the boundary could negatively impact regime actors and vested interests. While it cannot be removed, for a range of economic and investment rationales, it has been expediently compromised.

With changing urban narratives, urbanism and urbanisation have assumed a more institutionalised position and this is reflected in policy narratives and findings which associate the urban and other planning models with better, as if the urban is commensurate with sustainability or transition (Macarthur, 1996; Wachsmuth, 2019). Niche solutions for transition are yet to be included in regional planning other than multimodal infrastructures and suggestions of shared or collaborative mobility, some of which prioritise more sustainable transport forms. Because automobility is a profligate regime, it is difficult to shift given the stabilising influence of landscape conditions (Geels, 2012; Geels and Kemp, 2012). The landscape of automobility includes locked-in material infrastructures and mobility cultures as well as the intangible values and beliefs such as freedom and choice (Sheller, 2012, p. 185) and landscape level ‘masterframes’ which broadly define and structure collective action and stories (Benford and Snow, 2000). The regional planning and related planning has, more recently, promoted public and active transport and infrastructures that service and support alternative types of built form.

7.2 Regime

A regime is defined as “a coherent configuration of technological, institutional, economic, social, cognitive and physical elements and actors with individual goals, values and beliefs” (Holtz, Brugnach, and Pahl-Wostl, 2008, p. 629). This means that housing, development, transport, and other socio-technical systems which “[relate] to one or several particular

societal functions bearing on basic human needs" (Holtz et al., 2008, p. 629) are regimes interacting at different spatial scales of locality, city, regional and larger scales as a patchwork of regimes. Planning, like other policy making arenas, can be considered a functional subsystem of regimes such as property development, infrastructure, and transport and as such interacts with other functional subsystems. Interactions between planning and sustainable infrastructure transitions account for the multi-scalar and scalar intersections of multiple regimes. Regional planning aims to connect, coordinate, and integrate these regimes in space and across scales.

Planning is contested through competing claims for sustainability, globalisation, managerialism, marketisation, pro-growth ideology, and neoliberalism (Gleeson and Low, 2000). The findings from interpretation of the policy artefacts indicate regime and multi-level dynamics including path dependence, windows of opportunity, internal pressures, and regime resistance in relation to infrastructure and transport. The relationship between urban or regional regimes, spatial planning, and socio-technical systems is interactive with spatial planning playing a central and changing role in policy. Consequently, there is a need to examine the regime role of planning together with the challenges and opportunities it presents for transition. Limitations imposed by the regime, while supporting stability, also constrain the planning response to pressures and opportunities with planners *"doing what they can"* (Filion et al, 2015b). While the policy narratives and sub-narratives identified in the findings tend to infer landscape dynamics, they directly describe or account for regime dynamics. This may indicate that planners perceive themselves as regime actors and that planning primarily acts in and enacts regime processes.

7.2.1 Regime rules

The regime role that planning plays is significantly grounded in applying planning and settlement principles in the region. These principles are framed by legislative, regulatory, and governance expectations and practices. In SEQRP 2005-2026, this was a necessary corrective for a region that was growing without appropriate planning and service provision. Sustainable development principles, such as integrated land use and transport, that underpin urbanisation and urbanism are central to the regional plan. Integrated land use and transport, as a planning ideal, was described as *"the holy grail of regional planning ... if you get that right, you get a good outcome. If you don't get it right, you get a bad outcome."* This encapsulates a problem of historical legacy and future pathways for planning: in a social-technical systems perspective, addressing this problem entails a spatial perspective on infrastructure systems beyond normative approaches that shape land use and transport

planning predicated on spatial hierarchies and land use patterns. The regional plan addresses this through efficiency and agglomeration achieved through incremental consolidation and clustering. Ideas of *'good'* and *'getting it right'* are encapsulated by specific built and spatial forms rather than the relational pathways in which these forms are ensconced. Development, particularly low-density development, continues to occur in the region at a greater rate than higher density development. Based on planning logics and given the prevalence of low-density development, planning systems seem adept at 'getting it wrong' and insufficiently resourcing the likelihood of *'getting it right'*.

The policy and planning since 2005 conferred stability during a period of change in SEQ and has supported spatial restructuring and consolidation. The findings from the interpretive policy analysis indicate that the planning reform that resulted in introduction of regional planning, smart growth, and growth management together with new planning and policy instruments were innovations in the SEQ context that responded to population growth and applied ESD approaches to alter the development trajectory of the region. Such a focus is consistent with Steele and Gleeson's (2009) observation that planning maintains a self-referential interest in its own professional concerns as aligned to neoliberal reform agendas. In this sense, the profession plays a significant role in asserting and reproducing the socio-technical regimes in which planning is embedded and what constitutes 'good' planning. The elaboration of a *'good planning'* trope emerges from the ways cognitive rules are used and shared by actors for interpreting, sensemaking, and decision-making: "Formal rules, role relationships and normative ties also enter in decisions and actions, because actors are embedded in regulatory structures and social networks" (Geels and Schot, 2007b, p. 403). Without linkages to monitoring and implementation, good planning can seem decoupled from socio-ecological outcomes such as reduced carbon emissions, reduced inequality, and sustained biodiversity.

Regime flux in relation to transport and infrastructure is evident but also slow as the current regime of automobile dominance continues as multimodality grows. Regional planning has been reforming since 1990 in SEQ; state and national policy shifts are inflected at the regional and local scale. The transitions processes that Hodson et al (2016) characterise as 'transitions on' (top down, outside-in) and 'transition in' (bottom up, inside-out) are reflected across the interplay of spatial reconfiguration and system configuration. In terms of *"getting it right"*, spatial configuration and system configuration can assert competing or complementary visions or priorities depending on the context. Car dependence prevails in suburban areas and growth areas, while compact urban centres benefit from the multimodal and other transit services.

Planning alone does not achieve 'outcomes' and this is understood as a limitation of planning, especially where implementation of plans was subject to political and other delays. While limitations of planning are acknowledged, the policy narratives do not communicate a context that requires extensive systemic change, as warranted by transition and decarbonisation policy, research and theory. Transitions, as proposed in the policy narratives, seem to fit in or supplant existing dynamics. Despite their limitations, plans and policies *act* in socio-technical systems often reproducing prevailing conditions. The principles, models and strategies embedded in plans can be "empty signifiers" of intentionality (Gunder and Hillier, 2009) or "sustainability hypocrisy" (Vogel, 2015), rather than purposeful and intentional directions for sustainable pathways.

While the earlier regional, infrastructure, and transport plans state the need to change the development pathway, favour smart growth and opt for more sustainable and integrated urban forms and transport, the SEQRP 2005-2026 proposed that "private cars will continue to be used into the future for the majority of trips in SEQ". That is, the region remains highly path dependent; automobility was and continues to underpin transport and mobility in a primarily low-density region with limited sub-regional public transport links. The land use and settlement pattern is a constraint that inhibits significant change within the planning horizon and beyond specific projects. The regional plan seeks to steer spatial interventions that are more conducive for effective transport provision rather than perpetually servicing expanding low-density development. In this sense the planning has required infrastructure interventions to shift spatial relations and dynamics (Dodson, 2009). *ShapingSEQ* claims that business as usual in transport will not suffice. It explicitly states that "a multimodal and integrated regional transport system" that prioritises public and active transport underpins the region's complete and interconnected communities (Department of Infrastructure Local Government and Planning, 2017, p. 3). Of 17 Priority Region Shaping Infrastructure projects, which are also acting as spatial interventions, 14 are public transport projects and connect growth areas and this represents a changing balance in infrastructure compared to earlier infrastructure plans. At the policy level, this signifies a policy commitment to enhance density and economic activity on those corridors or at transit nodes, affirm a hierarchy of centres, and reconfiguring the transport system in favour of public transit. As significant projects, they are not presented as the locus for niche activity but rather for existing sub-altern modes and enhancement of multimodality. The challenge in many of these major projects is ensuring local accessibility to transit, particularly in low-density or outlying areas which can continue to be reliant on automobiles.

The growth boundary confers considerable stability in the region, particularly in terms of how and where development can and should occur. As a spatial framework, the urban footprint has also become instrumental in property and investment regimes. It plays a role in preserving and limiting the impact of development on agricultural land and regional landscapes. Despite the obvious benefits and move towards sustainable development, the established planning and policy framework may not be sufficient for addressing the demands of sustainable transition, even with a goal of zero net emissions envisaged as a techno-economic transition. While planning has changed over time, limitations have become more evident or entrenched, in part attributable to built and infrastructural forms, and demonstrate the regime role planning plays in relation to spatial and system change where transitions objectives are not envisioned or articulated.

A policy narrative of limitation reveals tensions that have occurred in the planning since its introduction, including the tension in asserting the purpose of the plan as a strategic or land use plan tied to land supply over the medium term. This tension interacts with other plans and policies as well as exerts demands on institutional arrangements. Consequently, the vision is affirmed across the regional plans as an expression of settlement pattern or spatial configuration that is anticipated to reproduce other social, economic and ecological objectives, while neglecting others, such as changing socio-technological dynamics. By 2009, following from the GFC, the region was experiencing significant financial pressures and this impacted the SEQRP 2009-2031 priorities. This indicates that the capacity of the regional plan to maintain sustainable change was overwhelmed by the economic shock. Property and infrastructure development were key sectors in which to realise growth and job creation in response to financial shock, a slowing economy and employment decline. A softer approach to the urban growth boundary facilitated greenfield developments of new townships, partly in response to the GFC and the need for economic growth.

Low-density development in SEQ, that can preclude access to public transit, includes greater emphasis on Priority Development Areas outside the urban footprint. While these developments fit the pattern of contained settlements connected by transport corridors and surrounded by inter-urban breaks, they tend to reinforce unsustainable pathways due to other spatial and system dynamics. The creation of Priority Development Areas is a specific point of contention who assert that this compromises the planning intent and capacity to provide public transport. While such areas were intended to address more orderly development, housing supply, and affordability, they can be construed as a type of regime resistance or limitation of planning where, as one interviewee reported, *"the developers are just finding ways of getting what they want"* in the form of greenfield development on large outlying

land holdings. Large populations are anticipated to grow in these new townships with future investment in public transport are indicated in infrastructure planning.

In *ShapingSEQ*, the legacy of regional growth management is acknowledged and the plan claims to "continue the regional planning approach for better management of our region as it grows" (Department of Infrastructure Local Government and Planning, 2017, p. 20). The settlement pattern, defined by centres and corridors, defines loci for property and infrastructure investment. It creates certainty for investment and development (Steele and Ruming, 2012). This confers a path dependent regime dynamic in planning, where changes in planning are bound by market and regime logics (Morrissey et al., 2018). Market led responses are also a planning principle of the State Infrastructure Plan. Market led responses are described by one interviewee as *"what you do when you're out of ideas"*, but also enables property and infrastructure developers to manipulate markets (O'Neill, 2010). With a resulting emphasis on marketisation and financial dimensions of policy and planning, the plans and policies affirm that considerations such as efficiency and cost effectiveness are emphasised in decision-making and priority-setting. A regime dynamic is established that conforms to some aspects of sustainable development but is not constitutive of transition without more radical changes to the regime and without the emergence of co-evolutionary pathways. The planning framework has been pivotal in shaping other regimes, including transport and infrastructure.

7.2.2 Social Networks

The SEQRP 2005-2026 was a new planning instrument in a reformed planning system that resulted in greater interaction and collaboration between state and Local Government planning. As such, the regional plan is a political instrument that affirms multi-level planning responsibilities and powers in a post-political epoch (Legacy, 2016). Planning processes and decisions are politically contested and sensitive, with a perception of private sector influence and capture of the planning process. Influence is multiplied in the planning system through the perceived relationship between politicians and the private sector. The uneven distribution of power in planning and policy processes undermine environmental and social objectives, subjugating them to economic agendas unless those agendas can leverage social outcomes such as liveability and wellbeing as dimensions of competitive or global cities ideals to attract and retain labour. In SEQ, this politicisation intersects with the political and vested interests of elected representatives as well as a specific history of political corruption at both state and local levels; although several elected representatives in the state's planning history are noted for their leadership in establishing planning reform and systems.

The planning agenda is experienced as being politically manipulated and controlled by elected representatives with politicians exerting power over the process, seemingly to favour developer interests or for political interest. Concessions to developers and deregulation can be levers used to stimulate job growth. Despite the policy, rules, and regulations, planning is seen as favouring developers and lacking accountability particularly in relation to social and environmental impacts. Examples of developments that are significantly developer driven were cited in interviews, such as PDAs and urban expansion areas, which, despite initial promises and planning, lack infrastructure and services including appropriate transport connectivity. Sustainable development, while adopted by government and stakeholders, is not regarded as a constraint to continuing economic growth and development, in part because ecological and social considerations can be traded off for economic growth. Policy narratives coalesce around these issues in which regime level economic and political networks are represented as commensurate and impact the prospects for sustainable infrastructure transitions.

While local authorities and State Government support the current governance arrangements, other stakeholders find them inadequate with insufficient opportunities to progress innovation and problem solving, particularly in relation to social justice, technological change, and environmental management. Consequently, the regional planning process is not seen as addressing pressing problems for the long-term, but rather responding to an intractable legacy of poor planning through piecemeal measures in the short to medium term within an array of constraints and limitations. Planners and planning officers are also regarded as a constraint where they promote a *"development imperative"* aligned to *"analogue"* planning approaches which reiterate existing systems and dynamics. Organisational arrangements emerged as a limitation in planning and realising significant change in transport systems. Policy narratives acknowledged historic tensions between departments responsible for transport planning and spatial planning, noting that the relationship has improved with more collaborative arrangements in place. However, this spirit of cooperation is not endemic across the transport authority where professional cultures, such as a preference for road building, prevail. This not only impacts the dynamics between agencies and organisations, but also within them.

Mixed perceptions and experiences of agency are indicated and align to the limitations of planning narrative. Those directly involved in planning accept significant constraints including the lack of implementation of plans. The most recent iteration of the regional plan seeks to remedy this by stressing delivery and monitoring. Rip (2006, p. 94) proposes that

the “illusion of agency” is “productive because [it] motivate[s] action and repair work, and thus something (whatever) is achieved”. As planners and policy makers are internal to systems, they are necessary to processes of change. The ‘illusion of agency’ seems to have diminished due to the acceptance of political and institutional limitations but also accepting incrementalism stretched over a longer period of time as a response to accelerating socio-ecological problems.

Perceptions of planning professionals in formal planning processes are conflicted, with some perceiving them as *“representatives of the development industry”*, while others perceive them as *“doing what they can”* even when planning work is undermined or subject to political interference. Such observations have implications for agency, power, responsibility, and trust in societal and professional contexts. While planners may appear to be responsive to sustainable development and exert agency to achieve sustainability goals, they remain bound by and aligned to regime rules (Geels and Schot, 2007b). Planners are not positioned to achieve breakthroughs in power imbalances and alignment between change-oriented actors with the planning process resulting in a lack of agency among stakeholders; in this sense planning and planner reproduce powerlessness and marginalise innovation. This is important because, as some urban transition case studies have indicated, individuals and groups, acting as policy entrepreneurs and intermediaries, within planning departments have been instrumental in creating niche planning and policy and building transformative capacity (Quitzau et al., 2012; Quitzau et al., 2013).

7.2.3 Socio-Technical Dynamics

In making the distinction between spatial and system configuration, Hodson et al (2016) present a challenge in and for planning where the spatial and system dimensions of cities and regions intersect and are mutually reinforcing. As can be seen in the regional plans and related transport and infrastructure plans, the spatial configuration includes responses to climate change and approaches to carbon emissions mitigation, but the plans are not exclusively attendant to those issues. The plans remain embedded in growth ideology and cultural preferences. Regional planning is a locus for intergovernmental coordination that articulates priorities for change which reflect national and state policy directions including transition vision. Regional planning emphasises infrastructure as integral for neoliberalised regional growth.

Infrastructure initiatives are planned as spatial interventions, knowingly imposing spatial relations, without addressing the “new spatial imaginaries and political subjectivities that

infrastructure can conjure" (Glass et al., 2019, p. 1655). The region is envisioned as a complex of major infrastructure interventions and, in its support of growth, is also regarded as a normative good (Dodson, 2009). Infrastructure is a normative good which is essential for economic growth and competitiveness. While the plans also propose major public and rapid transit infrastructures, they continue to emphasise major investments in automobility infrastructures such as tunnels, bypasses and motorways. This raises the question of how deeply sustainability principles inform planning and what they mean for transition, especially where planning continues to scaffold and propagate unsustainable development over a 25 to 50 year horizon. For *ShapingSEQ* to aspire to a carbon neutral region and for the *Queensland Climate Transition Strategy* to aim for a zero net emissions transport system suggests a more radical shift than multimodality, techno-economic approaches, and eco-modernisation can deliver. The *Queensland Climate Transition Strategy* stresses several strategies adopted in the current and previous regional plans and policies for spatial and technological approaches that focus on efficiency such as "to reduce travel demand and optimise public and active transport infrastructure and services" (Department of Environment and Heritage Protection, 2017, p. 21). The *Strategy* proposes emissions reduction and efficiency, as also included in previous regional plans and transport plans, "through improved vehicle and fuel efficiency, technology and innovation, and fuel shift" (Department of Environment and Heritage Protection, 2017, p. 21).

Both the regional plan and *Queensland Climate Transition Strategy* iterate a path that was set in motion by the SEQRP 2005-2026 that emphasises multimodality, connectivity, and flexibility, predicated on efficiency, in the transport system. In terms of Geels and Schot's typologies of transition (2007b), there is a reliance on managed technological substitution, such as replacement of internal combustion engine powered vehicles with electric vehicles or enabling active and public transit. The reliance on planning frames and models as indicated in the policy narrative findings also results in the lack of engagement with technology in the planning process.

New types of vehicles present challenges for planning and planners in that they may result in reduced carbon emissions but are unlikely to mitigate congestion and other socio-ecological impacts of automobility including willingness to commute long distances to economic centres and demands for low-density housing. These perverse impacts can be understood as maladaptation and inconsistent with sustainable transition when transitional measures that are inherently unsustainable come to dominate the socio-technical system. This is evident in the energy regime where natural gas, as a transitional energy source, became embedded in the energy and policy systems and is difficult to shift having developed as a significant

industry in the state (Foster et al., 2013). The current priorities for automobility, such as electric vehicles and autonomous vehicles, affirm path dependent spatial risks of transport. Technological innovations that reduce carbon emissions are not singularly sustainable innovations. The sub-narratives of planning ideas and aspirational vision hold to an integrated planning and built form response to these issues which is tied to an urbanist imaginary.

Socio-technical systems are enmeshed with market and consumer preferences, pointing to the risks of greater congestion, and the need for shared use models or Mobility-as-a-Service. It affirms that the system dynamics of new transport technologies or technological interventions may yield unanticipated consequences in a transport network that is already under stress. While the plans and policies have stressed the need for change and consolidation, none of them propose to eliminate or disincentivise automobility or mitigate its ecological footprint. They do not envisage a 25 to 50 year future where the majority of trips are, for example, taken using shared, public and/or active transport despite the anticipation of socio-technical system shifts. Even as plans express support for greater sustainability and socio-technical system change, maladaptation is a risk, and inertia and resistance are inhibitive. The scales and regime dynamics of these spatial flows remain unexamined in the regional planning in its pursuit of an urbanist imaginary in which the competitive and the sustainable are uncritically hinged.

This call for new kinds of imaginaries does not fit with SEQ policy making and planning in which existing structures and infrastructures are affirmed, although *ShapingSEQ* proposes innovative planning. The *Queensland Climate Transition Strategy* advances techno-economic approaches of leveraging spatial/land use, infrastructure and transport planning and policy to reach greenhouse gas emissions reduction targets by 2050. To achieve this task, the type of imagining that Wachsmuth (2019) proposes and the type of visioning that Nevens et al (2013) propose are a trigger or discursive niche for other institutional changes (Hölscher et al., 2019; John, Keeler, Wiek, and Lang, 2015; Späth and Rohracher, 2010). As carbon emissions rise nationally and internationally, current planning in these sectors does not present a committed or cohesive approach to reaching these targets through pathways that necessitate regime shift and innovation (Rosenbloom, 2017). The *Queensland Climate Transition Strategy*, arising from a policy window, also presents a window of opportunity or leverage point to critically evaluate regional, infrastructure, and transport planning in relation to sustainability and transition. The introduction of this strategy proposes that the current planning provisions are not adequate for transition and that further regime shift or reconfiguration is required to realise targets. Geels (2012) suggests that despite its stability,

cracks are appearing in the automobility regime; while still strong, it is not as dominant as it once was.

Consistent with a creative/destruction approach in transitions perspectives, Geels proposes a role for physical forms and regulation in weakening this regime, particularly reducing automobile access to urban places and spaces while also prioritising alternative transport modes and car-free areas. Other global dynamics are noted including abatement of passenger kilometres, and shifts in planning practice from demand driven to improved management and land use, including minimising new road building. While governments and citizens are aware of issues such as climate change and the environmental impacts of cars, including the significant land use, this is not sufficient to trigger comprehensive change. Such a comprehensive change would be inherently integrative of spatial and socio-technical networks (Filion et al., 2019). Extensive system change is not encompassed by the policy narrative of better planning; rather 'better' is understood in terms of incremental improvements and efficiencies rather than stepwise change. One of the issues not addressed is that of space and how infrastructural or public space is apportioned and shared in multimodal mobilities as modes such as inner urban active and micromobility grow. Like the bus rapid transit as a niche, public and infrastructural spaces present niche or regime-niche opportunities (Sengers and Raven, 2015).

Socio-technical transitions are already underway and these are now enmeshed in contextual complexity: the promotion of sustainable transport is both integral and different to transport transition pathways (Geels, 2012). Major planning initiatives sought to improve sustainable transport and access to transport through material and service improvements. The planning resulted in the implementation of public transport infrastructure, strengthening public transport networks, and identifying opportunities for enhanced public transport, infrastructure and land use integration through transit-oriented development and sub-regional self-containment. However, *ConnectingSEQ* and SEQRP 2009-2031 also proposed ambitious public transport patronage and active transport increases from 2006 to 2031 (from 7 percent to 14 percent and from 10 percent to 20 percent respectively; resulting in a commensurate drop in car use from 83 percent to 66 percent) as well as greenhouse gas emissions reductions by one-third by 2020 (Department of Transport and Main Roads, 2011).

In relation to greenhouse gas emissions, Queensland continues to be a high emitter and according to the *State and Territory Greenhouse Gas Inventories* (Department of the Environment and Energy, 2019), which does not include regional or sectoral estimates or

inventories, Queensland's emissions decreased from 186.9 million tonnes in 2005 to 161.5 million tonnes in 2017; although it rose from 158.1 million tonnes in 2015. In relation to travel to work, public transport use has increased to 20% but active transport has declined to 4 percent with car travel comprising 76 percent of trips to work (Department of Transport and Main Roads, 2016). This suggests reconfiguration of the regime where subaltern regimes (Geels and Kemp, 2012) diversify the regime and provide a greater share of transport with a view to reducing automobility and raising public and active transport priority in the planning and funding commitments. These shifts are the result of the changing planning narrative which proposed changing configurations of spatial and socio-technical systems. A need for greater transport mix is recognised in policy narratives but this is constrained in a polity which has limited revenues and a citizenry that has limited appetite for privatisation and cultural change in relation to housing, work and automobility. In seeking to prioritise public transport, the regional plan plays an agenda setting role and sets a framework for land use, infrastructure, and transport based on over a decade of consultation and collaboration between State and Local Governments.

Socio-technical regimes in the region are under pressure from within the regime and from exogenous or landscape conditions. In responding to this pressure, the regional planning supports consolidated and renewed areas together with expansion of low-density or mixed density development. Concurrently, these settlement patterns also trigger and entrench transport configurations and levels of service. Diversifying transport options in suburban and non-metropolitan areas that are responsive to decarbonisation and resource scarcity considerations is constrained by current regime decision-making paradigms which demand density and population as the basis for public transit provision while suburban and regional locales remain exposed to oil vulnerability unless oil dependency can be reduced (Dodson et al., 2018). While specific forms of sustainable transport were available and in development, regional transport was not necessarily transitioning in the sense of a radical shift. The sustainable transport focus in the planning provided the basis for a diversified, efficient, and optimised public transport system that networked regional communities, centres, and destinations. Sustainable transport options continue to function as subaltern regimes, which, together with automobility, offer an 'agreed mix' for multi-segmented markets (Næss and Vogel, 2012) in a primarily demand-based transport system. *ShapingSEQ*, as the first plan where disruptive technologies are thresholding, reflects on the legacy of past planning as ineffective acknowledging the misfit between infrastructure investment and planning objectives:

> Previous regional plans have sought to reduce car dependency in SEQ to achieve more sustainable and fairer communities, offering a genuine choice of travel. However, the 'business as usual' (demand-based) approach to infrastructure investment has not moved us significantly in that direction (Department of Infrastructure Local Government and Planning, 2017, p. 66).

The argument posited by such statements in *ShapingSEQ* is that while planning has changed, it has not changed sufficiently to address many of the landscape challenges experienced in the region. Terminology like *"carmageddon"* reflects the frustration planners and policy makers experience in planning for and allocating urban space for cars and the ways in which congestion-busting is a politically more palatable way of addressing automobility. Marx et al (2014) observe that automobility in cities is reaching a point of exhaustion given the amount of resources it consumes. They propose that more ecologically efficient cars will not address this problem and policy narratives reflect concerns about electric vehicles as a replacement technology and the State Government's focus on them in policy. Marx et al (2014, p. 1094) that "more appropriate policies to guide and to encourage other collective means of locomotion, as an alternative or complement to the use of individual modes" is required. In its Connect theme, which addresses transport, *ShapingSEQ* aims for efficient movement. It promises new solutions and innovation that minimise environmental impact and maximise community amenity while offering limited guidance on what that entails. While the plans also note the importance of health, fairness, and sustainability, efficiency is elevated as a planning value or aspiration but does not sufficiently direct planning towards achieving more radical shifts beyond optimisation at a time when mobility technologies are changing.

Electric vehicles and autonomous vehicles together with digitally enabled rideshare services are receiving attention as legitimate elements of the transport mix and these are included in the Draft Queensland Transport Strategy (Department of Transport and Main Roads, 2019). Consideration of these technologies and their implications for spatial forms was deferred in the regional plan despite policy development and demonstration projects in Australia. Planning remained focused on multimodal integration as an essential dimension of sustainable urban mobility. The infrastructure innovations required to support this and to particularly integrate active and public transport, automobility, and other transport solutions remain grounded in historic approaches, such as parking at transport hubs or potentially MaaS (Banister, 2008). Modal and network integration remains an ongoing challenge in SEQ across the region's suburban, peri-urban, and urban areas. Given that intermodal and multimodal connectivity remains a centrepiece of regional vision, there is a need to further examine this and for planning to respond to the spatial and socio-technical implications of

this where infrastructures are structuring urban space. In the preparation of *ShapingSEQ*, the anticipation of technological change and the role of planning in selection was prescient, for example:

> *We asked, 'are we doing anything here that would undermine the potential benefits of autonomous vehicles?' We convinced ourselves, either rightly or wrongly, that we weren't. But equally too we didn't want to grab hold of it as a particular policy outcome that we wanted to take forward.*

There is a high degree of uncertainty about how transport technology and systems will develop. From its regime position, planning has withdrawn from its exploratory and future making role.

7.3 Niche

Niches are a response to landscape pressure and regime destabilisation. Policy and planning play multifaceted roles in relation to niches. Kivmaa and Kern (2016) examine several approaches to niches in transitions research including protective niche spaces as deployed in strategic niche management, and the emergence of technological innovation systems by which regimes are destabilised and delegitimised through the diffusion of new technologies. Both ideas of niches facilitate disruptive technological innovation. However, they also propose that "transitions may not only require the development of disruptive innovations but also of disruptive policy mixes aiming for systemic change" (Kivimaa and Kern, 2016, p. 206). Given the tension between policy narratives of limitations of planning and more reflexive and flexible planning, political challenges can inhibit the policy change for more coherent policy mixes.

The SEQ regional planning context identified landscape pressure and uncertainty which is met with relative stability in the planning and policy system as well as the built and socio-technical environment. In part, this is attributable to the inertia of mobility, land use and housing patterns. Landscape dynamics confer this stability through highly inert or obdurate spatial relations and infrastructures, while regime processes such as markets and regulatory reform affirm stability that perpetuates incumbent systems and pathways. The situation in SEQ, and indeed globally, requires that sustainability be regularly negotiated, but regime stability resists change. While change and reconfiguration is advocated in the planning system, this is projected to occur through established regime dynamics and managerial process. Innovation within the regime or regime-led innovation is generally geared towards

improvements that reproduce the regime. Improvements are incremental and rarely gain sufficient momentum to change regimes. The result is a constrained response to mounting pressures as well as a system that lacks reflexivity and flexibility.

Niche activity is underway in urban system and socio-technical arenas including sustainable building, water, mobility, and energy (Farrelly and Brown, 2011; Malekpour et al., 2016; Marx et al., 2014; Nielsen and Farrelly, 2019). The findings from examination of the policy artefacts indicate that the narratives that relate to niche development are expressed in deficit terms, and as qualities lacking in the current planning system in relation to socio-technical transition. Where innovation was identified, caveats recognised the political, organisational, and agentic constraints of the policy environment. The findings further indicate that signs of transition are evident or pressures for transition are mounting with tensions between path dependence and claims for transition pathways. Missed opportunities are the result of regime constraints and conditions which obstruct transition pathways. Some of these pressures are understood as internal regime pressures. They have the potential to create windows of opportunity for planning and policy innovation but require support. Niche activity in planning is not extrapolated or understood in the SEQ context. The most significant policy innovation in planning was the introduction of regional planning and the multi-level governance and consultative process it instituted that lays the groundwork for ongoing development of the policy and planning process.

7.3.1 Policy niche

In 2004, the establishment of the OUM by the State Government can be seen as the formation of a protected or niche space to develop new policy and planning that had not previously existed. Before its establishment, non-statutory planning and the creation of Growth Management Frameworks and earlier iterations of regional plans were developed through collaboration and consensus building among levels of government and community stakeholders. The OUM was responsible for the development of the initial regional plan and established as a well-resourced entity that enabled innovation and new models of planning. In some respects, it established a transition arena with a remit to significantly enhance regional and urban planning based on ESD.

Considering the OUM as a policy niche provides an avenue for developing the role of such special purpose entities for policy formulation and institutional change, as commensurate with transition management. Policy shapes the selection environment in relation to socio-technical systems and change, with significant political power enforced to protect the status

quo. In SEQ, senior political leadership and a clearly defined remit were integral for shielding and empowering the OUM.

Insights about the OUM suggest planning reform would not have been possible without this supported structure that could act with authority across diverse departmental portfolios and legitimise planning shift. Smith and Raven (2012) propose that the properties of protected innovation spaces are shielding, nurturing, and empowerment. While OUM can be examined as a protected space charged with formulation of new policies and directions, it facilitated a high level of institutionalisation. This strategic work differs to that in strategic niche management. Niches for socio-technological innovation are not evident in the planning process, except in regime niches, such as the introduction of transport nodes and transit-oriented development to facilitate public and active transit. Policy narratives proposed that senior political and Ministerial protection was also integral to the success and achievements of the OUM. The OUM and any subsequent regional, transport or infrastructure planning process has not performed such a role, but the OUM suggests it is possible.

The planning reforms of the early to mid-2000s in Queensland catalysed a more cohesive approach to spatial, infrastructure and transport planning which has been retained, contested and developed under the leadership of Ministerial portfolios and government departments. Each review of the plan, which is undertaken by a planning team in conjunction with governance committees, provides space for refining priorities and approaches, negotiating desired outcomes, and drawing in new knowledge. This approach is consistent with policy learning, indicating a strong relationship between a protected policy space and learning in the Queensland context (Dunlop and Radaelli, 2018). The OUM reflects Quitzau et al's (2012, p. 1050) formulation of 'niche planning' to the extent that it introduced "new forms of strategic work ... in order for spatial planning to become a vehicle for change". That type of strategic work is evident in relation to transport where, for example, transport nodes and transit-oriented development are introduced to facilitate public and active transit. However, there is a point where such built forms and configurations cease to be innovative given their proliferation in planning practice, policy, and discourse.

Niche planning occurs within a transition trajectory and in the case of regional planning this requires institutional change: the agency and work of planning. Since those earliest regional plans, sustainable development, including reducing greenhouse gas emissions, was embedded although inconsistently addressed. In the early to mid-2000s, that strategic work responded to specific regional challenges and reconfiguring spatial relations. It filtered through transport and infrastructure planning and policy which was aligned to new

settlement and spatial principles producing coherence in the policy mix. Policy narratives indicate that sustainability was a secondary consideration, in that the solutions and outcomes explored and modelled, aligned to sustainable development. While it appears to be creating a sustainable transition pathway, it was more attentive to constraining and abating unsustainable development rather than building transformative capacity (Wolfram, 2016b).

Policy narratives also indicate that organisational and interdepartmental dynamics resulted in the 2009 regional plan and planning process losing traction. Despite this, other possible niche planning spaces opened as a result of this shift seeking innovative localised responses to regional planning priorities, including private sector and government partnerships, major infrastructure and urban development projects and Local Government initiatives. The extent to which these were grounded in a transformative perspective and vision that "seeks to change existing urban paradigms" and counter the institutionalisation of urbanism requires further investigation (Macarthur, 1996; Quitzau et al., 2012). In 2009, the *ConnectingSEQ* transport plan proposed a 'rail revolution' that would restructure transit and land use in the region. That revolution has not manifest beyond additional heavy and light rail lines, although rail projects, like Cross River Rail, are significant network altering initiatives. Planning remains locked into a set of conditions and conflicts, including a tension between strategic and land use planning and propositions of 'getting it right', that preclude more extensive examination of socio-technical systems and innovations.

Introspective conflicts arising from the different specialisations of planning emerged as regime tensions, including whether land use should lead transport or transport should lead land use. An engineering or architecture perspective would most likely yield a different claim and highlights the need for intentional disciplinary collaboration to support innovation (Fazey et al., 2018; Steele and Gleeson, 2009). Criticisms of *ShapingSEQ* point to the loss of strategic momentum of regional planning and a *'return to land use'*, which is seen as a constraint and perceived as casting the regional plan as *'one big development application'* weighted by a development imperative. While this impacts its role in undertaking the strategic work to which Quitzau et al (2012) refer, it potentially does not eliminate the possibility of enabling planning niches at other levels of government or in other parts of the development regime including land use. In considering niche planning as developing technological niches as part of an integrated spatial framework, since 2005, those anticipated technological innovations, which remain limited in their application to date, refer to transition to a low carbon economy and carbon neutrality. This includes multimodal or shared transport and digital and real time data applications through which transport systems are significantly altered. This means understanding how new technology can be

accommodated in particular contexts and refining technology for the context, which is already shaped by existing infrastructure and other material and practical conditions distributed across scales and spaces.

In *ShapingSEQ*, the SEQ City Deal was included as a delivery mechanism (Department of Infrastructure Local Government and Planning, 2017, p. 154). While this did not attract significant comment as a system or policy innovation, it was proposed that *"We don't know what a City Deal is in Australia yet and don't know if they work … It should never have been written into the plan",* indicating a view that the City Deal was extraneous to regional planning despite its alignment to regional outcomes such as liveability, economic growth, and connectivity. City Deals, as tripartite agreements between Federal, State and Local governments, provide the basis for intergovernmental funding and investment based on outcomes. As such they are understood as a policy innovation through which new partnership and delivery mechanisms are negotiated. The SEQ City Deal is still in development with governance arrangements now resolved. It is expected to be completed in 2020 and is informed by the regional plan.

The SEQ City Deal will enable the delivery of transport infrastructure – the Cross River Rail and Brisbane Metro (Council of Mayors SEQ and Queensland Government, 2019). It also proposes to "develop an SEQ Transport Infrastructure Partnership to achieve more strategic coordination of transport infrastructure planning and prioritisation between the three levels of government" (Council of Mayors SEQ and Queensland Government, 2019, p. 23). The SEQ City Deal is intended to steer a shift to "a shared and agreed regional narrative and vision" and "provides a foundation for private sector confidence in partnership and investment" (2019, p. 16). It tangentially responds to the priorities of the *Queensland Climate Transition Strategy* through priorities in green infrastructure, zero waste and circular economy, and liveability, but does not specifically state a commitment to a carbon neutral or zero net emissions region or the development of policy niches and spaces through which these can develop. The SEQ City Deal may dominate the policy mix due to funding arrangements and its selective address of sustainability without fully cohering with the remit of the existing policy mix. The negotiation of transition pathways, despite a transformation agenda, is absent from the City Deal documentation (Queensland Government, 2019b).

7.3.2 Policy learning

As new policies, the initial statutory regional plan of 2005 and related plans and policies are understood as policy innovation (Walker, 1969). The inclusion of contemporary socio-spatial

planning tropes in policy making, such as smart growth and sustainable transport, reflects a niche and learning activity that is ongoing and global. The OUM was disbanded prior to the development of the SEQRP 2009-2031 with resources directed to other agencies managing growth and regional development across the state. This included Growth Management Queensland (2010 - 2011), Urban Land Development Authority (2007 – 2012) and Economic Development Queensland (2012 - present). By this time, those socio-spatial planning tropes were embedded in state planning policy and the regional plans. These spatial and socio-technical configurations act as niche-regimes (Zijlstra & Avelino, 2012). As such, they support socio-spatial innovation that creates conditions where car dependence and domination can change, not where it will necessarily change or prevent expansion of car-based mobility. While the second iteration of the plan is not a policy innovation in the same sense as the first – as a completely new policy – it did include new and strengthened policies in relation to climate change and peak oil in which socio-spatial niche-regimes were affirmed and through which policy learning developed. *ShapingSEQ* states that it builds on the legacy of previous regional plans indicating that some policy learning or iteration is intrinsic to the planning process.

With stakeholder engagement integral to the planning process, the SEQRP triggered diverse policy responses and learning in relation to spatial problem solving and longer term vision. Policy narratives were attentive to institutional arrangements and acknowledged that while interdepartmental collaboration and stakeholder engagements occurred, such processes could be improved. Changes in the planning system in response to landscape conditions are indicative of policy innovation or learning. The policy innovations (or new policies) in regional planning and policy noted include the first iterations of each of the policy documents, particularly the SEQRP, the SEQIPP and *ConnectingSEQ*. This cluster of policy documents were regarded as ushering in a new era of integrated planning and mechanism for implementation. In terms of reorienting to sustainable development and acknowledging transition, a policy mix was taking shape.

The regional plan played a central role in articulating the regional implications of diverse policies as well as setting direction. Transitions researchers are examining the role of policy mixes and policy process for sustainable transitions and for articulating transformations of entire socio-technical systems towards sustainability (Kern and Rogge, 2018; Kivimaa et al., 2017; Rosenow et al., 2017). This includes destabilisation of old conditions and creation of new conditions as constitutive of policy innovation. While the planning and policy supported the development of more diverse transport systems and introducing infrastructure for electric vehicles, this does not destabilise automobility and fossil fuels. The present selection

environment for ‘alt-fuel’ assumes the continuation of the automobility regime. The early policy emphasis on electric vehicles, for example, includes the provision of charging infrastructure, is already shaping the selection environment for a next stage of automobility (Queensland Government, 2017). This is despite ongoing competition between hydrogen and electric cell powered vehicles, and the broad impacts of energy transition. In terms of the latter, when price point is achieved, this potentially includes domestic packages of low carbon technologies such as photovoltaic collectors, batteries and electronic vehicles, which readily affirms automobility and detached or semi-detached housing. Where the regional plan has intentionally been *“stripped of policy weight”* in a seeming denuding of strategic intent, more attention to policy mixes can interrogate their coherence and consistency in relation to strategic goals and impacts.

The collaborative intergovernmental process that emerged through non-statutory planning was a significant planning governance process (Abbott, 2011). Over a decade of non-statutory planning, local authorities responded to the need for a consolidated and overarching vision and framework for development for the region. This relational approach extends into other government departments and agencies which directly contributed policy to the regional plan and have continued to contribute to the regional planning. These collaborative arrangements, once an experiment in consensus building, have become institutionalised and are embedded in regional planning. The relationship between state and Local Government is perceived as excluding other stakeholders, particularly those from environmental and community sectors. Consultative and governance processes can be opportunities for social and policy learning. However, such processes did not yield learning as much as they played a role in formalising, politicising, and disciplining the planning process.

While process innovations in stakeholder engagement and participation included the use of digital media and inclusionary forums, a need to strengthen consultative and deliberative processes in planning and policy was expressed. This included a multi-stakeholder approach rather than segregating groups of stakeholders. Approaches to consultation were regarded as marginalising community and environmental interests in favour of industry and professional interests. They also specifically identified the consultative approaches of natural resource management which are acknowledged as imbuing multi-stakeholder and complexity-based governance.

Regional planning remains the decision-making preserve of state and local governments and state government departments. Perceptions and experiences of consultation are mixed, and some interviewees argue that the approach is not innovative and does not enable learning or

innovation in part because it lacks reflexivity and *"serves masters"*. This includes perceptions of developer or private sector influence in the planning process, including the secondment of consultants into planning teams and perception of a persistent and outdated approach to planning for the current digital and data era. In terms of transport planning, the policy transfer and learning were related to developing a multimodal transport system that was supported by specific infrastructure projects and spatial restructuring. Other dimensions of policy learning include *ShapingSEQ*'s acknowledgement of sustainable transport emphasising shared models of transport and propositions for innovative planning to mitigate the impacts of megatrends. The details of these innovations or the windows of opportunity for realising them are not specifically identified with an interviewee stating that the SEQ community was not 'ready' to discuss changing transport systems and technologies at the time the plan was prepared even though electric vehicles policy, rideshare, micromobility, and other components of transport innovation were part of the transport mix and ultimately reflected in the draft Queensland Transport Strategy released in 2019. The regional plan suggested ongoing policy process examining technological innovation in transport by proposing to "Investigate and plan to maximise shared use of vehicles, including through planning for the introduction of autonomous vehicles" (Department of Infrastructure Local Government and Planning, 2017, p. 68). Consequently, planning is attentive to and contributes to technological selection process by the terms and timing of such social and policy dialogues.

Innovations and learning in planning and policy could be overstated, noting that planning is a conservative profession and practice, often constrained by political, governmental and industry norms and expectations. Fundamental tenets of planning remain uncontested in the plans and policies on the assumption they are proven and well established with emphasis placed on ideas of professional hubris like 'good planning', engaging with other professionals and thought leadership, and 'relying on instinct'. Monitoring and impact measurement has historically been patchy. In developing plans, greater flexibility to support or enable innovation is warranted.

While the policy frameworks anticipate transition, the dynamics of this transition are yet to be envisioned in ways that are meaningful for spatial, infrastructure, and transport planning. These documents remain entrenched in their institutional and hierarchical frames, which is anomalous to a transitions perspective. A transitions perspective is responsive to socio-technical systems that attend to societal needs and are comprised of structure, culture, and practices (Rotmans and Loorbach, 2010). Some policy narratives expressed an appetite for a more reflexive and flexible approach to planning through which problem-solving and

interdisciplinary collaboration can develop, recognising that this approach can stimulate innovative approaches and policy. The policy mix formed by spatial, infrastructure, and transport policy encapsulate societal needs – shelter, food, movement, care, comfort, and so on – and ostensibly appears to provide a policy dynamic in which to achieve change or stability across those system elements. Regional planning has a role to play in relation to transitions, but the institutionalisation of sustainable development and the horizontal integration of policy can inhibit its ability to respond and transition.

7.3.3 Policy Direction

Because transition is a long-term process, vision is central to the formation of a policy direction and the development of transition pathways while communicating expectations within and for a socio-spatial-technological agglomeration such as a city or region. While the regional plan has articulated a regional vision for 25 years and 50 years, it does not impel towards deep transitional dynamics, relying instead on shifts and mixes of socio-spatial-technological arrangements, techno-economic counts, or technological change. The policy narrative of aspirational regional vision also casts doubt on the plausibility of the vision, given descriptions of *ShapingSEQ* is *"not very visionary"* or that *"planning cases ... feel more comfortable about saying aspirational things because you can't be tied down too much"*. In co-evolutionary terms, visioning both responds to selections pressures and shapes the selection environment (Smith et al., 2005). In transitions contexts, Nevens et al (2013, p. 114) proposes that

> transition visions will oppose expectations and visions of regime actors, and in this sense, transition visions are explicitly seeking conflict with vested interests and powers to establish a fundamental debate upon future development, the necessity of fundamental change, and the possibilities of an envisaged transition.

Policy process tends to neglect long-term perspectives, instead focusing on the short and medium term (Loorbach, 2010). Transitions thinking proposes that long-term thinking is fundamental for policy making progressing sustainable development. The regional vision may offer an alternative, even more sustainable or purposive, pathway through endogenous renewal (Smith et al., 2005), but is not transformative in the sense that Nevens et al (2013) describes. Both conflict and consensus building are at play, primarily at a governance level, with some consideration of stakeholder input. The role of vision in planning and transition differs in that planning tends to propose an end-state achieved through incremental actions where transitions proposes that "a change trajectory towards a more sustainable society ...

initiated by an appealing and inspiring vision. A vision entails images and a narrative of desirable systems based on shared principles of sustainable development" (Nevens et al., 2013, p. 114). Further, a transition path is characterised by the interaction of incremental or stepwise and radical change.

International case studies also document the role of vision and visioning in transitions, often with reference to transition management experiments and initiatives. Such visions are not commensurate with those in regional planning. In some cases, visioning acted as a discursive niche through which to intervene on policy pathways (Späth and Rohracher, 2010). In Rotmans and Loorbach's (2010) case study of Parkstad Limburg (Netherlands) the vision was distinct from the regional planning blueprint, and "was perceived to form an integrative frame for further development of the region and regional policies". Frantzeskaki and Tefrati (2016, p. 50) propose "a legitimised and socially embraced long-term sustainability vision" is needed for a city and to guide larger city scale action. In their case study of transition in Aberdeen (UK), they found that a vision that appeals to policy officers, may not be meaningful to citizens and other actors and that participatory visioning is necessary. In relation to Aberdeen's participatory envisioning, energy security was identified as a fringe issue for the local administration, whereas in the SEQ region it received significant attention, particularly in 2009, with planning directed towards peak oil and oil vulnerability.

More purposefully linking sustainability vision, such as a regional vision, to which other planning and policy align, with transition is a vital step in developing a discursive space for a policy mix supporting transition pathways that enables strategic, tactical, operational, and reflexive level activities (Frantzeskaki and Tefrati, 2016; Kivimaa and Kern, 2016; Wittmayer and Loorbach, 2016). This again affirms the need to reflexively develop policy mix and the interaction of instruments in establishing transition pathways. In transition management, these activities address "societal processes, persistent problems, fundamental change, and innovation as well as their normative direction" (Wittmayer and Loorbach, 2016, p. 19). Transitions approaches are not well integrated into regular policy processes and the transitions visions and agendas are developed in a 'shadow track' (Nevens et al., 2013) and this is evident in SEQ.

The regional vision did not reflect a strong a sense of place in SEQ except the references to sub-tropical living and overtures about environmental values. References are made to an "aspirational vision" in SEQRP, but whose vision is it? The perception was that regional planning can tend towards generalised ideas of livability and wellbeing institutionalised through urbanism and urbanist thinking. While the regional vision in SEQRP 2005-2026 was

the first regional vision enshrined in regulation, the vision for 2050 in *ShapingSEQ* presents an amorphous description of the type of region SEQ *'should already be'*. While the vision is berated for lack or failure of aspiration, this is coupled with a lack of imagination and failure to recognise the rapid changes already occurring and impacting cities and regions. In the dynamics of policy mix, the *Queensland Climate Transition Strategy* presents a statewide vision triggering a response at the regional level from *ShapingSEQ* and other plans and policies.

A sustainability vision is a necessary step towards a transition vision, which is also the result of imagination catalysing path creation and the vision was an important innovation in regional planning. For Hajer and Versteeg (2019), imaginaries of the post-fossil city, for example, are vitally important for marshalling capacity for change; they observe a paucity of imaginaries which rely on corporate and technological innovation. Imagination facilitates the experience of low carbon living because experience opens and changes minds where facts cannot and where history and the structure of reality has been obfuscated (Wachsmuth, 2019). In drawing on Lefebvre's notion of the "blind field", Wachsmuth suggests a need for "new eyes" (2019, p. 137). Planning for the future remains locked into perceptions of place and future forged through "the practices and theories of industrialisation, with a fragmentary analytical tool that was designed during the industrial period and therefore reductive of the emerging reality" (Lefebvre, 2003, p. 29 cited in Wachsmuth, 2019, p. 136). This emerges in SEQ regional planning, vision, and infrastructure with descriptions of *'analogue'* and *'last century'* approaches.

The sense of vision and sustainability is more conflicted: the innovation of an aspirational vision in SEQRP is constrained by the divide between the urban and non-urban, the limitations of land use planning, and reaching towards an urban future. There is more to imagine than a sustainable city - beyond institutionalised ideas or ideals of urbanism - and Wachsmuth (2019, p. 138) proposes resisting "the universalising imperialism of the 'urban age' idea while grappling with the realities of a global interconnected built environment to support human settlements across a whole range of scalar and territorial configurations". The *Queensland Climate Transition Strategy* vision suggests introducing a virtuous cycle (Birkeland, 2008; Foxon et al., 2004) or releasing capacity (Wolfram, 2016b) that recognises the multiple dimensions of sustainability. However, it does not reflect the type of vision or envisioning that Nevens et al (2013) propose that catalyses "insights, starting points and, therefore, a change of attractor", together with "reflexive moments" to develop a transition agenda and a transition culture (Krauz, 2016). The directions are articulated in policy and they do and have generally charted new trajectories for the region. However, the findings

indicate that the SEQ regional vision, which was regarded as aspirational, no longer plays the galvanising role it once did and does not reflect the interconnections of a transitioning region.

7.3.4 Social Innovation

Consideration of the relationship to regional planning and policy to social innovation is warranted as a growing area of research and practice in sustainable transitions that has bearing on socio-technical systems (Wittmayer et al., 2019). Social innovations, including socio-technical innovation, rely on more porous institutional arrangements in regional and other policy arenas for proliferation through reproduction, embedding, and scaling (ARTS Project, n.d.). Social innovations include market niches that are attentive to pricing and marketing dynamics. Those innovations emerging from grassroots and informal organisation and niches are acknowledged in urban transitions literature and research as playing a role in disseminating innovations across populations or in localities. For example, a transition town, community land trust, or ecotown initiative can exert pressures on Local Government planning and development as has been demonstrated in cases in Europe and the UK (Bayulken and Huisingh, 2015; Sauer, Elsen, and Garzillo, 2016; Wittmayer et al., 2019). *ShapingSEQ* (Department of Infrastructure Local Government and Planning, 2017, p. 83) aims to "[s]upport local strategies that contribute to the region's transition to a low carbon future and that implement effective climate change adaptation measures". As the only reference to low carbon transition in the regional plan, it highlights localised and community-led action and innovation that can inform regional planning. However, it does not specify how or with whom this reflexive or learning process occurs or whether such grassroots developments can be cultivated or protected like niches (Wolfram, 2016a).

The regional plans acknowledge the role of demand management, non-transport responses, new technologies, and community transport as part of the transport infrasystem, and these provide spaces for innovation and experiment in ways that major infrastructure do not. This can include user and social innovation utilising digital, mobile and mobility technologies. Community transport, for example, is a social innovation (bottom up) often initiated through civil society organisation and social enterprise experiments (Mulley and Nelson, 2012). It addresses needs such as localised transport for social and health purposes, that has attracted support of Local and State Governments and is acknowledged in the transport and regional plans. As such, community transport and demand responsive transport attends to sub-regional or local transport, spatial provision gaps, and inequality. The plan plays a role in disseminating these bounded socio-technical experiments (Brown, Vergragt, Green, &

Berchicci, 2004) and affirming programming that supports it. User and social innovations can have the capacity for scaling or replication at the regional scale or are acknowledged in the plan as a desirable outcome to be addressed in local planning.

Networks are also a recurring organising structure in the plan but are presented in a normative way as modal or multimodal structures rather than dynamic entities or assemblages, and the networks are not addressed as potentially intelligent and recombinant systems utilising information and communication or other technologies. This network and recombinant modality is necessary to develop MaaS initiatives. While various innovation propositions are acknowledged in the plan, it is unclear how such innovation develops and is nurtured or how their narratives of change develop. While acknowledged in the earlier regional plans and transport strategy, community transport is not acknowledged in *ShapingSEQ* in the same way within more collective and shared mobility. The social dimensions of socio-technical innovation are as important as technological dimensions in social innovations for addressing societal needs and equity and cultivating transformative social change. Avelino et al (2019, p. 198) define transformative social innovation as

> social innovation that challenges, alters or replaces dominant institutions in the social context ... [S]uch transformative change is an emergent outcome of co-evolutionary interactions between changing paradigms and mental models, political institutions, physical structures and innovative developments on the ground.

Community transport is transformative in that it specifically challenges the perpetuation of transport inequality through "co-producing new social relations, involving new ways of doing, organising, framing and knowing" (Avelino et al., 2019, p. 198). *ShapingSEQ* advocates for sustainable and fair transport through a focus on land use, infrastructure and transport mix, but neglects spatial gaps and inequality. It proposes to "prioritise planning, demand management, technological or other innovative solutions which do not require building of new or upgraded infrastructure to service needs, reducing costly infrastructure investments" (Department of Infrastructure, Local Government and Planning, 2017, p. 66). Where plans and strategies neglect to account for the legacy of spatial and transport disadvantage, civil society actors have explored or introduced alternatives. The omission of community transport from *ShapingSEQ* also plays a role in the selection process and technological mix in terms of legitimation, power relations and spatial typologies across the region.

7.4 Summary

The application of the MLP as an analytical framework to extend and discuss the findings of interpretive policy analysis reveals that regional planning narratives significantly reflect regime dynamics and socio-technical regimes. Transitions studies and methods present an alternative conception of sustainability than enacted in current national and state policies and plans. The discipline asserts approaches offering critical perspectives that aim to deeply embed sustainability in regional planning and development pathways. When analysed through this lens, the constraints of planning in achieving its strategic sustainability goals become evident and this has bearing on planning address of sustainable infrastructure and transport transition. The relationships between policy narratives and MLP levels are indicated in Figure 15. In summary, changing planning narrative expresses all levels but more strongly landscape and regime dynamics; limitations of planning mostly encapsulate regime dynamics; and anticipating transitions dynamics more strongly addresses regime dynamics, particularly niche-regime.

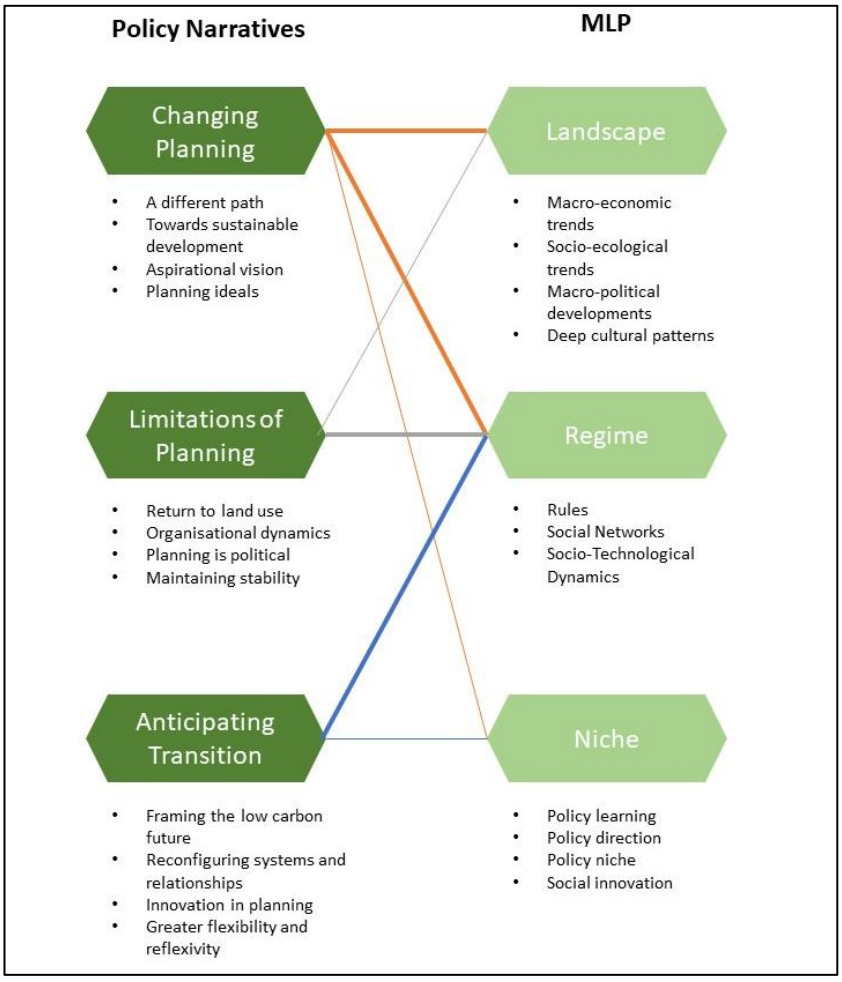


Figure 15. *Multi-level dynamics of policy narratives*

In the 12 years (from 2005 to 2017) since the first statutory regional planning, which is approximately the halfway point of the original planning horizon of 21 years, gains have been made towards objectives that relate to sustainable transition through spatial and socio-technical reconfiguration and intervention. Urban and regional systems are experiencing stress which results in reconfigurations of spatial and system relations including transport and infrastructure. The articulation of a transition to a low carbon economy in 2009 has not been met with sustained and concerted action to transform development and transitions pathways through niche or regime level innovation and despite the impacts of landscape conditions such as environmental shocks. The planning anticipates, and to a limited extent envisions, a transition to a low carbon economy and a carbon neutral region which has significant implications for transport and infrastructure. This transition narrative is not strongly articulated in regional vision. The *Queensland Climate Transition Strategy* vision is encumbered by the state's definition of transition focused on economic concerns which affirms the supplication of sustainable development to economic growth.

In sustainable transitions theory and literature, planning is found to privilege the incumbent regime and lack reflexivity. In practice, regional planning offers a medium-to-long-term and spatial policy frame for problem-solving, dissemination, scaling, governance, and innovation. The MLP analysis of policy narratives in the SEQ regional planning and policy indicates that some reconfiguration is occurring in infrastructure and transport, specifically a shift to a multimodal transport system that remains dominated by automobility, with some anticipation of technological innovation and innovative shared transport. The transition to low carbon transport is in its early stages and the commitment to low carbon transition of this regime is weak in part because incumbents and vested interests at the landscape (e.g. oil companies, engineering companies) and regime level (e.g. car manufacturers, property investors) are so powerful. Given the references in 2009 to climate change and oil vulnerability, the regional plans have played a role in developing a regional transitions response and this is aligned to the image and infrastructure of competitive regions and cities. Change is directed to enhancing lower carbon subaltern regimes such as active and public transport, necessitating significant infrastructure investments, rather than destabilising or decoupling the automobility regime. These subaltern regimes become more stable and viable with supporting programs and access, infrastructures, and urban forms which strengthen spatial and socio-technical system relations. Some innovations evident in the plan, such as changes in land use and urban form, have limited application and momentum and none appear to be positioned to overwhelm or disrupt the automobility regime (Geels 2012). Equally important is the failure to address the embedded cultural structures of the

automobility regime and its linkage to settlement pattern, behaviour and new technologies (Sheller, 2012) especially as new low-density and outlying development occurs in the region.

The policy artefacts examined in this research present arguments, narratives and framings of policy issues that evoke deliberate responses and actions, often referring to or refining pre-existing conditions or historic legacies in the regional context. Decarbonisation, for example, provides a limited, but necessary, frame for sustainable transitions. Decarbonisation is not the whole story of sustainable transitions and presents scope for maladaptation in transport and energy systems through alternative fuels and infrastructures which affirm automobility. Transition pathways that envision an inherently sustainable future are predicated on transformative momentum and capacity (Webb et al., 2018; Wolfram, 2016b). Transitions imply and necessitate unbinding traditional policy sectors in order to reconfigure and reshape societal systems and consequently consumption and production patterns which planning plays a part in producing and reproducing. That is, transitions thinking and practice "demands a systemic approach that goes far beyond the principle of horizontal policy integration advocated by the sustainable development paradigm" (Happaerts, 2016, p. 871). Transitions methods and concepts, such as MLP and Transition Management, can act as boundary objects through which to facilitate interdisciplinary and multi-scalar exchange (Loorbach et al., 2017). As transition studies is a distinct discipline, the development and application of boundary work and objects has been a key feature of transitions and sustainability research and practice.

The research findings and this discussion and analysis based on the MLP demonstrate that planning, as regime bound and institutionalised, maintains its own internal logics, frames, practices, and structures that adhere to a specific view of sustainability issues and how to address them. While there is interest in planning, including policy and practice, in addressing the challenges of GHG emissions reduction and transition, there are ongoing interrogations about the purpose and efficacy of planning in facilitating system change and to reconcile spatial and systems. Based on the interpretive analysis of policy objects, policy narratives highlight more introspective dynamics of reflecting the purpose and agency of planning in a constrained field of influence, not only in relation to politics but also in terms of an enhanced focus on land use and urban forms. With a strong relationship between regime and landscape, which is also inured in the planning process and plans, top-down tendencies prevail in planning. The ability of the regime to innovate and cultivate niches is constrained and obstructed and impacts transformative capacity in the urban and regional context. Those aspects of planning which are recounted as 'innovations' do not necessarily result in new regimes even when they result in changing spatial relationships. Many aspects of spatial

restructuring and urbanisation are no longer innovative. Spaces for policy innovation and learning tend to be situated in regime contexts with other policy innovation approaches neglected. This dynamic suggests that policy entrepreneurship and policy transfer are more strongly inflected in planning processes than policy innovation and policy learning. The next and final chapter concludes the research with response to the research questions, reflection on significance of the research and considerations of further research.

Chapter Eight

CONCLUSION

This research has examined the intersection of regional planning and sustainable socio-technical transitions in the case of SEQ through Interpretative Policy Analysis and the MLP to frame analysis and discussion of the research findings. It has examined how policy narratives that developed over time have conditioned the regional planning approach to sustainable socio-technical transitions in infrastructure systems, particularly transport. The research deployed a boundary work approach to navigate the intersection of the two disciplines and practices of sustainable transitions and planning in the case of SEQ regional infrastructure and transport planning. The research also recognises that transitions are both a context, in the sense that transitions are large-scale changes already underway, and policy, in that transition goals and objectives have been introduced into a policy mix. While regional planning addresses a broader range of societal, ecological, technological, and spatial considerations than exclusively sustainable transitions, it is not outside or beyond transition. Those broad policy priorities impact transitions and development pathways. Regional planning can support or inhibit transitions, it can be pressured by transitions, and it can learn from and in transitions.

Planning occurs in a transitioning environment – electric vehicles are produced, renewable energy is generated, social practices and preferences embracing sustainable products and services grow, sustainable or living buildings and precincts are constructed. Planning must also respond to and anticipate those socio-technical changes at different scales within a changing policy environment. Policy plays an important role in transitions, not only in terms of the organising power of narratives and visions but also in terms of actor relations, governance arrangements, system and learning dynamics, and support for innovation. The analysis in the previous chapter revealed that planning makes statements about and commitments to sustainability and transition but the integration of regional planning with the infrastructure and transport planning (socio-technical system) dimensions of regional planning experiences structural, cultural, and practice constraints that inhibit transition and sustainable development. Case studies in Europe and Asia presented in the literature review and discussion chapters also highlight the shifts that transitions approaches and analysis can catalyse in planning contexts at different scales as well as tensions between planning and transitions, particularly in relation to innovation, niche, and visioning (Corvellec et al., 2013;

Frantzeskaki & Tefrati, 2016; Næss & Vogel, 2012; Nevens et al., 2013; Valderrama Pineda & Jørgensen, 2016).

While decarbonisation, as a policy objective, is not commensurate with "purposive, systemic, long-term, and vision-led, societal shifts towards more sustainable modes of production and consumption" (Nielsen and Farrelly, 2019), it is integral to sustainable development and fulfilling international emissions reduction agreements to which Australia is a signatory. Decarbonisation, as a techno-economic process, is a focus of the current policy agenda for SEQ under the rubric of sustainable development commitments that prioritise new economic opportunities. Internationally, research has indicated that a gap exists between current policy and planning practice and transitions processes and policy, including urban and regional planning (Carroli, 2018; Happaerts, 2016). With significant capacity to develop vision and strategy for cities and regions, the role regional planning can play in sustainable transitions is negotiable and flexible. The historic and traditional role regional planning has fulfilled, and its regime-based innovations, may no longer meet the complex challenges facing regions like SEQ.

8.1 Response to Research Questions

The responses to the research questions are embedded in the identification and analysis of planning narratives through which socio-technical system and planning relations are constructed and bounded. The overall research question of *'How do policy narratives in regional planning inform the relationship between planning and socio-technical systems transitions?'* is supported by two sub-questions: *(SQ1) What narratives emerge from policy artefacts?* and *(SQ2) How are socio-technical systems and multi-level dynamics reflected in these narratives?*

8.1.1 SQ1: What narratives emerge from policy artefacts?

In response to the sub-question, "what narratives emerge from policy artefacts?", Chapter Six details three narratives distilled through interpretive policy analysis. These narratives reveal meanings and conflicts that arise in regional planning. In the first narrative, **changing planning**, a critical juncture occurred in planning with the introduction of statutory regional planning. This reform took more than a decade to evolve through non-statutory processes, multi-stakeholder collaboration and consensus building (Abbott, 2001, 2011). Planning, together with a lack of coordinated planning, shape the historical processes that resulted in

an assemblage of sustainable and unsustainable urban and regional system configurations. SEQ is not uniquely unsustainable: sprawling, car dependent, carbon intensive, environmental threats and/or socio-spatial inequality. These issues prevail globally and constitute landscape conditions that are intrinsically tied to capitalist production.

The introduction of regional planning was regarded as charting a new and better path aligned to an aspirational vision. Sustainable development was explicit in that pathway despite an awareness of trade-off which undermines it. This new pathway also sought to apply planning ideals and models to achieve specific results supporting sustainable development. Since 2005, regional, infrastructure, and transport plans and policy were predicated on altering development models and settlement pattern to counter the legacy of unsustainable development. Regional planning played a remedial role while also reorienting towards a more sustainable systems and modes. While the regional plan has articulated these changing dynamics, there is a sense that it remains a vehicle for development, that its principles are easily compromised, and that, despite the urban footprint, undesirable development is perpetuated due to weak regulation and economic priorities. The plans respond to priorities in other federal, state, and regional level policies, and are the outcome of collaborative governance and consultative planning processes. The subsequent changes in the planning system have yielded mixed results with deregulation or loosening of planning provisions including changes to the principal management mechanism, the urban footprint, which is considered a significant policy innovation. Only parts of the regional environment have changed for the better – or in ways that may be considered transitional - while other parts of the region are subject to the path dependence of unsustainable infrastructural and spatial dynamics. These are not just the result of existing and obdurate infrastructures and spatial systems, but conscious choices made by developers and planning authorities under the rubric of the planning system which the regional plan permits.

The second narrative, **planning limitations,** highlights the regime bound, rule-oriented, and institutional nature of regional planning and perceptions of its recidivism and decreasing efficacy where regulatory reform and unsustainable or path dependent development have prevailed. Even where planning is perceived as innovative or new, it can be constrained by regime dynamics that demonstrate inertia and lock-in in spatial relations, infrastructures, and structures despite, at times, poorly understood sustainability performance (Filion et al., 2015a; Gren et al., 2019). Regional plans, such as the *SEQRP*, propose sustainable transport, but have limited capacity to address sustainable transition. This highlights a need for ongoing policy learning, cultural engagement, and niche experimentation in relation to transport systems and subsystems as well as other regional socio-technical systems.

Regional planning is not the policy arena that supports transitions but it is a policy arena in which the major socio-technical systems are spatialised at the urban or regional scale and through which they become locked in. Regional planning acknowledges and articulates the need for addressing landscape pressures and reconfiguring regime relations over a medium to long-term timeframe. The incremental and slow momentum of planning, anchored in land use and spatial reform, while stabilising, is a constraint in the current moment when accelerated and urgent action is necessary (Schot and Kanger, 2018; Steffen and Hughes, 2013). Newton (2018, pp. 157–158) argues that "business-as-usual metropolitan planning has delivered the problematic urban 'landscapes' described earlier, with each successive strategic plan revision failing to achieve the necessary outcomes". This further suggests a crisis in planning that has resulted in cumulative problems in planning practice and policy between planning as legacy and planning as futuring.

Such observations are reflected in planning tropes such as placemaking or density are inflated as if supplanting or supplementing planning ideals of "good planning". The limitations are represented as significantly impacting planning capacity not just for innovation and transformation, but for realising better or good planning outcomes. Limitations inhibit collaboration, agency, and learning by political, organisational, and vested interests. These limitations are often constitutive of regime rules and can indicate both regime resistance and tensions, such as those between consistency and uncertainty. Limitations also provide insights about dysfunctional systems that can yield alternative, transformational or new urban productions, instruments and regimes (Newton, 2018).

Third, **anticipating transition** to a low carbon economy has appeared in regional planning since 2009 and includes provisions intended to address this shift in relation to transport. It is a minor narrative in the plans aligned to other broad objectives of sustainable development and the prevalence of major technological systems in the region. Between 2005 and 2017, the State Government has expressed goals like "reducing greenhouse gas emissions", "transition of the SEQ community to a low-carbon future" and "carbon neutrality". Such policy framings can act as boundary objects. Monitoring shows mixed results, while showing a general trend towards denser environments, although some targets have either not been met, released or measured (Queensland Government, 2019a). While some regional indicators can be taken as a surrogate for GHG, the most recent indicators omit measures such as estimated regional greenhouse gas emissions (Queensland Government, 2008, 2018). Further examination of de-locking path dependent socio-technical systems in the state's regional planning and policy is necessary (Unruh and Río, 2012).

An interest in and appetite for novel approaches to regional planning beyond current practice is evident with an interest in building cross-sectoral and departmental coalition, capacity, and collaboration. This requires regional planning and policy to purposefully integrate the complex spatial and socio-technical dimensions of urban and regional systems beyond normative and prescriptive integrated planning or sustainable transport which can manifest as incrementally gained eco-efficiencies and cost reduction rather than transition. Increasing and diversifying response options can provide organisations with more opportunities for learning (Folke et al., 2005).

Organisational and institutional arrangements and preferences indicate that the planning context is not well equipped to examine the implications and potentials of socio-technological transition and system change. Planning, infrastructure, and transport agencies are managing networks through project orientation to achieve a different transport mix. Caution about technologies, such as electric vehicles and autonomous vehicles, is evident where these technologies do not explicitly affirm the trajectory towards a multimodal or shared transport system. Planning does not, in this view, exclude this possibility but the emphasis remains on public transit to be realised through significant projects and investments. Whether this is a planning tendency for caution, conservativism, or distrust of technological innovation in cities and regions already struggling to meet the spatial and infrastructural demands of transport requires further investigation. The reconfiguration of the transport system necessitates significant investment in infrastructures supporting subaltern regimes rather than reapportioning infrastructure space.

Institutional awareness of transitions is developing in planning and planning research, although in practice planners and policy makers opt for a techno-economic understanding of transition or a partial conception of transition. Reconfiguration of the socio-technical system or transport assemblage is preferred and underway, with changes in land use, while automobility is entrenched. This uneven type of reconfiguration does not represent a transition pathway promoting spatial and socio-technical equity. The regional plans can be interpreted as presenting emerging windows of opportunity for transitions resulting from changing and emerging policy narratives, from sustainable transport to ‘transition to a low carbon future’ to zero net emissions transport strategy. The emphasis remains on changing the transport mix and the spatial assemblage of land use, transport technologies and infrastructure, which has been established as a niche-regime with limited capacity to drive and accelerate system change in a diverse regional landscape.

Innovation in planning is stated in policies as necessary for addressing complex system challenges, but these neglect to outline how and where innovation unfolds in a regional context or how it can link to existing regional innovation and policy systems. In acknowledging transition, some policy or planning niches could be anticipated where grassroots action and institutional arrangements can be leveraged. However, niche activity is limited and constrained despite perceived successes such as the OUM which oversaw the early policy innovation process, and collaborative and consultative processes. The early policy innovation was both relatively autonomous and well supported politically. Experiments and innovations have occurred which demonstrate regime fluidity and system learning in and with planning, but these do not necessarily breakthrough regime dynamics as institutional and landscape dynamics can be overwhelming and inhibiting (Fastenrath and Braun, 2018; Nielsen and Farrelly, 2019).

ShapingSEQ proposes that the scale and scope of megatrends requires innovative planning suggesting that current planning practice is not equipped to address them. *ShapingSEQ* has addressed several lagging aspects of the regional planning including implementation, monitoring land supply and monitoring other regional indicators. Regimes respond in path dependent ways, where variations of a preferred approach or solution are applied to different problems and lock out other actors, approaches and innovation. In regional planning, grassroots niches which challenge planning assumptions, such as intentional communities, slow cities, community land trusts and transition towns, are seemingly excluded (Zijlstra and Avelino, 2012). Beers (2016) suggests a need for greater network hybridisation to support urban transitions and transitions governance, including niche-regime hybridisation where regime incumbents engage in niche activity. In citing eco-town projects as an example of this dynamic, Beers (2016) recounts that opportunities for niches can occur in all domains including policy and can draw diverse stakeholders together to pursue niche opportunities. With its attention on urban renewal and consolidation, current regional planning triggers some incumbent engagement with niche opportunities but tends to exclude grassroots niche activity or social innovations. This has mixed and inconsistent results both in spatial and infrastructure dynamics. This is prescient given the *Queensland Climate Transition Strategy* directive for land use, infrastructure and transport emphasising low carbon transition.

Niches cannot be diffused if regulatory, infrastructural, organisational or market supports are not present. There is a distinct difference between planning and transitions in that plans are intended to provide certainty as localities change (Steele and Gleeson, 2009) as well as direct that change, whereas transitions approaches respond to uncertainty and experiment. Niche developments aspire to change regimes and this requires “shifting selection pressures on the

regime, and the coordinating resources for adapting to these pressures" (Levidow and Upham, 2017, p. 2; Smith et al., 2005). Selection pressures in a planning context refer to the ways in which socio-technical systems and infrastructures are planned, prioritised, procured, and delivered as well as used. Several emergent spaces for innovation, including in the planning process as a policy learning endeavour, were identified in the analysis. This necessitates expanded understandings of learning in the planning context; to not just learn but to learn about learning (Goyal and Howlett, 2019; Larsson and Holmberg, 2018).

Statutory regional planning is a relatively new policy process in Queensland and this indicates a level of policy learning drawing on contemporary planning principles and methods addressing sustainable development including community consultation and engagement, compact growth, enhanced public transport, and transit-oriented development. In planning, these approaches can have the qualities of niches but are limited in their capacity to steer or accelerate transformative change. These changes may also introduce some means for negotiating and introducing other innovations. However, the plans are normative – they offer desired regional outcomes – and the vision is generic and aspirational rather than radical, challenging, or transformative. The vision continues in the vein of seeking to remedy the legacies of the past, seeking to plan a region and settlements based on urbanist propositions of settlement containment and urban forms (Hölscher et al., 2019; John et al., 2015). A transition perspective encourages a critical approach that interrogates "a need for not merely new societal practices, but changes in the structures in which these practices are embedded, and which have coevolved with earlier practices" (Grin et al., 2010). Identifying narratives in the regional planning and policy mix has enabled boundary bridging where the narratives function as boundary objects that enable further analysis and exchange between regional planning and sustainable transitions.

8.1.2 SQ2: How are socio-technical systems and multi-level dynamics reflected in these narratives?

The response to this question is revealed through the MLP analysis and discussion of the narratives. In examining the multi-level dynamics specific tendencies in SEQ regional planning were identified. The analysis and discussion of the findings applying the MLP provides a basis for boundary work to facilitate enhanced understanding and negotiation of the role of regional planning in transitioning regional systems. This is necessary because transitions are messier and more complex than the MLP heuristic suggests (Morone et al., 2016; Næss and Vogel, 2012).

Landscape dynamics are addressed in planning and exert pressure on regimes, recognising that land use, transport, and infrastructure are multiple but connected regimes. Landscapes are place-based as they can vary from place to place, yet some landscape dynamics may be common to many places, such as macro-economic trends, neoliberalism (and assertions of individualism) and growth ideology (Geels and Kemp, 2007; Næss and Vogel, 2012). In relation to the 'changing planning' narrative identified through interpretive policy analysis, a lack of planning has contributed to the pattern of settlement and infrastructure that has developed historically in SEQ. This landscape condition has not only contributed to path dependence but also contributed to regime pressures to continue unsustainable development and infrastructure provision. These have developed in response to and shaped material cultures and cultural frames such as housing and transport preferences. Landscape and regime dynamics are tightly intertwined, and this can mean the two levels are difficult to discern. A combination of landscape and regime pressures necessitated planning reform and the introduction of regional planning as a collaborative intergovernmental process. As landscape instability and exogenous shocks have exerted pressure on a patchwork of regimes that shape development and infrastructure, ongoing planning reforms and institutionalised responses have ensued.

Planning and policy are embedded in the socio-technical **regime dynamics** of infrastructure and transport in the SEQ regional context. Sustainable development has become embedded in policy and planning but needs to change in order to substantially effect change (Norman, 2018; Rydin, 2013). Planning principles are negotiable and regional planning sets a development pathway for the region aligned to ESD and is predicated on planning models such as smart growth and urban growth boundary. Regime incumbents, including planners and policy makers, refer to the dominance of economic interests in decision-making and also identify 'trade offs' as a means of ineffectively managing conflict with other dimensions of sustainability. Trade-offs and balance in the SEQ planning context are understood to mean placating neoliberal and capitalist economic interests rather than meaningful and reflexively negotiating regional complexity (Rydin, 2013).

The findings indicate multiple meanings and narratives as well as contestation in response to regional planning priorities and directions, including in relation to socio-technological and system innovation and ESD. In relation to the 'limitations of planning' narrative identified through interpretive policy analysis, planning is constrained by the structural, cultural, and practice dimensions of regime dynamics. This means that the emerging transition will elicit a regime or institutional response, often negotiating a gap between short-term actions and longer term visions (Huxley, Owen, and Chatterton, 2019) with limited capacity for

innovation and political pressure for short-term benefits; this can have the result of affirming existing socio-technical system relations.

Regime dynamics are informed by actor and power relations as well as other market, technological, socio-cultural, scientific, and policy relations. Power dynamics are evident in the formation of regimes, with vested interests or incumbents, particularly corporate interests and politicians, perceived as exerting significant influence in planning arenas. The planning process can be closed to more exploratory, open and deliberative approaches, despite claims of collaborative and consultative processes. Consequently, planning remains professionally introspective and institutionally bound (Steele and Gleeson, 2009) that is more attentive to prefigured *'good planning'*, about which there is some conflict, than problem solving. For example, the empirical basis of smart growth as commensurate with sustainability is contestable (Gren et al., 2019). This differs to the transition approach which takes "a societal challenge as starting point rather than a possible solution, by a focus on exploring, searching and learning vs. testing and demonstration, and by including multi-actor alliances across society rather than specialized ... staff" (Rogge, Pfluger, and Geels, 2018). The prevalence of a development imperative and the privileging of economic actors indicates selective engagement of stakeholders in a post-democratic process rather than "to explore the means by which cooperation and support can be obtained, so that real change can take place" (Banister, 2008, p. 79). Further the retreat of regional planning from policy and strategy, affirming a focus on land use, could be indicative of "policy resistance" (de Gooyert et al., 2016) resulting in the cessation of policies and recidivism to previous policy settings. A policy mix in which planning is implicated can be obfuscated by competing arrangements, such as the SEQ City Deal, which provide parsimonious consideration of sustainable development and transition.

Planning and policy are enmeshed in regimes, shaping them through regulatory, policy, and governance processes to imbue certainty and stability. The discourse of certainty to attract investment and development is prevalent and can manifest as lax regulation including repealing environmental protection (or removing 'green tape'). In a larger policy mix, regional planning provides strategic spatial guidance and rules across and within levels of government. These inherently complex stakeholder and policy dynamics have yielded conflict and tension in institutions and within the policy mix. This is demonstrated by tensions between planning practices and departmental priorities. This evinces a fundamental disagreement in the co-evolution of transport and land use and their integration within the planning framework. Such contestation also suggests a lack of interdisciplinarity and

reflexivity in regional planning across spatial and socio-technical systems and professional domains.

Planning and policy also demonstrate a techno-economic tendency in relation to infrastructure systems, which does not attend to the complex dimensions of socio-technical systems, further imposing an insufficient conception of sustainability. As demonstrated in research (Malekpour et al., 2015; Morrissey et al., 2018; Steele and Dodson, 2014), the planning tendency towards incrementalism, optimisation and managerialism has resulted in responses to landscape pressures that are regime bound and constrained by institutional limitations imposed on planning. These dynamics also reveal landscape and regime interactions in planning that shape spatial and socio-technical change, such as the imposition of major infrastructure as spatial intervention (Dodson, 2009). Regime bound responses to pressures, such as toll roads and hybridised privatisation (Beers, 2016), reflect 'business-as-usual' and can resist transformative and system learning by prioritising regime based innovation supporting incumbents.

Regimes that cultivate system innovations can develop as niche-regimes with the proposition that land use and transport configurations present a spatial niche-regime (Zijlstra and Avelino, 2012). Regime change results in a changing mix where more sustainable initiatives prevail over those which are not sustainable (Næss & Vogel, 2012, p. 40). Regional population growth has made multimodal transport more economically and technologically viable and much of this provision occurs within the established governmental infrastructure procurement processes emphasising subaltern transport modes and infrastructures. Other development of the system is occurring, such as telecommuting, rideshare, bikeshare and micromobility. The sudden and disruptive appearance of ridesharing in SEQ triggered a need for a rapid and ongoing regulatory response, recognising the lack of regulatory readiness for, and anticipation of, new entrants into the mobility market. These more collective and collaborative modes of transport are niche-regime innovations, in the sense that they are new, that have required regulatory and policy response. They are also part of a developing subaltern mobility mix (or a more diverse regime) reliant on agglomerative dynamics of more compact urban environments and hierarchies of centres which regional planning has directed.

Despite having steered towards urbanist forms, regulators remained unprepared for socio-technical change. This further indicates that planning is not well prepared for anticipating socio-technical change or the systemic implications of the spatial forms it prioritises. Transport affirms spatial divisions in relation to transport access and diversity where

urbanisation and urbanism is a prevailing sustainable planning imperative achieved through urban forms, yet even with densification and intensification, suburbanism and suburbanisation, which are more car dependent, remain the prevailing and dominant experience and form in the region. As a type of socio-spatial form, suburbs face specific transition challenges (Dodson, 2014) and reflect the non-linear aspects of transition. In seeking to develop sustainable suburbs, the positive traits are not necessarily displacing the negative in the current urban footprint.

Through **niche dynamics** novelties are developed that are intended to radically change regimes. In the policy context these niches have been examined as planning niches (Quitzau et al., 2012) and as niche-regimes inclined to moderate innovation (Avelino, 2011; Zijlstra and Avelino, 2012), where new types of policy enable urban forms and socio-technical innovation aligned to transition objectives. In international case studies, regional and urban transitions work has been grounded in transition management approaches through which niche policy and planning work is undertaken (Rotmans and Loorbach, 2010; Julia M Wittmayer and Loorbach, 2016). Policies can also support socio-technical or technological niches that destabilise regimes in a creative/destructive dynamic (Kivimaa and Kern, 2016). In this research, those niches are sites of policy innovation, visioning, system learning, and/or policy response to landscape and regime pressures. Niche dynamics are social processes that include the articulation of vision or expectations that guide and communicate innovation, develop networks that support the innovation, and learning processes that provide greater stability for the innovation (Kivimaa and Kern, 2016).

Regional planning resulted in the development of a regional vision which is described repeatedly as ‘aspirational’. However, the extent to which this vision enables long-term sustainable planning and development is also rebuked as it reproduces dominant discourses and biases. In part, this is attributable to the limitations imposed on planning in relation to material impacts, institutional arrangements, political context, and incrementalism. The earlier planning reform that resulted in regional planning demonstrates some niche tendencies through which regional and urban priorities were aligned to ESD. However, physical regional and urban structures and systems have not radically transformed except in particular localities, such as the development of a significant public transit corridor (Næss and Vogel, 2012), where spatial and socio-technical relations have been reconfigured or consolidated to achieve a specifically sustainable result. Transition remains spatially uneven with ‘planning lag’ acknowledged as an inhibiting factor predicated on institutional, political, and practice dynamics; this is manifest as a lack of connection between incremental change and vision. While indications of niche activity are evident in leading up to and

establishing statutory regional planning, this has not been sustained through the planning and policy making process, which has achieved a high degree of stability and institutionalisation.

Some selectivity in the way regimes and regime actors respond to policy learning and innovation is also evident, particularly in relation to stakeholder engagement and cross-sectoral collaboration. For example, the private sector is regarded as a more capable and efficient innovator and therefore the proper locus of planning, infrastructure, and transport innovation, rather than community and government sectors which also make claims for innovation. This is inherently disempowering for civil society actors who are denied opportunities to interrogate and challenge assumptions about innovation and socio-technical selection (Avelino et al., 2019). Consistent with ESD, stakeholder engagement and multi-level governance are also arenas for innovation and system learning, but these are not equivalent to the type of multi-stakeholder visioning and governance that transitions theory and management espouses (Wittmayer and Loorbach, 2016). Conflicting ideas about the sufficiency of consultation are evident. Like visioning, the participatory dimensions of planning are not inclined to explore or enable grassroots or alternative values and lifestyles that reconfigure sustainable urban development (Wolfram, 2016a).

The limitations of planning and the political context in which it is undertaken constrain innovation capacity and exclude innovation. This relates to the 'emerging transition' narrative through which these limitations require redress in order to enable niche activity that can expedite transition pathways. In identifying constraints and barriers to change, policy narratives specified regime dynamics that supported lock in, path dependence and lock out. These translate into unrealised opportunities or windows of opportunity for innovation and system learning particularly in response to landscape and regime pressures.

Despite their perception as deficits in planning, these unrealised opportunities propose an alternative approach to planning that is better suited to the complex and systemic problems experienced by and in regions and cities. These unrealised opportunities also provide foundational thinking for sustainable transitions approaches which "counterbalance optimisation of existing systems [by aiding] in strengthening alternative dynamics and empowering actors to seek to change existing unsustainable systems" (Wittmayer and Loorbach, 2016, p. 28). The 2017 regional plan, *ShapingSEQ*, was intended to reshape the sustainable development narrative and pathway for the region. However, this plan has attracted criticism for maintaining a division between development and sustainability by promoting development at the expense of sustainability. At a point where more reflexive

interrogation of sustainability is necessary, ongoing and unresolved tension in policy systems about sustainable development is evident among stakeholders.

8.1.3 RQ: How do policy narratives in regional planning inform the relationship between planning and socio-technical systems transitions?

The response to the overarching Research Question assimilates the responses to the sub-questions to further consolidate how the regional planning is analysed through the MLP. The narratives identified in this research function as boundary objects in that they bridge the regional planning case study and sustainable transitions analysis. Regional planning and policy tend to follow contours of landscape and regime interactions as well as regime-based responses to exogenous and regime pressures. Internal regime tensions between transport and land use planning are also evident and manifest particularly in relation to Priority Development Areas, which attract significant criticism. This suggests the integrative agenda of planning is grappling with disciplinary tensions and its normative models of "good planning" in which land use and transport are inseparable. In relation to regional planning in SEQ, the interaction between landscape and regime pressures resulted in policy innovation and a change in direction specifically referencing sustainable development. However, regime dynamics are perceived as undermining sustainability principles in favour of economic growth and a development imperative. Regional planning is aligned to a landscape level growth imperative, which also affirms the development imperative and facilitates investments. Landscape pressures present problems to be addressed by planning through regime processes, institutional actors, and actions.

The findings of this research affirm research by others that indicates the significance of landscape dynamics to reinforce infrastructural and socio-technical regime stability and counter sustainability actions (Kemp, Geels, and Dudley, 2012; Næss and Vogel, 2012). The planning response tends to be incremental and hinges on ideas of improvement that are slow to develop. The slowness of these changes in a deregulated and deregulating context can mean they are undermined or deferred due to changing planning horizons or plan reviews. The proposition that niche-regimes have manifest reconfigured socio-spatial patterns also supports the landscape-regime dynamic that has developed through regional and urban planning. However, the introduction of the *Queensland Climate Transition Strategy*, while enacting a top down transition approach predicated on an economic growth paradigm, has not resulted in the same sense of critical moment as the regional plan. Many of the interviewees, for example, were not aware of the strategy or its implications for planning,

infrastructure and transport and did not acknowledge differences between sustainable development and sustainable transition.

Landscape-regime tensions also inhibit the development of niche-regimes and lock-out grassroots niches, often resulting in antagonistic stakeholder interactions in relation to planning and development. The prevailing narrative of change is grounded in principles of ESD that are not well resolved in practice with an enduring perception that economic priorities take precedence over ecological and social priorities. While not unique to SEQ, this deficit approach to ESD has a corrosive impact on the interface of planning and sustainable urban transitions, with Morrissey, Moloney, and Moore (2018, p. 69) recognising that given "current developmental and economic imperatives and norms, it is difficult to see how planning interventions can truly foster city-region sustainability, when first priority is consistently and uniformly afforded to narrow economic interests". Over time, the regional plans have specified greater need for infill development and urban consolidation to enable better or more efficient transport services and networks. The regional plan anticipates infill development will overtake greenfield development in the next 25 to 50 years, yet greenfield development will continue. This relationship is at the core of the regional planning approach to sustainable development and regional and urban structure; it is anticipated that sustainable transition will fit into that frame rather than challenge it. Integrated transport, infrastructure and land use is intended to net economic and efficiency dividends while investments in infrastructure further catalyse spatial intervention, urban consolidation, or development. Morrissey, Moloney, and Moore (2018, p. 69) stress that low-carbon transitions, together with other sustainability challenges are "paradigm shifting" and necessitate a "new means of conceptualising and delivering city regions" grounded in place specific and customised sustainability principles.

While the regional, infrastructure, and transport plans translate and interpret sustainability principles in a place-based context – with concepts like sub-tropical design, integrated planning and transit-orientation, urban renewal, and a pattern of urban centres – a tendency towards and acceptance of trade-off remains integral to a narrowly defined application of sustainability. This has been observed as planning being "unable or unwilling to rise to the very real, lived challenges posed by [climate change as the] most fundamental of planning agendas" (Steele and Gleeson, 2009, p. 14). The narratives of change, limitation, and transition are tense and conflicted, providing indications of potential windows of opportunity. If planning is to support infrastructure transition, there is a need to further investigate how this is to occur. This includes cultivating capacities for learning: to make

space in planning and in place for experiment and learning; to integrate in relationally and spatially meaningful ways; to rethink policy and mix policy; and to reconfigure and retrofit.

Having experienced significant shifts over the last century, urban and regional planning remains constrained by established incremental and managerial methods and reactive planning cultures indicative of regime dynamics. The findings of this research recognise that 'something else' or alternative performances of planning are needed in the policy context for planning to retain its relevance and responsiveness during transition. Interviewees ask *'what can planning do?'* in recognition of its lack of agency in relation to spatial and infrastructural dimensions. Such questions indicate that alternative and reflexive approaches to problem framing and response are required to support learning and transformation. Limitations as identified in the findings highlight frictions in the planning process that transitions theorists argue can act as points of regime transformation. Given Hodson et al's (2016) proposition that scales for negotiating and contesting transition are not 'pre-given', the limitations imposed on regional planning further reduce its capability for intervening at the intersection of spatial and system reconfiguration.

It is evident and expected that tensions arise in planning processes, for example between environmental stakeholders and planning officers, because of different ideals or ideas of the purpose of planning. Ostensibly, the role of regional planning in sustainable infrastructure transition is negotiable. Despite an emerging transition narrative in regional planning, the pathways for planning require further investigation and engagement from planning. The response to this research question is extended in the next section and framed as a transformative challenge as the MLP analysis reveals that the regime dynamics of planning are under pressure and that proponents of change are met with policy and regime resistance. This seemingly tense situation potentially presents windows of opportunity to introduce new narratives of change and learning that can support socio-technical transitions beyond the reconfigurations and unintended consequences proposed by the regional plans.

8.2 A Transformative Challenge: Windows of Opportunity

Framing a transformative challenge for planning recognises tensions and unrealised capacity in regional planning to address socio-technical transition. These can potentially manifest windows of opportunity where transitions methods and approaches can enrich planning. The MLP supports researchers and policymakers to explore what opportunities, if any, exist and are emerging for interventions, niches, and transitions pathways. The nature of current complexity indicates that many of the stable and settled systems by which humans live

cannot endure under the weight of mounting crises, including a crisis in planning (Angotti, 2020). Transitions thinking enables reconsideration and renegotiation of sustainability and sustainable development. Policy narratives are woven into transition pathways that sharpen sustainable development approaches, and are developed by doing and creating more that is fundamentally sustainable and supplanting unsustainable practices, cultures and structures.

Planning is conflicted between prevailing trajectories of development and pressure for transformative approaches (Filion et al., 2015). Newton (2012, p. 98) argues that:

> current metropolitan planning systems and political-institutional-community structures in high-income western democratic societies appear incapable of the longer-term transformational decision-making and implementation process.

Regional planning is a significant institution and actor in socio-technical system regimes; such systems and regimes not only occupy space, they construct and structure space relationally (Frantzeskaki and Loorbach, 2010). Wolfram's (2016b) conceptualisation of transformative capacity, Smith, Stirling and Berkhout's development of adaptive capacity (Smith et al., 2005) and Hölscher et al's (2019) proposal for governance capacity are particularly compelling as they refer to both endogenous and exogenous conditions for change and, in particular, taking action to unlock capacity and escape constraints.

Regional and urban planning face a transformative challenge in SEQ in relation to both *socio-technical transitions in the regional planning context* and *regional planning processes in the socio-technical transitions context*. Both are necessary for greater reflexivity, radical vision, policy learning, and exploration in planning to search for sustainable socio-technical system pathways and translate them into institutional frameworks. Transitions thinking provides both a way of examining urban and regional systems, and the policy and planning prescriptions by which those systems and spaces are constituted. Hodson, Marvin and Spath (2016, p. 468) argue that "scales and arenas for negotiations about decarbonisation activities are not pre-given". Rather, they are processual and arise from dynamic scaling and contestation where actors with stakes in, or operating at different scales, are also contesting and negotiating the creation of low carbon spaces. The perception by some stakeholders that incumbents are privileged in consultative processes reifies the processes by which low carbon propositions develop.

When driven by sustainability visions and targets, practices of 'doing something other with planning' or 'performing planning otherwise' result in cultural and spatial shifts and

learning. Planning theorists, such as Gleeson (2012), propose that planning has been successful at finding "new aspirations and rationales". Such rationales may also need to be grounded in values, responsibilities, and ethics especially where intractable limitations are at play or where the infrastructural violence of inequality is a risk or in force (Ferguson, 2012; Rodgers and O'Neill, 2012). This searching requires reflexivity and exploration in planning and purposive engagement with sustainable transitions to navigate the uncertainties and selection environment of systemic transformation in, with, and for, sustainable infrastructure systems and futures in cities and regions.

Regional planning and policy in SEQ make claims for sustainable development, low carbon transition and a carbon neutral future emphasising technological change, behaviour change, and spatial reconfiguration. The policy narratives suggest that regime reconfiguration is slowly and incrementally occurring, but that significant regime resistance and constraints are also evident. Regime and policy resistance also occurs in the remit of regional planning to establish a workable spatial framework as well as its transformative capacity to address the requirements of transition. Regional planning introduces an urbanist framework in a region comprised of multiple land uses and spatial forms and regional planning coordinates across different policy and planning arenas, such as urban, natural resource, and environmental planning. Consequently socio-technical transitions occur unevenly and unequally in the region; not as an extension of the urban but comprised of a web of territorial and extra-territorial relations. Windows of opportunity in the planning context and at the regional scale can engender greater reflexivity, radical vision, policy learning, niche planning, and exploration in planning to search for sustainable socio-technical system pathways. It is possible that the windows of opportunity - created through top-down pressures from policy, regime level searches for alternatives, and grassroots expectations uncounted in the planning process - can emerge. Further research can explore these relations to understand how grassroots innovation in the regional planning context influences sustainable transition.

Transport and mobility transition have been widely researched, but not specifically from a regional planning perspective, as presented here. This has included examination of regional planning tropes, such as growth management, sustainable transport and integrated planning, through interpretive analysis and from a transition perspective. The result of this investigation is not to determine a range of policy prescriptions but rather to investigate the implications of policy processes and narratives for infrastructure transitions. The most recent Draft State Transport Strategy alludes to a shift in transport from *access* to *mobility*, as if transport and infrastructure networks can yield capacity for increasing mobility. Geels et al (2012, p. 362) observe a tendency in transport planning and policy to direct attention to

‘technological fixes’ rather than pursue societal or transformative change. Socio-economic relations continue to rely on transport primarily enabled by automobility.

Several policy lessons have emerged that affirm findings in other studies indicating that transport systems are currently experiencing pressure and cracks in the regime are appearing that suggest windows of opportunity for transitions and socio-technical reconfigurations (Driscoll, 2014; Geels et al., 2012; Marletto et al., 2016; Næss and Vogel, 2012). While policy and planning do not determine the result of these processes, they have a role to play in creating selection conditions for system changes and supporting promising niche developments and system learning.

The regional plans and policies stress the importance of multimodal and intermodal transport networks, based on mass transit systems, a proposal that predominantly supports urban dwellers and does not account for socio-economic and spatial access. They also progress the socio-spatial niche-regime of compact cities, which have limited momentum and have not had significant impact on transition even though they represent a reconfiguration of spatio-socio-technical relations. Other elements of the transport mix in the regional planning emphasise efficiency gains, demand management, traffic management, active transport, and other forms of collaborative transport provision. Despite gains in public transit use, this suggests a limited orientation towards sustainable transition in transport in regional planning.

In relation to interaction between sustainable socio-technical transitions and regional planning, recognising that transitions are already underway in complex and non-linear pathways, it is useful to consider how transition and planning tendencies intersect (Happaerts, 2016). Planning and sustainable transitions theory proposes that planning be enacted strategically to reflect movement from government to governance, from hierarchical to a relational modality, and from managing uncertainty to ‘probing the future’ or ‘engaging in the development of the futures-to-come’ (de Roo et al., 2012; Friedmann et al., 2004; Pierre and Peters, 2005; Skelcher, 2012).

In transitions thinking, vision and imagination are integral to and for these uncertain and complex processes and can play a tactical role in “uncovering specific current practices that stand in the way of transformative change” and the need to ameliorate tensions at play in geospatial and multi-scalar processes (Beers, 2016, p. 179). The regional plan and related policy and plans are silent on a range of issues and interventions including, for example, the question of retrofit, which is a multi-scalar and multi-level task (Eames et al., 2013b). The opportunity for retrofit at the regional scale includes diversifying, repurposing, and adapting

infrastructure and transport corridors. Retrofitting and reconfiguring transport and infrastructure networks is not included in the regional plan and other plans and policies. Major projects are not projected with consideration of future remediation or retrofit and the goal of low carbon transition. As evinced with major public transit infrastructure projects upon which regional transport networks are reliant, such as the Cross River Rail and Gold Coast Light Rail, there is regional and urban capacity to diversify the transport mix on some corridors and in some nodes especially where it affirms an urbanist trope. Other potentialities for urban system sustainability and integration, such as configurations of metabolic and eco-system services are not explored or addressed as potential niche opportunities.

The approach to infrastructure has changed since 2005, with shifts in intention from leading development with infrastructure, to sequencing development and infrastructure provision in 2009, to 'sweating our assets' in 2017. A changing narrative is also evident in relation to transport planning where the 2005 plan stated that automobility would remain dominant to declarations of a rail revolution in the 2009 *ConnectingSEQ*, and the declaration in *ShapingSEQ* that business as usual cannot continue. The tension between sweating assets and cracking business as usual can present a window of opportunity for reconfiguring and de-locking infrastructure systems; with the *Queensland Climate Transition Strategy* also directing more integrative approaches to infrastructure and transport. A longer term and ecological perspective can enhance the performance of socio-technical systems; isolated enhancements and efficiencies in sections of systems can result in perverse outcomes such as reduced overall performance (Brown, 2010). From a policy narrative perspective, tensions are building that indicate current pathways cannot be maintained. As a sub-narrative that addresses planning limitations, planning ideals often predicated on a spatial fix, such as integration, can develop as a transition arena for further research and examination in terms of built forms and spatial relations.

As the research points to a transformative challenge for planning in relation to socio-technical systems, concluding comments are framed by the four key attributes of sustainable transitions (Happaerts, 2016): co-evolutionary dynamics; reflexivity and self-awareness; learning through experiment and innovation; and ongoing open-ended processes of societal innovation.

8.2.1 Co-evolution and System Changes

The most recent regional plan provides a 50 year vision while not recognising that planning should *co-evolve with system changes.* Socio-technical systems will also change in ways that

the plan does not anticipate. Planning has been found to perpetuate limited and dated methods and approaches that are ineffective in addressing societal systems and change in part because it has co-evolved with those systems and provides feedback that affirms incumbency (Edmondson et al., 2018). More critical perspectives and imaginaries of urbanism and its implications for regional sustainability can address the dominance of incumbents in the planning process (Coenen, 2017; Hajer and Versteeg, 2019; Wachsmuth, 2019). The nature of infrastructure and transport decision-making (Hale and Eagleson, 2015; O'Neill, 2005) can result in lags in the provision of multimodal transport services, particularly in difficult to service areas such as priority development areas, suburban estates, or smaller towns. Planning narratives highlighted planning principles, rules and decision-making, and affirmed ideas of 'good planning' or normative planning that builds on past 'good planning' efforts rather than futuring or envisioning alternative pathways (Frantzeskaki et al., 2019). The incrementalism for which planning is critiqued (Malekpour et al., 2015) is evident in SEQ and across the three regional plans and related policies.

ShapingSEQ stressed a shift from demand driven approaches to transport to shared and collective modalities as well as enhanced mobility choice in a regional context of communities and economic growth. While the plan itself does not provide significant direction in how to make that change, it reiterated regional planning principles that could support such a socio-technical system shift. In keeping with Hodson et al's (2016) observation of the spatial configuration as contextually embedding system configurations, the regional planning and policy establishes such a framework while also imposing regime conditions. These regional policies and plans as well as the *Queensland Climate Transition Strategy* are top-down policies. To align to transitions pathways, Marletto (2016) proposes that top-down policies play a role in accommodating bottom-up initiatives, then diffusing such initiatives, and embedding those initiatives. The role of planning in diffusing, scaling, embedding and stretching grassroots innovations is not explored despite requests from stakeholders for greater input into the planning process.

The *Queensland Climate Transition Strategy* directs planning, transport, and infrastructure to align to its priorities to achieve its targets. This requires negotiations by which transitions are not only instigated and supported but also proceed without obstruction. The market and community play a significant role in guiding planning and policy, but these are indicative of a top-down, inside-out mode of sustainable development and sustainable transition. In the current framings of sustainable transition at the regional scale in SEQ, the findings from the examination of policy artefacts indicates that tensions between spatial and system configuration are apparent where some aspects of low carbon transition are proposed but

which may have negative consequences particularly where technological fixes are anticipated, such as electric vehicles.

8.2.2 Reflexive and Self-aware

A more *reflexive and self-aware* planning and policy process can navigate currents of change and institutional arrangements by engaging the complex social dimensions of consultative processes, the tensions between path dependence and transition pathways, and shifting socio-cultural and socio-technical practices and preferences. For this to occur, planning must be a site of significant and ongoing learning. Recent transition studies have focused on policy process and policy mixes to provide accounts of the role policy plays. The policies examined here are specific strategic documents that set out regional scale spatial, infrastructural, and transport directions and commitments in the medium to long-term. Since 2005, a policy mix addressing the interactions of land use, transport, and infrastructure at the regional scale has developed and continues to evolve. Recent research stressed the importance of policy mixes and policy process in relation to sustainable transition and this suggests that a policy system response is needed for socio-technical system transition. This not only means policies that affirm transition and diffuse innovation, but others that abate the proliferation of the incumbent regime to create meaningful pathways.

The systemic limitations of planning relate to the interactions of planning and policy in broader spatial, socio-technical or techno-economic systems. Policy narratives for these systems in a variety of ways recognising in the first instance that the regional plan is a preeminent plan in a policy system or mix and that it involves complex stakeholder processes that are intended to affect spatial, socio-technical, or techno-economic systems. Regional planning has played a significant role in steering spatial reconfiguration towards a more compact form and settlement pattern that is consistent with low carbon transition and consistent with a socio-spatial niche-regime. It may well be at the limits of what can be achieved with and within this approach in this context. Policy narratives articulate that this trajectory of spatial reconfiguration will continue through strategies for achieving goals such as higher infill development targets and ensuring land supply which will have a direct impact on socio-technical systems.

While attaining zero net emissions is the core goal of the *Queensland Climate Transition Strategy*, it is not the endgame of a broadly framed sustainable transitions agenda especially given the likelihood of greater than 2 degrees temperature rise. As an intermediary goal, it can assist in shaping other socio-technical transition pathways through cross-sectoral

collaboration and learning. Webb et al (2018), Shove and Walker (2007, p. 764) and Gren et al (2019) propose an increased focus on urban or socio-technical systems and processes is necessary for planning to contribute substantially to sustainable transitions by disrupting existing regimes so that they can be supplanted by new socio-technical configurations. Presently, the direction taken in planning affirms a spatial pattern predicated on automobility within a multimodal mix or diverse regime requiring specific infrastructural and spatial interventions as well as changes in institutional arrangements which are projected to result in enhanced network coordination and modal integration. To gain momentum, such a change requires reflexive and disruptive reframing of professional and institutional assumptions and practice.

8.2.3 Learning through Experiment and Innovation

A planning process that is reflexive is also *learning through experiment and innovation*. Innovation is at the heart of sustainable development and learning is at the heart of innovation, necessary to create conditions for and maintain focus on transformative change (Fazey et al., 2018). Sustainable development or sustainability is not an end point but an enduring process of creating and developing pathways that are reshaping human lives and settlements. In order to do so, problem framing and definition is a way of developing meaning that makes problems "more (or less) acceptable" (Geels et al., 2012, p. 366). The narratives of economic imperative and trade-off are strategies for achieving acceptability of environmental destruction and social-economic inequality.

As indicated in the findings, the recent history of planning for SEQ evinces intentional deviation from historic patterns and systems of planning and settlement at the regional scale, shifting from a non-statutory to statutory system since 1990 and rapidly settling into institutionalised regime dominated pathways. It introduces a range of policy initiatives through which a tension between sustainable development and neoliberalism is manifest. These new policy and plan typologies, such as regional plans, infrastructure plans, and transition strategy, are a form of policy innovation in that they are new governmental policy agendas and platforms. As policies that identify a need for innovation, they only modestly support it. The interpretation of policy artefacts provides insight into the structure and dynamics of the regime, including regime resistance, power relations, and windows of opportunity. The regional planning seeks to progress infrastructure and transport system changes within existing regime constraints. Limitations in the planning system inhibited the attainment of strategic goals and affirmed regime dynamics particularly power dynamics. While proposing and experiencing changes, planning has not experienced or pursued the

paradigm shift that sustainable transitions thinking argues is necessary (Morrissey et al., 2018; Næss & Vogel, 2012). Greater attention is needed to how planning innovates or how innovation occurs in planning, particularly in relation to which actors and conditions are legitimised in experimentation.

8.2.4 Continuous, Open-ended Societal Innovation

Sustainable transitions are *continuous open-ended processes of societal innovation.* This infers a political process where the politics and values of sustainability are central to social change and path creation. Innovation in policy process implies that policy actors, intermediaries, and entrepreneurs are empowered to fulfil a role in opening windows of opportunity, undertaking negotiations, and problem framing. By several accounts, regional planning is black-boxed and nested in a political context in which some regime incumbents exert influence, and this imposes limitations on what can be done with regional planning and what regional planning can do. Systemic limitations are often addressed as conflicts and tensions that are embedded in planning and policy processes. In part these limitations refer to a lack of preparedness, action-orientation, and readiness to shift systems or respond to exogenous socio-technical change.

Regional planning is self-referential and introspective: it is apparent policy narratives that the regional plan and associated policies reiterate previous plans without necessarily undertaking extensive reviews, which can stimulate learning. While the regional, transport and infrastructure plans all address the need for different spatial configurations in the region and attend to reprioritising government expenditure to achieve this, these priorities are not always or consistently implemented or monitored, although more recent regional planning has resulted in a new data collection initiative.

Descriptions of the limitations of planning also indicate points of contestation and power imbalance in the planning process in relation to infrastructure and transport including institutional, scalar, and instrument conflicts and closure which inhibits innovation. The place specific logics of actors, politics and institutions are all integral to transition. Fastenrath and Braun (2018) propose that hindrances and ‘transition detractors’ also need to be identified. Planning is not an impartial or independent actor or policy domain in sustainable development or sustainable transitions: it can present obstacles to transitions, play into multi-stakeholder tensions, and fail to account for policy outcomes (Coutard and Rutherford, 2010; Fastenrath and Braun, 2018; Gorissen, Vrancken, and Manshoven, 2016). The political discourses, habits, and practices that shape these policy and regime resistances

obstruct the ways in which alternative narratives, practices, and processes can be instrumentalised (Boons et al., 2019). Delegitimisation practices seek to influence selection environments by countering naturalised accounts of path dependence; where planners, for example, claim they are not privileging new technologies they retained a static or naturalised selection environment and pathway (Barnes et al., 2018; Voß, 2007).

Regional planning plays a significant regime role and has been an element of regime configuration and reconfiguration since the 1990s. While change has happened, this may yet be transformative. Social and policy learning are integral processes in sustainable transitions and the establishment of transitions arenas provide a protected space for these learnings to be enacted. This includes the creation of space for "reframing and reinterpreting knowledge and dominant (policy) frames by engaging with different societal perspectives and types of knowledge" (Beers, 2016, p. 179). For Segura-Calero and Peris (2019, p. 1036) transitions and transformative capacity "help to design approaches for unlearning the urban planning conservative paradigm and pathways". In SEQ regional planning is undertaken in a pressured environment of short time frames, outsourcing to consultants, insufficient consultation and constrained resources. This also impacts the transformative capacity of the planning process even when politically supported and organisationally protected and the purposeful development of transformative capacity is warranted given its relationship to niche planning and socio-technical system integration.

8.3 Academic Contribution

This research contributes to both planning and transitions disciplines and practice by examining the intersection of these disciplines in relation to narratives in policy and plan making over time. This research makes several theoretical, empirical and practical contributions. First, transitions theory and research is increasingly directing attention to urban and regional systems but not specifically on the policies shaping the cities as spatial assemblages or patterns. Planning histories, planning practices and planning cultures are present in urban and regional infrastructure transitions (Carroli, 2019). Significant assessments of the role of regional and metropolitan scale planning in sustainable transitions have not been undertaken, although recent explorations of transitions in place-based and local government contexts conclude that transitions theory is applicable in planning practice and transitions approaches can be deployed by intermediaries or in transitions arenas (Bush et al., 2018; Morrissey et al., 2018). This research provides insight into the complex interactions of transition and planning dynamics at the regional scale. It particularly presents

an approach to bridging regional planning and sustainable transitions for examining the fuzziness and extensions of boundaries and interfaces for a more deliberate and meaningful engagement.

Attention to policy process, policy narrative and policy mixes is also a growing area of research in sustainable transitions. Sustainable transitions benefit from examination of the spatial, temporal, and scalar implications of policy as well as how planning fits into these mixes. A developing body of literature about transitions and policy mixes is relevant to research about governance and politics in relation to infrastructure planning, emphasising consistency and coherence of the policy mix, promoting policy learning, and applying a systems perspective for analysing policy mixes (Rogge and Reichardt, 2016; Kern and Rogge, 2017). As planning in Australia tends to be consistent across Australian cities and regions, these findings are generalisable in the Australian context and other jurisdictions which practice similar types of planning.

A spatial or scalar perspective in sustainable transitions has developed (Coenen and Truffer, 2012; Markard et al., 2012; Raven et al., 2012; Truffer and Coenen, 2012). This research contributes to this theory through recognition of regions as societal systems that are enmeshed in transition dynamics and as spatial, territorial, and scalar domains which also shape socio-technical systems relations. Regional planning is a policy process that guides spatial and infrastructural development and is relevant for this arena of transitions research. This research examines how regional planning narratives fits into or with the transitions research and theory examining space, place, and scale. This emphasises the boundary work aspect of this research which proposes that a more integrative approach to planning is required for transitions management and transitions dynamics and that policy narratives can act as boundary objects in a planning context.

Practically, the analysis of planning narratives using the MLP highlights limitations of planning and provides an alternative lens for understanding the power exerted by incumbent narratives. Through a boundary bridging approach, the research traces a boundary between planning and transitions practices and identifies bridging approaches that draw together planning narratives and transitions tendencies. This research also further affirms the ontological value of interpretive analysis in sustainable transitions research. This provides a link between planning research, which is also grounded in interpretive approaches that focus on narratives and discourse, endeavouring to find common languages and intersections that enable a productive and constructive exchange between disciplines which inflect in urban and regional policies and contexts. The MLP has been applied to analyse policy and

narratives, and this research contributes a regional scale case study to this arena of transitions research while also providing a basis for further research.

This research elaborates culture, structures, and practices of planning which engage with sustainable transitions, particularly through the spatial, policy, and relational dimensions of infrastructure systems. The research is also significant for practitioners and policy makers who may be expected to continue to develop transition policy and planning through urban and regional planning. A more open approach to sustainable transitions will benefit policy and planning, particularly in framing policy problems, developing visions, and cultivating policy process in terms of the relational dimensions of socio-technical and spatial systems. This also has implications for professional and planner education and practice. The research has revealed weaknesses in current practice that indicate opportunities for additional policy tools. These include visioning, complex stakeholder engagement and collaborative governance, building transformative and governance capacity, recognition of socio-technical and infrastructure systems as "a way of thinking" (Rutherford, 2020), engaging system and organisational learning.

8.4 Further Research

This research has revealed several pathways for further research examining the relationship between regional planning, sustainable transitions, and infrastructure and transport. Having presented a qualitative analysis of the relationship between policy narratives and sustainable infrastructure transitions, there are further opportunities to extend the inquiry. The integration of qualitative and quantitative methods in planning are also possible. As in Robertson et al (2017), in which qualitative narratives and quantitative descriptions are merged to quantify qualitative storylines, such as those identified in this thesis, to outline transition pathways.

The policy mix for sustainable urban and infrastructure transitions warrants further research at the Federal, State, Local and regional levels. Further understanding of policy mixes and processes for sustainable transition includes examination of the spatial, temporal, and scalar applications of policy as well as how planning fits into and enacts these mixes. This research focused on policy to 2017, with the release of *ShapingSEQ* and the *Queensland Climate Transition Strategy*, and the windows of opportunity they present. The implications of transitions for addressing the parlous state of infrastructure and services in Remote and Regional Indigenous communities, as identified in the *Queensland Climate Transition*

Strategy and National Infrastructure Audit is pressing (Infrastructure Australia, 2019). Further policies have also been developed and released including a draft statewide transport policy and the SEQ City Deal.

This research proposes that planning itself is in transition and co-evolving. Complex policy dynamics are at play particularly as regional planning remains ensconced in land use and urban development rather than the complex array of infrastructural, political, technological, ecological, economics, and social systems and interdependencies that shape the region. Transitions studies has expanded its methodological base and other transitions frameworks and methodologies, including hybrid methodologies, policy analysis, transition management, and urban transitions, can be applied in the Australian context. While address of power and actor relations has been a significant arena of examination, particularly in relation to social innovation, this has not addressed gendered and inclusive infrastructures. For example, digital disruption and supporting subaltern regimes may be lower carbon or reduce congestion but remain gendered and exposes women and children to potential risks in transitioning systems and locations (Lecompte & Juan Pablo, 2017; Siemiatycki, Enright, & Valverde, 2019; Whitzman, Andrew, & Viswanath, 2014).

The MLP has enabled an approach that has prised open the highly institutionalised practice of regional planning to suggest that multiple infrastructure transition pathways in transport remain unexplored as policy makers endeavour to cultivate new conditions rather than pursue more interventionist approaches (Geels, 2019). Due to this epistemological aspect of the MLP, this research provides a sound foundation for ongoing investigation of transformative dynamics and processes in regional socio-technical systems. This examination has found that regional planning is particularly responsive to landscape and regime dynamics, in which landscape and regime dynamics are highly enmeshed and through which regime situated innovation is emphasised. The specific attributes of these interactions can be examined to identify how networks, actors, infrastructures, and power relations interact. This research found that political interference and incumbent preference is imposed in planning – in part this is endemic of neoliberalism and post-democracy. The dynamics of this, in relation to the interplay of transition pathways and policy or regime resistance, can be further investigated to identify barriers to transition.

Advocacy coalitions, such as Future Earth, are forming and publicly propose urban and regional innovation, transition, and transformation (O'Donnell et al., 2019). Future Earth is proposing long-term policy reform and strategy in response to perceived governance and leadership gaps (O'Donnell et al., 2019). The Sustainable Development Goals are presented

as providing a necessary guiding framework for enabling innovation, developing vision, building capacity, and engaging research. Research into niches and the role they can play in bridging sustainable transitions and urban and regional planning, reflecting on such coalitions, could also be warranted. This can include examinations of policy niche and learning, niche planning, visioning and discursive niches: an interrogation into what counts or matters as innovation in regional planning.

In South East Queensland, several major public transport infrastructure projects are underway or recently completed including the Gold Coast Light Rail, Cross River Rail in Brisbane and the Brisbane Metro. Brisbane's busways represent a longer lived and legacy public transport infrastructure intervention that has shaped the region's public transport network, transport access and mobility. Further research about the socio-technical system dynamics and the contribution of these major projects to sustainable transition at the regional and urban scales. This is particularly relevant in a rapidly changing technological context in which new technological relationships and innovations are impacting personal, collaborative and collective mobility and the reasons why citizens commute. As demonstrated in this research, regional planning has not canvassed the changing technological environment due a lack of readiness and exploration.

Sustainable transitions are not well understood and marginalised in planning considerations in that sustainable development conceptually encompasses sustainable transitions even when conceptualised weakly. Processes of problem framing and reframing are essential for sustainable transitions as they promote policy and social learning. In anticipating transitions, technological and/or behavioural change is evoked rather than a more dynamic system change. Conceptions of evolutionary planning and sustainable transitions are related and research which canvases their connections may support learning. While this can be understood as a type of policy resistance, it accounts for the minor articulation of transition in regional planning and policy and broader articulation in the *Queensland Climate Transition Strategy*. Research is needed to develop new tools and approaches that can be assimilated into practice, particularly those that support visioning, collaboration and decision-making. This would support and extend translational work that engender greater access to and engagement with socio-technical systems and sustainable transitions research by planning practitioners, industry groups and policymakers. Success has been recorded in such research where exploratory and innovative tools have yielded options that were not typically canvassed in urban and regional planning.

8.5 Coda

The MLP analysis of regional policy narratives reveals that the introduction of regional planning was a policy innovation that restructured regime level dynamics and the regional selection environment primarily to coordinate spatial and settlement pattern. It was a regime level response to landscape and regime pressures that required and facilitated ongoing planning and policy regime configuration as well as policy innovation and policy learning in relation to sustainability. Through regional planning vital relationships between sustainability, space, place, and infrastructure have been addressed. The changes in the planning over time – including spatial, infrastructure, and transport – were responsive to emerging and negotiable ideas of sustainable development and sustainability in the regional context. They enabled the development and affirmation of niche-regimes such as sustainable transport and smart growth. While these changes have consolidated the settlement pattern and provided a framework for enhanced integration of land use and transport, they are not commensurate with transition. The policy narratives and MLP analysis evince weak links and misfits between sustainability, spatial, infrastructure, and transport in policy narratives indicating that transitions and socio-technical systems thinking and methods can develop capacity and strengthen transitions pathways. Niche activity, particularly grassroots innovation, is excluded from the planning process further indicating not just power imbalance but 'lock-out' that inhibits transition pathways.

The *Queensland Climate Transition Strategy*, while proposing a narrow transition vision, may open a window of opportunity for further reform of socio-technical regimes which shape the region, there is some uncertainty in the planning context about how this can, could or should unfold. Consequently, institutionalised activity at the regime level complexly interacts with selective and adaptive capacities (Huxley et al., 2019). As the *Queensland Climate Transition Strategy* targets land use, infrastructure, and transport policy and planning, this indicates that these existing policy arenas, which propose sustainable planning, development, and transport, are not sufficiently addressing the sustainable transition objective and targets. It further suggests that the focus on efficiency and value for money in all the plans is not commensurate with sustainability and/or transition. In the policy mix where the current regional plan and the *Queensland Climate Transition Strategy* both express support for community and regional transition initiatives, further exploration is needed including processes and lexicon to capture practices of retrofit, care, and repair. Even in its limited form of expression in regional plans, such as "transition to a low carbon economy" and future carbon neutrality predicated on spatial, infrastructural, and

technological integration, and its explicit expression in the *Queensland Climate Transition Strategy* policy documents, regionwide transition is prescribed as a generic and generalised condition.

This analysis finds that in the SEQ regional context, regional planning is playing some role in infrastructure transitions but experiences a tension between its constraints and a broad strategic remit. The socio-technical transitions perspective affirms that planning can be limited and limiting in its support for sustainable transitions and new or alternative types of planning are needed for infrastructure system transitions. The regional planning, while disavowing 'business as usual' is constrained in envisioning alternative systems or transition pathways as well as enacting alternative forms and type of policy. Policy has a role to play in transitions by "creat[ing] conditions for new markets; creat[ing] spaces for interests, values and dreams to meet, and shift[ing] resources (time, money, power, ...) towards the niche", recognising that niche activity occurs in different levels at different times (Beers, 2016, p. 175). A breadth of niche dynamics is currently at play in society, for example, grassroots organisation for alternative economics, just transition, and rescaled modes of production and consumption. In the regional planning context, these interests and grassroots niches are marginalised through limited forms of participation and engagement.

The perception that planning is undertaken by incumbents for incumbents affirms a regime based lock-out, rather than suggests that policies and plans are developed in ways that weaken incumbent regimes and the influence of vested interests who are perceived as having captured the planning process (Boons et al., 2019; Marletto, 2016). Given their basis in co-evolutionary non-linear pathways, transitions are described as fuzzy and messy involving combinations and recombinations of complex relations through tensions in stability and change, subjectivity and materiality, and agency and structure. With claims for sustainable development, innovative planning, and sustainable transport, regional plans and policies do not significantly explore such system learning. Instead they tend to reconfigure contexts and relationships incrementally and in the name of sustainable development, although with mixed results. Planning that is perceived as predicated on a development imperative or economic imperative asserts urban and infrastructure development in competition with socio-ecological care and transition. Despite the momentum in the introduction of regional planning in 2005, the acknowledgement of mounting complex problems and the assertion of sustainable transitions, the response of subsequent iterations of plans and policies to pressing challenges and infrastructure transitions has not been commensurate with their precipitation and urgency.

Appendix One
Interview Questions – Semi-structured Interview

Introduction

This project is being undertaken as part of PhD research at QUT.

The purpose of this project is to examine the role of regional planning in sustainable infrastructure transitions through a case study of transport in the South East Queensland Regional Plan. This involves addressing the relationship between sustainable transitions, as long-term shifts in combined social and technological (socio-technical) dynamics, and planning.

Questions – Semi-structured interview

Context

First, I would like to know a bit about your involvement in the regional planning in South East Queensland

- How many regional planning processes have you been involved in? What are your reflections on these? If involved in more than one regional plan, how did the planning processes compare?
- Describe your role in SEQ Regional Planning? What Committees, Interest Groups or Reference Groups were you involved with? In what capacity did you represent an organisation, issue, sector or other interest (e.g. industry)?
- After three plans what do you think regional planning has contributed to South East Queensland?
- What are your observations of how planning and other policies has dealt with infrastructure and mobility in the region?

Transitions

- *Note: The phrase 'transition to a low carbon economy' was included in both the 2009 plan and the 2017 draft.* How was sustainable transition discussed or understood in the planning process, if at all?
- How were options for change in infrastructure systems and mobility presented or explored?
- How did the planning address new technologies or technological change - particularly in relation to infrastructure, mobility and transport systems?

- I am interested in hearing about any experimental, exploratory, alternative or novel approaches that were evident in the planning process? If they occurred, how did they inform the planning?

- What technologies were given priority in the planning process? How did that manifest? Was it perceived as constant or changing?

Learning

- Describe the mix of stakeholders or participants in the planning process that you were involved in?
- How did the groups of stakeholders reflect on the policy mix and the relation of the regional plan to other policies particularly in relation to sustainability, infrastructure and mobility?
- How did learning, searching, lessons and altered understanding of issues, places and responses occur in the policy making context?
- How difficult or easy was it to introduce new thinking, policy ideas, processes and the like into the planning process in relation to mobility and infrastructure? Do you have an example?
- Is there anything else you would like to say about the relationship between regional planning, infrastructure and mobility, and sustainable transitions in SEQ?

If, after reflecting on this interview, you think of other things you would like to say please feel free to be in touch.

Thank you for your time and thoughts today.

Prompts/Probes

It may also be necessary to include prompts or probes to elicit more information during the interview. These may include:

- Could you please explain what you mean?
- It sounds like you are saying ... / Is that an accurate summary?
- Can you please tell me more about that?
- Why do you think that happened?
- Can you please provide an example?
- What sort of response did you receive?
- How could it be done differently?

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