

Intermediaries and learning in sustainability-oriented urban transitions: a transdisciplinary case study from Stellenbosch Municipality

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Abstract

This research follows the experiences of an embedded transdisciplinary researcher in tracking an evolving governance arrangement between Stellenbosch University and Stellenbosch Municipality, in the Western Cape of South Africa. The Rector-Executive Mayor Forum demonstrates a joint response to the myriad of urban sustainability challenges in the greater Stellenbosch region. This research explores how the process of collaboration and learning within this space of intermediation was initiated, structured and facilitated. It elaborates on the dynamic nature of this unfolding engagement and highlights potential lessons for innovative urban governance practices, particularly in small- to medium-sized cities in Southern Africa. Further, it adds to the development of a Southern African perspective on transdisciplinary research and demonstrates its integrative potential for illuminating various interlinking and emergent urban learning dynamics. This is done through an analysis of the transdisciplinary research engagement within Stellenbosch Municipality using a framework of urban learning that draws together three modalities of urban learning—transition management, the Learning City and Urban Assemblage approaches.

Bios:

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1. Introduction

Looking to the urban future requires urban practitioners to think radically differently about how human societies are organised in relation to both the socio-technical systems that conduct and shape our production and consumption patterns, and the natural world in which socio-economic systems are embedded and rely upon.

Cities and metropolitan regions comprise the world's most complex nexus of social, political, economic and ecological systems (ICLEI 2014). As of 2007, cities are home to the majority of the global population, and where approximately 75% of global resource consumption occurs (Hodson et al., 2012). Upward trends in urbanisation and population growth have implications for the manner in which cities affect ecological systems. However, as “unique spaces that connect a wide range of actors, networks, infrastructures, resource flows, cultures, social processes, and histories, within specific biophysical, ecological, and political contexts”, cities offer significant potential in finding ways to reconcile economic growth, human wellbeing and the sustainable resource use (Hodson et al., 2012: 789). As cities are the focus of this population and economic growth, they are increasingly acknowledged as the localities where the reconfiguration of our socio-technical and socio-ecological systems should take place (Hodson et al., 2012).

Tackling sustainability at the city level require steering transition activities in positive directions and requires innovative approaches to management and collaboration. This will require the building of supportive frameworks and coalitions of shared interest, particularly at the city scale since “cities are at the point of intersection between the nature of the global economy, the environmental crisis and the second urbanisation wave” (Swilling et al., 2011: 1). (Swilling et al., 2011). Smith et al (2005) suggest that system change is “enacted through the coordination and steering of many actors and resources, whether these are intended or emergent features of transformation processes” (Smith et al., 2005: 1492). Governance for sustainable development requires the reorientation of development trajectories so that genuine social advance can be sustained (Meadowcroft 2007). Using social learning approaches, interventions need to be oriented towards genuine sustainability goals. Recognising the connection between thought and action, it is becoming increasingly clear that “to break deeply entrenched unsustainable patterns demands a new kind of thinking inspired by powerful learning processes that simultaneously lead to individual and collaborative action and transformation” (Wals & van der Leij 2007: 17).

For the African continent, the rapid transition to a predominantly urban population has vast implications for the way we think and act in our cities (Parnell & Pieterse 2014). With unique urban challenges, finding pathways towards sustainability in towns and cities across the continent presents a critical task for urban practitioners. Swilling and Annecke (2012: xiii) explain that sustainability transitions necessitate “deep structural changes that will require extensive interventions by capable developmental

states, active commitments by progressive business coalitions and a mobilised civil society rooted in experiments that demonstrate in practice what the future might look like”. This research presented in this paper is an exploration of one such complex urban system in transition. It describes a transdisciplinary researcher’s account of various transformation processes in Stellenbosch Municipality (SM), in the Western Cape Province of South Africa. In response to pressing urban development challenges, a unique governance arrangement between Stellenbosch University (SU) and Stellenbosch Municipality, namely the Rector-Executive Mayor Forum (REMF) has resulted in two sub-committees—the Integrated Planning Committee (IPC) and the Infrastructure Innovation Committee (IIC) which have met bi-monthly since November 2013. This dynamic research context was an opportunity to investigate how transformative social learning processes within a space of intermediation were facilitated and supported by transdisciplinary research efforts. Ultimately, this case study from SM undertakes to generate insights on how urban actors learn as researchers and municipal officials seeking alternate and additional knowledge and resources participate in a fluid and constantly evolving urban governance arrangement.

Generating richer insights about sustainability transitions at the urban scale is pertinent and is a central aim of this paper. In this discussion that follows, this will be done by drawing together the concepts of space, intermediaries and learning and developing a framework of urban learning that is then employed in an analysis of the case of the REMF collaboration. The core argument presented in this paper is built on the following three points. First, cities are the spatial locality in which sustainability-oriented transition efforts must be deployed. Secondly, interventions to reconfigure cities as socio-technical systems require strategic facilitation and therefore transition activities must account for innovative approaches to governance and collaboration. Thirdly, orienting transition efforts towards favourable sustainability goals requires integrating social learning processes. Engaging with the sustainability transition literature in terms of these three concepts, provides an avenue through which to comprehend structural change in society. Following this, a framework of urban learning, underpinned by principles of transdisciplinary research, draws together three modalities of urban learning—transition management, the Learning City approach and Urban Assemblage—to better understand how urban actors learn in pursuit of sustainability-oriented transformation. Rather than asserting the suitability of any one of these modalities of learning in understanding how urban actors learn, a transdisciplinary framing of research engagement is helpful in illuminating elements of each approach and gives emphasis to dynamics aligned to transition management, the Learning City and Urban Assemblage approaches in this governance collaboration.

Contextualising the research

SM aims to position itself as a leading and innovative African city-region. Although it is relatively small municipality, it is faced with a myriad of developmental and urban sustainability challenges, experienced predominantly in the town of Stellenbosch, the municipality’s largest urban node. These

include substantial infrastructure backlogs due to long-term under-funding and insufficient provision for future demand, and ad-hoc spatial development which entrenches spatial exclusion and economic disparity. This complex, and seemingly intractable, dynamic hinders the municipality's mandate of delivering sufficient and equitable basic services and enabling inclusive local economic development. Realisation of an ecologically and economically sound development trajectory for the region is hindered by a lack of internal strategic coordination and long-term integrated planning. Historically, this is evident in the lack of coordination with private sector, civil society and research institutions, particularly with Stellenbosch University, an internationally renowned research institution around which the local economy is anchored.

Faced with seemingly insurmountable urban development challenges, particularly around the provision and planning of infrastructure services in SM, a few key officials have come to the realisation over the last few years that amongst themselves, and with the limitations of this local municipality, they have been, and will continue to be, unable to coordinate sufficient adaptive and innovative responses required to overcome these obstacles.

It is within this context that a set of relationships has opened up over the last decade and culminated in a unique governance arrangement between the university and municipality. The REMF, set up in 2005, has resulted in two recent sub-committees—IPC and the IIC. Constituting municipal officials and political representatives, selected private sector players, and university researchers and administrators, the IIC and IPC represent the coming-together of a diverse array of stakeholders with distinctive objectives and visions for the future, in an effort to jointly tackle the region's development and sustainability challenges.

Guided by a transdisciplinary research methodology, this research is the culmination of 20 months of intensive engagement, observation and participation as an embedded researcher in this unique and ongoing governance arrangement. It was characterised by an unprecedented and sustained level of access and involvement on the part of the researcher in an established and stable research environment. In this way, it served as an invaluable opportunity to investigate how this governance arrangement, underpinned by transdisciplinary principles, supported a space of intermediation and learning.

The progress thereof is demonstrated in two major recent outputs from the REMF that are set to completely transform the future developmental trajectory of the region. These include the draft Stellenbosch Spatial Development Framework (SSDF) produced by the IPC and the Stellenbosch Quo Vadis document produced by the IIC. Together, these documents reflect the outcome of nearly five years of debate and engagement between the institutions, particularly around issues of sustainable infrastructure development and spatial planning. They provide the basis for a large-scale program of collaborative innovation and design in Stellenbosch over the coming years. As important as the strategic contents of these documents are, the process by which they have been produced is perhaps more so.

The process has resulted in unprecedented cooperation between different departments within SM, and encouraged more meaningful integrated planning between the SU and SM.

From a shared problem statement to a unique research question

A transdisciplinary approach removed the obligation of entering this real-world context with a coherent, pre-defined and fixed problem statement. From the perspective of an embedded researcher, this helped to build a rich understanding of the dynamics of this intermediation space, and the broader environment in which the REMF sub-committees are located.

Embedded within this intermediation space, I was able to develop a research question and objectives informed by, and located within, the infrastructure and development related challenges that the IIC and IPC were tackling. Smith et al's (2012) framework of socio-technical transitions served as a bridge between the identified problem of a lack of capacity to initiate a sustainability transition in SM and my focus on a process-oriented research question. Smith et al (2012: 1492) suggest that "in the long-run, the particular form and direction of regime transformation, and the associated modes of governance, will depend on the transition context: a function of the availability of resources and how they are coordinated", (my emphasis). Thus, it follows that the transition context is a function of adaptive capacity. My focus on the process aimed to better understand a particular transition context in terms of how stakeholders went about accessing suitable knowledge, resources and partnerships and then in what manner these activities were coordinated within the intermediation space made possible by the REMF and its sub-structures. Since 'adaptive capacity' is an often indeterminable factor, difficult to quantify and measure (Pelling et al. 2008), developing a richer understanding of this transition context in terms of resources and coordination, necessitated examining the process of learning and intermediation that is facilitated.

Research question and objectives

My research question and objectives were shaped by a problem statement formulated by the IIC and used as a foundation for both the sub-structures of the REMF. This is captured by the following problem statement, generated by the SITT in 2012, and adopted by the IIC in November 2013 as its basis for continued discussions around infrastructure and development in the region:

"The current state of affairs relating to infrastructure in the Stellenbosch municipal area is that the existing landfill is full, sewage treatment plants have reached capacity, key components of the existing road infrastructure are failing and due for upgrading, water supply over the long-term is not secure and energy supplies are becoming increasingly expensive and are effectively capped until 2014/15 (or later). Therefore Stellenbosch cannot function properly and day to day management is under threat. Furthermore, there is a real risk that development applications cannot be approved in Stellenbosch because the required infrastructure to support future development is inadequate" (IIC 2014b).

This shared awareness of the imperative for meaningful transformation in how they manage the urban system for which they are responsible, has resulted in an openness to establishing and participating in a collaboration with SU, through the REMF and its two-committees, the IIC and IPC. It is also indicative of an absence of effective spaces for strategic, critical and creative engagement within the current configuration of their organisation. Additionally it points to insufficient adaptive capacity to contend with socio-technical, political and environmental pressures bearing down on the urban system for which they are responsible.

The question that guided the research presented in the paper is as follows:

In pursuit of urban socio-technical transitions, how is it that urban actors learn, particularly as they engage within a facilitated 'learning agora', supported by transdisciplinary research efforts that serve to enrich their understandings in way that reinforce multi-level learning processes?

In answering this question, the primary objective of the research was to:

Contribute to the literature on urban learning and socio-technical transitions by building a case for the role of cities, intermediaries and learning therein, from a transdisciplinary research engagement in Stellenbosch Municipality.

This necessitated a secondary objective to:

Become an embedded researcher, immersing myself in an innovative governance arrangement between Stellenbosch University and Stellenbosch Municipality.

2. Space, intermediaries and learning in sustainability transitions

Van den Bergh et al (2011) present a framework of transition theory which outlines four distinctive paradigms within which to comprehend complex long-term processes and demarcates the most prominent perspectives on societal transitions.

The first stream of sustainability transition theory is the innovation systems approach. Until fairly recently innovation systems have focused solely on achieving and enhancing economic development and thus the shift towards mobilising innovation systems to affect institutional change towards sustainability, additional to economic development, is significant (Hekkert et al., 2007). Sustainability-oriented innovation systems constitute a new approach to innovation systems research premised on the necessity for decoupling economic growth from environmental impact (Altenburg & Pegels 2012; Stamm et al., 2009). The second stream of transitions research, according to van den Bergh et al (2011), is that of the Multi-Level Perspective (Geels 2002; Geels 2004). The complex array of actors, institutional, artefacts and interrelations implicated in transition processes are situated within a multi-level three-tiered framework consisting of the macro (landscape), meso (regime) and micro (niche) levels. "Sustainability transitions are conceptualised as shifts from one stable socio-technical configuration to a new one by interacting processes at the different 'levels' of landscapes, regimes and

niches” (Coenen & Truffer 2012: 369). The complex systems approach is based on the idea that transitions can be best understood as changes in complex (socio-economic) systems (van den Bergh 2011). Avelino and Rotmans (2009) refer to the transition of societal systems as complex adaptive systems, examined in terms of non-linear and long-term processes of change. “A transition occurs when a social system moves from one dynamic state of equilibrium to another through a sequence of alternative phases of relatively fast and slow dynamics which form a non-linear pattern” (Avelino & Rotmans 2009: 545). As the fourth transitions orientation, the evolutionary systems approach argues that like cultural transitions, a sustainability transition will occur by means of an evolutionary process (van den Bergh 2011).

Spatiality and sustainability transitions

Van den Bergh et al’s (2011) four orientations towards transitions present sophisticated accounts of the dynamics and processes of transitions for understanding how change in society takes place. There is evidence to suggest however that the spatial and institutional contexts in which transitions unfold could receive closer attention (Markard et al., 2012; Hodson & Marvin 2010). Raven et al (2012: 76) find that transitions studies focus predominantly on the national level, failing to account for socio-technical change as being “configured and emerging out of interactions between actors situated in structures with different temporal dynamics that are spatially heterogeneous.” Hodson and Marvin (2010) reiterate that this often implicit emphasis on national scale transitions leaves the role for sub-national scale murky, especially that of the role of cities and urban socio-technical transitions. And much like the rationale for a city system of innovation, Hodson and Marvin (2010) find it ‘surprising’ that urban transitions are given so little attention since cities are sites of intensive economic activity. Coenen and Truffer (2012) call for a more “pronounced and explicit focus on the territorial embeddedness and the multi-scalarity of sustainable transitions” (2012: 369). Recognising the unique spatial and often temporal nature of transitions needs to be sensitive to the differentiated capacity of cities and urban regions’ capacity to shape transition processes. This emphasis on the ‘territorial embeddedness’ recognises that spatial contexts matter and sheds light on the ‘institutional contingencies and particularities’ of spatial contexts where transition pathways unfold (Coenen & Truffer 2012).

Drawing together the four formulations of transition theory in terms of how each relate to space, there seems to be sufficient consideration of the locality of transitions in order to overall, reconcile transition theory with the spatial aspect of sustainability transformation. The innovation systems perspective recognised the various levels at which systems of innovation might be cultivated ranging from the national or sectoral scale right down to the regional or city level. The MLP perspective is criticised for its spatial naivety although Hodson and Marvin (2009; 2010), Coenen and Truffer (2012) as well as Raven et al (2012) give attention to how this shortcoming might be addressed in the further development of the MLP. The complex systems perspective is sensitive to the nested levels within complex adaptive

systems. The fourth orientation, the evolutionary systems perspective, relates least to the spatiality of transitions and rather offers complementary thinking to develop and extend current transition thinking.

Intermediaries and sustainability transitions

The issue of stimulating and managing processes of transformation has raised much attention in the field of sustainability transitions (van Lente et al., 2003). Jorgensen (2012: 997) states that “the location of agency is at the core of discussions in transition theory.” This is important given that “transition studies aims to understand the trajectories towards new socio-technical regimes and argues for agency-centric perspectives to explain processes of change” (Ferguson et al., 2013). Transitions might appear spontaneous however “changes in socio-technical systems can often be traced back to strategic interventions of particular actors. Innovation and transition processes, in other words, do not just emerge from a rather unintentional interplay of actors that pursue their own narrow strategies. Instead they may be strategically shaped by players with some kind of a ‘larger plan’ or vision—at least to a certain extent” (Farla et al., 2012). Within this wider discussion of the necessity for more actor- and agency-centric perspectives on transitions, the role of intermediaries has become increasingly prominent, extensively explored and written about (Guy et al. 2011).

Faced with increasingly complex interactions and interrelations between societal actors, governance is framed as the move towards broader forms of socio-political coordination between public, private and civil society actors. The concept captures the growing complexity of the institutional structures, political process and social relations involved in broadening the ways in which collective goals and societal interests are advanced (Moss 2009). With this understanding of governance, Hodson et al (2011: 158 most recent) state that “the rise of new intermediaries means thinking beyond the capacity of the state, public agencies, social movements and commercial companies to explore how it is that interrelationships between them, within particular contexts, can generate added value that contribute to sustainable practice.” The necessity for intermediaries is further motivated by Hodson and Marvin (2010) who suggest that there is a “need for effective coordination of capacity and capability to initiate and attempt to enact system transitions” (Hodson & Marvin 2010: 484).

As the name implies, intermediaries are often those actors operating in-between other, often more formal and distinctive domains. However, no clear definition or conceptual understanding exists (Moss 2009; Guy et al. 2011). The term is employed across a wide range of literature to explain the work of individuals or organisations operating between and within other actor groups (Moss 2009). Regardless of their form, intermediaries are distinguished by the intentional relational work they perform as well as their positions between other actors or entities (Moss 2009). “This emphasis on deliberation is of particular relevance for addressing the governance dimensions of intermediation” (Moss 2009: 1483). Hodson and Marvin (2009: 521) explain that “intermediaries are deliberately (rather than neutrally) positioned to act in-between by bringing together and mediating between different social interests.”

This is done for the purpose of producing outcomes that would not have been possible, or as effective, without their involvement (Hodson & Marvin 2009).

It is evident that intermediaries and intermediary work are prominent in three of the four formulations of transitions that van den Bergh et al (2011) demarcates. Each of these perspectives offers a unique conception of how intermediation contributes to the structuring and furthering of transition processes and makes it possible to assert that in general, intermediaries and intermediation processes are recognised in an agency-centric framing of transition theory. Even with this conceptual recognition of intermediaries in sustainability transitions, further case study explorations thereof are necessary.

Learning and sustainability transitions

Safarzynska et al (2012: 1020) highlights that in transition research “much emphasis is placed on the process of social learning through which knowledge develops during interactions between various stakeholders”. References to learning are evident across the transition theory orientations however there seems to be an insufficient and in many cases superficial consideration of learning in transition frameworks.

The necessary spatiality of transitions has been established, along with the recognition of intermediaries and intermediation for a richer understanding of the agency within transition contexts. Overall, a general recognition of learning is evident although learning as part of transition processes is somewhat taken for granted and not sufficiently conceptualised in transition theory. Having established tenable connections between transition theory and spatiality and intermediaries respectively, a gap in the transition literature is revealed with respect to the conceptual integration of learning and learning processes. This points to the necessity of exploring processes of intermediation and learning in urban transitions as part of applied research and transdisciplinary engagement.

3. Research Methodology

Transdisciplinary research efforts were fundamental to the structuring and facilitation of the REMF as a space of intermediation and learning. The following section motivates these efforts from the perspective of transdisciplinary research responding to the demands of sustainability science and instrumental for the creation of a ‘learning agora’ in the case of the REMF. This is followed by a brief overview of specific research methods employed in developing this research paper.

Sustainability Science, transdisciplinary research and the ‘learning agora’

The recent emergence of the distinctive domain of sustainability science is indicative of the shifting demands on knowledge production and responds to the complexity of sustainability challenges (Kajikawa et al., 2014, Kauffman & Arico 2014, Burns et al., 2006; Jahn 2008; Hirsch 2006; Bunder & Reegers 2009). The distinctive mandate for sustainability science is developing knowledge that is “user-inspired and, at its best, provides solutions to real-world problems encountered for the needs of a

sustainability transition” (Kates 2010 in Kauffman & Arico 2014: 413). Burns et al (2006: 380) offer a definition of sustainability science as “research that produces knowledge that is immediately useful for policy and management. It therefore has a goal of integrating science and technology with other sources of knowledge to inform problem-solving decisions. This requires operating within a ‘knowledge system’ comprising networks of linked actors broadly classified as producers and users of knowledge. In other words, both the problem to be solved and the knowledge needed to solve it are defined collaboratively in the conduct of sustainability science”. Kajikawa et al (2014: 432) emphasise how sustainability science must take place in the real-world and so “we have no alternative but to engage society in collaboration and to attempt change in an environment that requires transdisciplinary practices.”

Pohl (2010: 75) identifies four key features of transdisciplinarity—the focus on socially relevant issues, the transcendence and integration of disciplinary paradigms, an emphasis on participatory research and the search for a unity of knowledge between disciplines. Bunders and Regeer’s (2009: 42) definition of transdisciplinarity captures this inherent diversity by explaining that “transdisciplinarity is an umbrella term for all kinds of efforts towards reflexive co-evolution of science, technology and society. It creates interfaces between science and society to address challenges, by generating knowledge and solutions for unstructured problems.”

Collaboration and multi-stakeholder participation processes are integral to transdisciplinarity (Kauffman & Arico 2014, Schneider & Rist 2014, Kajikawa et al., 2014, Burns et al., 2006; Wickson et al., 2006, Polk 2014). The integration of stakeholder knowledge, skills, and resources must be produced “through collaborations among disciplines and actors within and outside the academy in robust participatory and iterative processes that recognise policies and proposed solutions as experiments and that foster societal as well as scientific learning and advancement” (Kauffman & Arico 2014: 417).

The difficulty in achieving such robust transdisciplinary knowledge is connected to three major barriers. The first is the lack of institutional support and appropriate structures for transdisciplinary activities (Polk 2014). Regarding the setting for transdisciplinary approaches, these “require new rules and norms that merge both academic and practice-based requirements and mandates” (Polk 2014: 449). Polk (2014) identifies the other two challenges as insufficient participation from stakeholders or practitioners and unbalanced problem ownership.

Polk (2014) suggests that to overcome these distinctive challenges, transdisciplinary approaches must create a space where science and policy can meet and interact on equal terms. Polk (2014) suggests that this hybrid space must exist alongside, but not entirely separate from, the formal confines of disciplinary, administrative and political cultures. Instead, these meeting places need to be highly embedded within both spheres in order to enable actors to break the boundaries between diverse

knowledge and expertise (Polk 2014). These sites of interaction are critical for producing necessary participation and knowledge integration which can more effectively bridge the gap between science and policy spheres (Polk 2014).

As Polk's (2014) first barrier suggests, the challenge for transdisciplinary research remains more than creating actionable or socially robust knowledge in the hybrid space, but how to ensure that co-produced knowledge is still compatible with institutional structures and decision-making processes (Polk 2014). Operating as a transdisciplinary researcher is about facilitating the creation of such institutional settings where engagement and collaboration allows opportunities for diverse knowledge integration and problem solving. Considering the institutional settings for transdisciplinary activities is a core component of unpacking this methodological approach.

Within these institutional spaces of intermediation, transdisciplinarity is about joint problem solving and mutual learning as part of a social learning process (Scholz et al., 2000; Schneider & Rist 2014; Reyers et al., 2009). The generation of the three types of transdisciplinary knowledge (systems, target and transformation knowledge) "takes place within an interactive learning process, involving discussion and negotiation, and leading to a common knowledge base which may fulfil scientific standards (validity), demands of the political and administrative systems (policy relevance) but also social robustness (societal relevance)" (Schauppenlehner-Kloyber & Penker 2015: 59).

Such an interactive and holistic learning process is about the personal development of stakeholders in the form of the reflexivity, questioning and possible integration of underlying assumptions, knowledge, goals and values (Wittmayer & Schapke 2013). Pohl et al (2010: 270) offer the concept of an interactive and permeable learning agora with the transdisciplinary approach creating an in-between space "in which the boundaries are provisionally blurred." It is within the agora that according to Wittmayer and Schapke (2013: 485) "science and society address real-world problems, generate knowledge, formulate solutions and pilot actions for a more sustainable future." This aligns with Polk's (2014) recommendation that transdisciplinary spaces of intermediation need to find a balance between being embedded in and suspended from formal structures. Pohl et al (2010: 270) continue to explain how interaction with the agora contributed to learning processes: "the resulting 'messiness' of 'divided identities' is the necessary condition for engaging with 'others' and ultimately helping to reshape the involved groups' 'perceptions, behaviour and agendas that occur as a function of their interaction." The purpose of this messiness is summarised by Wittmayer and Schapke (2013: 485): "overall, these spaces are characterised by the co-construction of social reality by their participants—common futures, lived reality, social identities and roles are all negotiated within them."

Transdisciplinary research at Stellenbosch University and the REMF as a space of intermediation

Polk's (2014) notion of a hybrid space, and Pohl et al's (2010) 'learning agora,' in which stakeholders from science, policy and society can meet and interact on (ideally) mutual terms resonates strongly with the REMF.. Underpinning this collaboration was a commitment to transdisciplinarity and the recognition by the Rector, supported by a number of key figures within the university, that shifting demands on universities necessitate the creation of innovative engagements with society. It has evolved into a formalised experiment in transdisciplinary research and a unique governance arrangement between these two institutions. The REMF sub-structures, and indeed the overarching collaboration between Stellenbosch University and SM, are the outcome of a consistent, tedious and painstaking decade of relationship building and agenda setting, in both formal and informal contexts, between key officials in both institutions. However, as is the nature of institutions, high ranking political and administrative positions have shifted—people have entered and exited the system, with varying involvement in and sentiment towards the REMF partnership. This has presented numerous challenges in retaining a culture of collaboration between the university and municipality through the REMF. Fortunately, the long-standing position and tenacity of a few university researchers from the School of Public Leadership, has been instrumental in sustaining this effort and securing the participation of student researchers, such as myself, as animators of the transdisciplinary research process. A growing attitude of openness and acceptance towards these students within the IIC and IPC has allowed more students to enter into, contribute to and move fluidly through the processes. In my view, this embodied a tacit, shared recognition of the importance of fresh ideas and diverse perspectives within a space of collaboration that has, largely, been unencumbered by conventional power structures that might dilute the interaction between student researchers and stakeholders. It demonstrated a progressiveness of thinking amongst stakeholders as well as the more realistic demand for additional research and administrative support.

At no point has the REMF been framed as a research endeavour driven and owned by the university and so a transdisciplinary methodology has not been explicit or neatly pursued. The initiative is operated in a manner which attempts to emulate this joint responsibility—meetings are scheduled monthly and alternate between being hosted in university or municipal chambers and chaired by either the Rector or the Executive Mayor. This shared responsibility has set a precedent for a similar attitude in initiatives borne from the REMF, such as the IIC and IPC. As REMF is recognised at the highest level of both Stellenbosch University and SM, this has implications (both problematic and advantageous) for the positioning and legitimacy of its sub-committees. Its recognition, is heavily reliant upon the reputation, rank and credibility of the key officials that have driven the REMF over the last decade. This has required discerning and pragmatic facilitation and speaks to the unique demands on transdisciplinary researchers within spaces of intermediation and learning such as this.

The Transdisciplinary Case Study

Transdisciplinary research serves as an umbrella term for a broad range of methods and tools. In this case, an appropriate mix of qualitative strategies were employed to generate the required systems knowledge, target knowledge and, most importantly, transformation knowledge required to address the various research objectives.

In a period of intense engagement between August 2013 and April 2015, I actively took part in the REMF's subcommittees, more specifically in the IPC's SSDF process as well as the closely related IIC. Operating as a participant observer, I became a member of the core SSDF team and took on the responsibility of coordinating the IIC. Fulfilling integral functions, these roles allowed me multiple perspectives to take part in and reflect on the unfolding initiatives. This engagement has seen me attend over 90 events including outings, workshops, formal and informal meetings, and semi-structured interviews. During this time, I had the opportunity to engage informally with the wide network of stakeholders associated with these processes as well as conduct 10 semi-structured interviews with core members. This was fruitful in building a network of connections and a comprehensive understanding of the context. Assisting in a sustained, part-time capacity and developing professional relationships afforded me direct access to key role players as well as sometimes sensitive or restricted information.

The research began with a comprehensive literature search in order to build a conceptual case for the role of intermediaries and learning sustainability-oriented urban transitions. Case study research constituted the overarching framework for the collation of information and insights given its congruence with transdisciplinarity and given that it draws from a variety of supporting tools and methods. In this qualitative research, I unavoidably served as the primary research instrument by locating myself in a real-world setting that was fluid in time and space (Yin 2011). Using my discretion, I aimed for methodological consistency in developing a set of methodological tools and employing these in appropriate combinations. In practice, a pluralistic methodological approach made use of participant observation, ethnographic and narrative research and semi-structured interviews and content analysis of grey material. Reflexive research methods such as ethnographic and narrative research helped to focus attention on my own agency as a researcher.

4. A conceptual framework of urban learning

“A regime shift cannot occur without changing worldviews, institutions, and technologies together as an integrated system” (Safarzyńska 2012: 1014). Learning, for individuals and in social settings, is an essential mechanism in transforming preferences, behaviour and institutions in sustainability transitions. Each formulation of learning sets out principles and strategies for structuring a learning environment. Seen together, and underpinned by a transdisciplinary research approach, they provide a more robust strategy for creating spaces of intermediation that cultivate social learning for sustainability. As opposed to asserting their individual merit, this framework acknowledges how a

transdisciplinary approach serves to integrate the contributions of transition management, the Learning City and Urban assemblages approach and gives emphasis to particular dynamics stemming from the respective framings.

Social learning

Social learning is the chosen foundation for engaging with urban learning because it advocates for learning beyond the individual, is about developing interaction and joint action within groups based on alternative perspectives on reality (Safarzyńska et al., 2012; Reed et al 2010). It refers to the way in which individuals and groups question and reflect on the values, assumptions and policies that drive their action, and in turn find ways of changing them. Creating stimulating environments where diverse stakeholders can comprehend the perspectives, motives and visions of one other and in turn develop shared understanding for joint action, is crucial for achieving social learning. Transition Management, The Learning City and Assemblage Theory are three frameworks which offer strategies for creating such learning environments.

Transition management

At the core of its relevance to a framework of urban learning is how TM implies an entirely different governance approach, one that “views social change as a result of the interaction between all relevant actors on different societal levels within the context of a changing societal landscape. Managing societal change thus becomes the organization and coordination of this interaction; a way of indirectly influencing, adjusting, redirecting and guiding actions” (Loorbach 2007: 80). This exemplifies a reflexive governance approach since transition management is a process which challenges societal actors to jointly scrutinise and reconsider the underlying assumptions of how socio-technical systems are structured, practiced and governed (Hendriks & Grin 2007; Voß, Smith & Grin 2009).

Facilitating multi-stakeholder engagement, oriented towards long term social change and sustainability goals is central to transition management (Loorbach 2007; Avelino & Rotmans 2009; Kemp & Loorbach 2006). The distinctive features and iterative phases of transition management are operationalised within the transition arena—a carefully constructed social environment or engagement space for a selective number of creative, strategic and visionary societal actors. Transition management’s primary contribution to a framework of urban learning is the notion of a transition arena as a protected space for a multi-stakeholder engagement process focused around the development of a long-term transition agenda towards sustainability. Initiated and guided by an organised transition team, a transition management process can be structured around a wide range of societal problems. The explicit leadership and facilitative role taken on by the transition team in bringing together a group of frontrunners and strategically positioned stakeholders is another distinguishing feature of the transition management approach. The transition arena is about “opening out the decision space, establishing new

coalitions of actions, and encouraging societal learning about various alternatives” (Meadowcroft 2009: 337).

As a new field of governance, transition management is a specific conceptualisation of steering for sustainability and the transition arena is one of its strongest contributions. “Transition management can therefore be seen to propose a new governance community or arena between government and market that allows for long-term reflection, innovation and social learning and collective goal- and strategy-formulation” (Loorbach 2007: 82).

The Learning City

Linked to the economic performance imperative, an evolving conception of urban governance has allowed for the emergence of a multiplicity of development approaches; the learning cities approach is one such metaphors around which space, people and economic activities are organised in urban localities. Distinctive from transition management as a governance strategy that aims to cultivate social learning within carefully orchestrated transition arenas, is the perspective of learning cities where knowledge- and innovation-based development can lead to improved economic performance and competitiveness at the urban and regional scale (Campbell 2009; OECD 2001). This approach has been adopted as an explicit development strategy by cities across the world as leaders aims to create the conditions for continuous learning and innovation that allow leading cities to keep pace with socio-economic, political and environmental challenges (OECD 2001; Campbell 2009; Campbell 2012).

Campbell’s 2012 publication, *Beyond Smart Cities: How cities network, learn and innovate*, represents the most comprehensive research done in the field of learning cities. It is an effort to illuminate the learning aspect of urban development and whilst it acknowledges that all cities have the potential to learn, innovate and adapt, the learning cities agenda is most closely aligned with cities that approach proactively integrate a learning perspective into their governance strategies. Its implications for urban governance strategies are evident in how the learning cities approach builds on cooperation, partnership and knowledge exchange with other cities as part of wider urban learning networks coupled with a stronger focus on collaboration and participation with local public, private and community actors (Bontenbal 2009: 63). “The key step is to facilitate exchange in cities, internally and externally, but above all to create an atmosphere of trust involving a wide swath of stakeholders” (Campbell 2012: 13). Finding the reason to learn, and assembling a platform that reflects the common interests of key stakeholders, constitute indispensable parts of the process” of creating a conducive environment for urban learning (Campbell 2012: 68).

Urban Assemblage

An assemblage approach to urban learning builds on a post-rationalist perspective on knowledge and provides novel contributions on how knowledge is created, how it is communicated and the ways in which learning take place. A rationalist perspective on knowledge and learning, where knowledge is a

commodity and the transfer of knowledge a technical process, has the effect of separating knowledge from politics and context (McFarlane 2009). An assemblage perspective on knowledge and learning is an attempt to reintegrate these aspects. Thus, knowledge is characterised as being situated in systems of ongoing practices, as relation and mediated by artefacts, being rooted in a context of interaction, acquired through different forms of participation in communities of practice, and continually reproduced and negotiated and thus always dynamic and provisional (McFarlane 2009).

Assemblage “allows us to move away from a notion of the city as a whole to a notion of the city as a multiplicity, from the study of ‘the’ urban environment to the study of multiple urban assemblages” (Farais 2011: 369). In this way, assemblage urbanism focuses on the multiple ways of dwelling in the city, the various networks, localities and communities of interaction and communities of practice implicated in the multiple ways of constructing the city (Farais 2011, Blok 2013). McFarlane (2009: 5) argues for learning as “partial, social, produced through practices, and both spatially and materially relational”, essentially that which emerges through practical engagement with the world. McFarlane (2011) positions learning as a process and an outcome and as such learning is actively involved in changing or bringing into being particular assemblages of people, resources and knowledges.

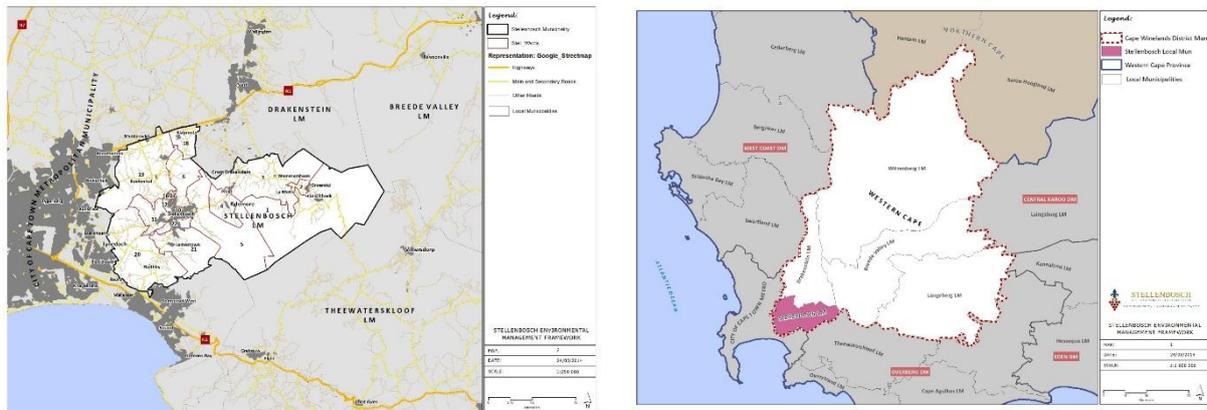
Assemblage highlights the spatiality of learning since it is constituted through socio-spatial interactions (McFarlane 2011). Further, learning is framed as a constructive act of world-making, rather than occurring prior or following from engagement in everyday practices (McFarlane 2011). “Assemblage is used to emphasise the labour through which knowledge, resources, materials and histories become aligned and contests. It connotes the processual, generative and practice-based nature of urban learning as well as its unequal, contested and potentially transformative character” (McFarlane 2011: 1). An assemblage perspective on knowledge and learning is helpful in grounding these processes in particular, distinctive urban localities. As opposed to the previous two conceptions of urban learning which have a strong governance approach, assemblage is based in a vastly different conception of knowledge and advocates for a means of engaging with how city is assembled and constituted through diverse learning processes.

5. A Transdisciplinary Case Study from Stellenbosch Municipality

Introducing Stellenbosch Municipality

Stellenbosch Municipality is situated roughly 50 km from Cape Town in the Western Cape Province of South Africa. It is one of five local municipal authorities in the Cape Winelands District Municipality. Since the formation of a unitary Stellenbosch Municipality a decade ago, this local municipality has had to bring together previously separate administrations. The municipality’s area of jurisdiction now includes the town of Stellenbosch, stretches past Jamestown and Raithby in the south, to Bottelary, Koelenhof and Klapmuts to the north, and over the Helshoogte Pass to Pniel, Kylemore, Gorendal and Franschhoek in the east. The municipal region covers around 900 km² is comprised of 22 separate wards

and has a total population of roughly 155 000 people, according to municipal figures (SM 2015). This figure is contested, with other sources indicating a population as high as 220 000 (Swilling et al. 2012). Regardless, the region, and the town of Stellenbosch in particular, is a focal point for growth.



The municipality is located in the heart of the Cape Winelands which is dominated by agricultural land of high historic, cultural and aesthetic value and globally-important natural habitats (SM 2014). The area has a long history with the town of Stellenbosch having been established in the late 1600’s. Historically, the greater Stellenbosch area is an agri-based economy and more than 40% of the total land area has been modified through cultivation (SM 2014). It now includes well developed tourism, education, research and agricultural industries whilst moving towards a more tertiary services-oriented economic focus supported by a growing manufacturing and construction industry.

Set within this network of agricultural and conservation areas, is a network of urban settlements. The municipality has two major towns—Stellenbosch and Franschhoek—and a range of other formal, more rural and informal settlements (SM 2015). Stellenbosch is the largest of the municipality’s fourteen official urban nodes and is the urban centre around which the local economy is anchored (IIC 2014b). The town is one of South Africa’s oldest formal settlements and like most South African communities, it exhibits considerable inequality (Ewert 2013). It also has to contend with many of the same challenges (Nicks 2012). The town’s urban fabric is reminiscent of the “suburban dream of apartheid planning” given its fragmentation and physical segregation”, even so, Stellenbosch “offers an urban experience of a quality and intensity unique amongst South African towns” (Nicks 2012: 24).

The many faces of Stellenbosch deliver vastly incongruent experiences for residents, employees and visitors. And despite Stellenbosch’s apparent prosperity, its flourishing tourism, manufacturing financial and agricultural sectors, “this picturesque town has its fair share of ‘ugly’ poverty” (Ewert 2013: 1; Nicks 2012). This highly divided town thus reflects a microcosm of the wider patterns of inequality within South Africa, and indeed, those institutionalised in global patterns of disproportionate production and consumption (Swilling & Annecke 2012). Despite this seemingly dismal set of circumstances, Stellenbosch is also endowed with “extraordinary intellectual capacity with the university at the heart of the community, social diversity, financial resources, creative potential, high

value eco-systems, spiritual energy and some of South Africa's most vibrant grassroots social movements in its poorest areas" (Nicks 2012: 31). It is widely recognised that Stellenbosch and the greater Stellenbosch region is characterised by a remarkable and unique concentration of capabilities, resources and opportunities, a favourable position from which to contend with these development challenges (Swilling et al. 2012).

Towards collaborative governance

The institutional conditions enabling partnership and collaboration between the municipality and the university have been made possible, primarily, through the establishment of the Rector-Executive Mayor Forum in 2005 (Swilling 2014). In the early 2000's the Rector and Vice Chancellor Chris Brink at the time introduced the vision of a Stellenbosch as university town and undertook to reposition Stellenbosch University within a network or league of internationally renowned university towns. The implication of this, was the realization that in order to frame Stellenbosch as a university town, the university needed to rejuvenate its local roots, leverage its connections to a particular context and embed itself further in the dynamics of a distinctive municipal and regional system. What became apparent however was that the relationship between the two institutions was limited and in an effort to facilitate greater coordination between the university and municipality on a very practical level and to address greater strategic alignment, a monthly meeting was initiated between the Rector, Executive Mayor and key officials from the respective administrations.

The sustained effort to building this partnership between Stellenbosch University and Stellenbosch Municipality further served to reinforce the university's positioning within a global discourse—one which has been hugely successful and is now widely accepted. The introduction of The Hope Project, pioneered by the previous vice Chancellor and Rector Prof Russell Botman, and a strategic focus on 'science for society', further entrenches the positioning of the university as an institution embedded in its local context, and one cognisant of its responsibility to wider regional, national and international research imperatives. This attitude towards collaboration has been carried forward by university leadership as "the university endeavours to create the conditions that will ignite the imagination of scientists to solve problems in creative ways through basic and applied research and through multi-, inter- and transdisciplinary academic activities" (Swilling et al. 2012 2012: 4).

In 2012, *Sustainable Stellenbosch* was released and signifies a tangible outcome of the improved collaboration between SU and SM over the last decade. It is the product of diverse interactions between SU researchers and officials and councillors at Stellenbosch Municipality. The publication is the first of its kind—an interdisciplinary collaboration, that in the words of Mayor Conrad Sidego, has resulted in "a shared body of knowledge that, for the first time, provides an integrated understanding of the challenges Stellenbosch faces and the possible future solutions at its disposal" (Swilling et al. 2012: xi). In the words of Prof Russel Botman, the Rector at the time, "...the university has a social contract with

the town and all of its people. Unlike the conventional use of the term, which seeks to provide a legitimate basis for political authority, the university's pact with Stellenbosch entails a willingness to be of service to the community" (Swilling et al. 2012: xvii).

From the onset the REMF has provided a forum where officials of the university and municipality meet at least once a month to discuss issues of mutual concern and to coordinate their efforts in the promotion of human development (Swilling et al. 2012). From the municipality's perspective, a partnership with the university and more specifically the School of Public Leadership (SPL) and the Sustainability Institute (SI) was advantageous as it would support developing innovations for building of a green economy in the municipality (Swilling 2014; Swilling et al. 2012). As Mayor Conrad Sidego wrote in *Sustainable Stellenbosch* (Swilling et al. 2012: xi), "Innovations, however, do not happen just because they are needed. World-wide experience shows that spaces for engagement, dialogue, exploration and creativity need to be opened up and fostered, because it is from these kinds of spaces that innovations tend to emerge. Innovations are usually the outcome of intense interactions between researchers, investors and practitioners who manage to build sufficient trust so that they can jointly tackle complex problems. Without trust and these spaces for innovation, we will not overcome the challenges faced by Stellenbosch". The municipality's focus on innovation is demonstrated in its vision to become "*The Innovation Capital of South Africa*".

In the late 2000's, with housing a pressing issue in Stellenbosch, the focus of the REMF was first developing a sustainable housing strategy in the face of a considerable housing backlog (Swilling 2014). What emerged from research conducted by the SI together with SM in 2007 was that investments in housing must be part of a wider infrastructure strategy. This shifted the discussion with the understanding that, underpinned by pertinent sustainability issues, coherent and integrated infrastructure planning is imperative when thinking about the future of Stellenbosch. Over the next few years between 2007 and 2011, the REMF had a strong project focus with progress made in expanding the University's Mobility Plan and various initiatives such as Stellenbosch Free Wifi to improve connectivity Stellenbosch's CBD (Swilling et al. 2012).

The 2011 local elections were a turning point in the REMF collaboration and presented a window of opportunity for progress. In these elections the Democratic Alliance gained a majority, giving the party control of the municipality. This has been the first term in SM's recent history where a single party majority has allowed for some stability in council. Before that, the municipality experienced considerable volatility. It was around this time that two committees were set up as substructures of the REMF—the IPC and SITT. As the name implies, the IPC was conceptualised with an explicit focus on facilitating more effective integrated planning primarily between the university and the municipality. The SITT had a broader focus on the greater Stellenbosch area and from the onset, envisioned cooperation between municipal officials, researchers and practitioners.

In November the SITT was established and had the aim of “finding alternative, innovative and sustainable solutions regarding the provision of infrastructure services to the greater Stellenbosch area” (SITT 2011). Initial discussions recognised the importance of discussing and investigating the regulatory and institutional frameworks to facilitate this collaboration, an emphasis that alternate technologies must be employed in addressing infrastructure backlogs, the development of innovative funding sources and mechanisms to contend with restrictive municipal regulations and the importance of a supportive spatial framework (SITT 2012).

Stellenbosch Municipality has a complicated spatial planning history compounded by political instability (de la Bat 2014; Nicks 2011). According to Swilling (2014) the election of a majority in council in 2011 opened a window of opportunity to get a municipal-wide SDF document approved. The current approved MSDF was initiated in 2010 and adopted in February 2013 (Swilling 2014; de la Bat 2014). The approval of this MSDF was instrumental in laying the foundation for collaboration within the IPC and SITT / IIC.

Meeting regularly every second Friday during 2011 and 2012, the SITT forum drew in municipal councillors and administrators, provincial representatives, business stakeholders as well as university researchers and students. An objective was identified which proposed the “adoption of a local infrastructure financing framework that (guides) consideration, adoption and implementation of investment and financing schemes for the private sector to participate in the provision of infrastructure required to grow and sustain economic development” SITT 2012). This culminated in a set of Terms of Reference for the SITT which stipulated the overall of the forum was “to ensure that an integrated and sustainable Strategic Infrastructure Plan (is) developed for Stellenbosch that addresses the ‘condition’, ‘provision’ and ‘growth’ backlogs of the greater Stellenbosch area, with special priority for the Stellenbosch urban area” (SITT 2012). Particularities of the SIP were expanded as well as supporting aims of the SITT. A valuable contribution was the articulation of the infrastructure challenge in a succinct problem statement. A series of Work Groups were established to tackle these tasks; Institutional, Finance and Technology Work Groups were run by particular SITT members and were tasked with exploring key interventions and recommendations.

To support the SITT’s work of developing an SIP supported by a long term Financial Plan, the Palmer Development Group was contracted in April 2012 to develop a Municipal Services Financial Model for Stellenbosch Municipality. A comprehensive final report was completed in January 2013 with the model finding that capital expenditure of R4 455 million would be required over the next ten years to allow for eradication of backlogs, extension of services as the municipality grows and rehabilitation of infrastructure (PDG Report). However, this report was never formally acknowledged or carried forward as “for various internal political reasons the Mayor shut (the SITT) down in about August 2012 after it did some good and important work” (Swilling 2013). Over the next few months, various internal

discussions resulted in the reconceptualization of the SITT as the IIC and in November 2013, the first IIC meeting was held with political consent from the Mayor.

Re-establishing the IIC was no easy feat but the collaboration entered a new and rejuvenated phase. “The real achievement (of the SITT) was the creation of the relations of trust and understanding between officials and between officials and university representatives” (Swilling 2013). The other major contribution of the SITT was a problem statement that adequately captured the nature of the infrastructure logjam which then served as the basis for discussions going forward in the IIC. Similarly, the SITT was instrumental in corroborating the extent of the massive infrastructure backlogs and the considerable capital investments required to overcome these.

Chaired by Prof Mark Swilling, the IIC was convened in November and discussed the way forward. New working groups and coordinators were established—Finance, Energy, Water and Sanitation, Solid Waste, Transport and Institutional. Draft Terms of Reference were reviewed and a *modus operandi* outlined. The IIC, firmly positioned as a sub-committee of the REMF, continued to meet every second Friday, chaired by Mark Swilling and coordinated by myself and committed to ensuring regular feedback and open communication with relevant departments and structured in SU and SM. This was highlighted as one of the key failures of the SITT and a primary reason, according to the Mayor, why the committee was shut down. Still committed to the task of developing a Strategic Infrastructure Plan linked to a Financial Plan, the IIC put together TORs and a Founding Document which were distributed in early 2014. To cement political support, the first meeting of 2014 in late January hosted the Mayor and a number of Council members. This was helpful in setting a precedent in the IIC for transparency and regular communication. As the coordinator, I was committed to ensuring that meeting agendas and minutes were distributed to the Mayor, Municipal Manager and Municipal Directors, over and above regular communication with the IIC committee.

The IIC proceeded with investigating how it might best work towards a SIP linked to a FP. In February, after a series of relatively frustrating discussions, the recently appointed CFO came to a watershed realisation with regards to the linkages between infrastructure planning, budget planning and a spatial framework. As noted in the meeting minutes from 21 February 2014, the CFO “highlighted that the issue for municipal plans is what informs the budget. Projects are identified for infrastructure master plans which in turn are derived from spatial matters...Infrastructure plans cannot be compiled without knowing what the spatial strategy and guiding principles are which might provide a basis and offer direction for urban planning” (IIC 2014). The IIC came to a joint understanding that it could not progress with infrastructure planning without a coherent spatial vision. This breakthrough unlocked significant potential and novel thought based in the realisation that SM, besides its 5-year Integrated Development Plan, does not have a binding vision of the future development of the region. Furthermore, the university’s long term planning processes, captured in its Master Plan, were not necessarily in line with the emergent thinking within the municipality. Thus, the two institutions with the greatest bearing

on the town and the surrounding region's future, were misaligned in their planning approaches. The Quo Vadis was significant as it signified a change in understanding of the infrastructure problem that shifted from a focus primarily on eliminating backlogs to one that sees this challenge as an opportunity for public transport-focused, infrastructure-led development in future. Furthermore, it served as a novel planning instrument that facilitated municipal and university planning officials to communicate and integrate their planning agendas and in numerous instances, the challenge the underlying assumptions about future growth that guided their thinking.

For the remainder of 2014, the IIC was predominantly focused on developing the Quo Vadis document which was released and circulated internally in September 2014.

“In response to the discussions around the long term integrated strategic planning gap in the municipality at an IIC meeting on 21 March 2014, the IIC and IPC decided to set up a joint workshop to link together financial, spatial and infrastructure planning. The purpose of this workshop was to produce a Quo Vadis document (*where are we going?*) as an instrument to guide to work of the IIC and IPC; one which was the product of collaborative efforts between municipal planning officials, private sector experts and university researchers. Held at the Sustainability Institute on Friday 7 March, the IIC workshop was attended by the core IIC team who spent an afternoon thinking creatively about the strategic direction of the municipality. It also provided a unique and productive opportunity for officials and councillors from the planning, engineering and finance departments to share and integrate their work in the municipality” (IIC 2014b).

The outcome of the meeting, which unlocked considerable momentum is captured in the IIC's Quo Vadis document, an internal planning document:

“For at least a decade, development in Stellenbosch has been paralysed by an unresolved tension between two opposing perspectives: a heritage perspective that sees development as a threat to the cultural and ecological heritage of Stellenbosch, and a developer-driven perspective that favours urban sprawl. This document proposes a third option: an innovative Sustainable Transit-Oriented Development (STOD) approach that would radically redefine the future spatial development of Stellenbosch around a set of ecologically sustainable high density development nodes built around integrated public transport services. Stellenbosch is faced with a serious infrastructure challenge due to long-term under-funding of infrastructure backlogs, provision for future demand as well as repairs and rehabilitation” (IIC 2014b).

There was considerable overlap in participation in the IPC and IIC which was advantageous for creating stronger alignment and feedback between the formal spatial, finance and infrastructure planning

processes. Whilst the IIC was getting underway, a closely connected process regarding a spatial development framework for Stellenbosch town was being initiated through the IPC. In line with the MSDF's integrated nodal development approach, each of the recognised fourteen nodes require their own SDFs to translate the principles of the municipal-wide SDF and outline exactly how development will take place. Conversations with key planning officials and researchers in the IPC explained that an alternative approach to drafting the Stellenbosch town plan was pursued due to the lack of funding to appoint a consultant. Furthermore, they identified this as an opportunity to design a potentially radically different approach to developing an urban spatial plan which leveraged the growing connection between the municipality and the SPL and SI, made possible by the REMF (Swilling 2014, de la Bat 2014).

Davidson (2014) and Swilling (2014) explain how the Shaping Stellenbosch campaign emerged out of discussions between a core group of municipality officials and SI affiliated researchers and professionals in around July or September 2013. The municipality officially appointed the SI to "assist in the preparation of an SDF for Stellenbosch town, incorporating transdisciplinary thinking innovative approaches to ensure a sustainable spatial plan" (IIC 2014b). Commitment to designing such a process began with the idea of hosting ward committee workshops and then integrating these insights with those of experts in a Strategic Analysis Group (SAG). With the involvement of Robert Davids, a professional facilitator from RAINN, the ideas soon grew—reflecting back on the process Davids (2014) indicated how this Shaping Stellenbosch campaign was in constant flux, continually responding to the areas of need that emerged. Loosely, a two-pronged approach was adopted to ensure that expert knowledge was matched with the needs and aspirations of the diverse residents of Stellenbosch.

The Shaping Stellenbosch campaign, a unique and innovative process-oriented project was "carefully designed to demonstrate in practice how it is possible for the citizens of a historically divided South African town to generate a positive vision for urban development that connects economic development, social inclusion and ecological sustainability" (Robinson 2014). The Shaping Stellenbosch campaign consisted of two parallel process thus drawing together and integrating insights generated through expert and community engagement processes. "Combining 'bottom up' insights with 'top down' leadership, the process demonstrates that even statutory planning processes such as the drafting of a town plan can be achieved in innovative and inclusive ways" (Robinson 2014). The expert engagement process constituted a series of workshops between experts from Stellenbosch University and Stellenbosch Municipality. This was supported by a software program, Parmenides Eidos, "designed to enable strategic clarity by helping to define the key elements in complex situations, develop flexible and focused strategies to address them, test the robustness of these strategies against several different scenarios, and assess their ability to be implemented" (IIC 2014b).

The public engagement process was where the name *Shaping Stellenbosch* came alive. Following various meetings and workshops with stakeholder groups in Stellenbosch, the idea was that people with positive ideas on how to improve Stellenbosch could share their ideas through an online form on

shapingstellenbosch.co.za or in hardcopy at any of the five Stellenbosch libraries. Once these two processes were completed, outputs were synthesised and informally mapped by the core team. Feedback was also given to the relevant municipal departments as well as the 112 people submitted the 208 ideas as part of the public campaign through personalised emails and formal presentation by municipal officials. This was to get a sense of how stakeholders responding to the emerging logic and the framework of opportunity that the SDF came to signify.

The IIC and IPC made significant progress in 2014 in particular, with the creation of the Quo Vadis Document and a draft SSDF describing a spatial vision embodying a ‘compact, inclusive and sustainable town’. The draft SSDF described the narrative of moving toward a new spatial vision and outlined a strategic framework of opportunity for development, supported by a public transport-oriented, infrastructure-led development logic. There was a massive shift in energy and direction in 2015 within the IIC and IPC which had massive implications for the policy process with the SSDF and the work of the IIC in developing a SIP and supporting research within each of the working groups. Despite buy-in from within the IIC and IPC’s core stakeholder group around the credibility of this spatial vision and the clarity with which this was asserted in the draft policy document, it was surprising to see how municipal officials who had not being properly invested throughout the process, undermined the progressive and bold nature of this emerging strategy. Meetings in early 2015 with municipal officials in various departments across the municipality in particular seemed to indicate a regression in thinking—back to old patterns of thinking, most easily seen in how officials in the planning and engineering departments slipped back into a paradigm of car-based urban development. From the core IIC and IPC facilitators there was a palpable frustration with how formal municipal and university processes as well as unexpected events such as shifts in leadership, could derail and undermine the outstanding progress made in the months before. In the face of demanding municipal processes for example the revision of the budget or Integration Development Plan, many core officials were forced to lessen their involvement and contribution to the IIC and IPC. For university researchers, the bureaucratic hurdles were frustrating and with more pressing academic commitments, many university officials pulled back from the IIC and IPC as well. The first few months of 2015 saw a loss of momentum. During this time, the process fragmented to such a point that it felt that efforts to push the process forward were more damaging than constructive. Shifts in leadership at both SU and SM drew energy away from the IIC; political pressure also had negative effects on the image of the IIC in the Council. In April 2015, IIC meetings were suspended in order to allow for necessary internal discussions to take place so as to establish the most favourable positioning of the REMF collaboration, taking into consideration the leadership agenda of the recently Rector, Prof Wim de Villiers.

Looking back on the process, a great deal was achieved within this intermediation space as an informal space of intermediation, the IIC and IPC, and even the REMF as the highest expression of the commitment to institutional collaboration, was extremely susceptible to wider political and institutional

dynamics. As relatively pioneering spaces of engagement, many officials from within the university and municipality were unfamiliar or ill-informed with the purpose of the IIC and IPC. And despite the attempt to ensure clear and formal communication by distributing meeting agendas and minutes, facilitators within the intermediation space were powerless to advocate on behalf of the IIC and IPC in the face of larger, deep-seated institutional or political battles. The REMF and its sub-structures were continually contested however this was not directly connected to the contributions or failings of the committees themselves. Instead, as fluid and emergent processes, the committees were often used as ‘footballs’ in the institutional and political ‘battles’ between municipal departments, between the council and the administration and between different informal and formal factions within both the university and the municipality. Internal fallouts had implications for the framing of the IIC and IPC—for example, conflict between members of the Mayco served to undermine the IIC in the eyes of the wider council as they ‘used’ the committee to further their own political or personal agendas. Prominent actors within the intermediation space were advantageously positioned to facilitate and mediate internally but in many cases were limited in how they could advocate for the committees within wider formal processes. This was where high level support was useful as the rank of prominent and powerful stakeholders within the municipality and the university could be leveraged. For example, the sudden death of Rector Prof Russel Botman in late 2014 essentially closed the chapter on the REMF as it had operated under his leadership at the university.

After a few quiet months, the SSDF process has been revived and the final component of the document will be completed. Ideally, this will culminate in a Final Spatial Development Framework which will be approved by council towards the end of 2015—all that remains is a formal mapping process with an appointed consultant. Regardless, much of the strategic thinking has already been established in how decisions are being made within the REMF space as well as in the wider SU and SM planning spheres. There is already evidence that this will result in a series of development opportunities; much like urban acupuncture points, these will help in bringing the wider regional vision to fruition. The redevelopment of the Stellenbosch town stations is one such opportunity that might be the source of unprecedented innovation—a consultant has been appointed by SM to develop proposals for the regeneration of the precinct made possibly by interventions in the public transport system. It has the potential to become a flagship project given the unique governance processes that will be required to bring together the range of stakeholders into a social process of collaboration and innovation. This is further supported by the revision and reorientation of SM’s Comprehensive Integrated Transport Plan which will support and further develop a transit-oriented development approach. The SSDF will also be first of the town plan’s put together for SM’s 24 urban nodes—ideally, the social process that Shaping Stellenbosch designed can be redeployed in the region’s other major towns. It will be most telling to see which of these processes come to fruition and whether the public transport planning processes initiated by the university and the municipality respectively, can be used to leverage more effective integrated planning

going forward. Another massive opportunity lies in the potential support of such a collaboration by the newly appointed Rector; if the university views the initiative favourable, this could potentially unlock considerable research funding and support.

6. Analysis

Rather than an intermediary body itself, the fluid and dynamic IIC and IPC structures functioned more as intermediation spaces supportive of learning processes. The framework of urban learning is useful in reflecting on how the REMF sub-committees were able to arrive at a level of collaboration and shared understanding, tangibly exemplified in the Quo Vadis Document and the draft SSDF document.

Participation in these sub-structures offers stakeholders from SU and SM opportunities to interact in a space of intermediation that activated, coordinated and sustained particular combinations of resources and capabilities that would otherwise not be possible. Municipal administrators utilised this collaboration as a way of activating pertinent resources and capabilities outside of their jurisdiction. For researchers, this space opened up novel research opportunities for real-world problems to become the focus of applied sustainability research. Thus, the facilitation of collaborative governance in SM by key researchers and students has made possible the demand of sustainability science: allowing real-world problems to become the drivers for transdisciplinary research and learning.

Throughout, the REMF's transdisciplinary underpinnings have been emphasised. This conception of knowledge and research was invaluable in structuring a space of intermediation that allowed for social learning—assuming various perspectives, namely transition management, the learning city and assemblage approaches, is helpful in expressing more clearly how this was done.

Employing the lens of transition management, it is clear that strong leadership from a core group of frontrunners was integral to the evolution of the REMF as a strategic partnership, and the IIC and IPC as practical expressions thereof. Additionally, the benefits of a strong, structured and well-coordinated transition arena are evident in how agenda-building as part of a multi-stakeholder process, resulted in robust and shared sustainability goals. This was true for the IPC but especially the IIC which saw a core leadership group of stakeholders carefully managing a network of experts and practitioners who could assist in realising the forum's mandate. Participation emphasised involvement of strategically positioned decision makers and influencers. A collaborative agenda-building process saw interactions between stakeholders facilitated in such a way that a destabilising context gives rise to shared understanding around appropriate sustainability visions and collaborative strategies for action. This is most clear in the emergence of a vision of future development that overcame previously conflicting visions of Stellenbosch's development trajectories. Intensive discussion in carefully managed spaces, most notably the day workshop in March 2014, allowed for competing visions to be mediated in ways that built shared understanding about more suitable alternatives. As is the case with governance in line with transition management, progress has to a large extent, been limited to the stakeholders that were

intensely involved in the intermediation space. The downside of this is that the cooperation and joint understanding built in this forum was difficult to transfer into wider municipal departments. Nonetheless, the participation of directors and councillors from various departments meant that the broad vision was, to varying degrees, integrated into the management and leadership of the Financial Services, Engineering Services and Heritage and Planning departments.

The Learning City approach is useful in understanding how many municipal officials and university researchers look to other cities, municipal authorities and research bodies for inspiration and assistance. Some examples of this are numerous invitations by the IIC to representatives from the City of Joburg, the Western Cape Economic Development Partnership (WCEPD), the Tygerberg Partnership, the Western Cape Government as well as international guests such as Maarten Hajer, to present on their particular field of expertise. Professionals for Green Cape, a research agency under the Western Cape Government also brought outside expertise to the IIC discussion by participating actively in working groups. The IIC learnt about the Western Cape Government's Infrastructure Framework, the City of Joburg's Capital Investment Management System, the collaboration between the City of Cape Town and the business sector to develop the Tygerberg Partnership and the role of the WCEPD in supporting innovation and partnerships at the municipal level. At each of these meetings, rich discussion followed more formal presentations and the benefit derived by the IIC participants was easily identified given their close alignment with the challenges the IIC were trying to address. Other examples of how the Learning Cities approach was evident in structuring these learning processes was how examples of sustainability interventions in urban planning in cities across the world were communicated to the IIC and IPC stakeholders as well as community members as part of the Shaping Stellenbosch process. Videos, images and anecdotes were used to inspire peoples' imaginations and what might be possible in the greater Stellenbosch region. Exchanges between city officials was also facilitated through ICLEI workshops focused specifically on achieved integrated planning. All of these are examples of how the Learning Cities approach to urban learning was employed as participants in the IIC and IPC and its related initiatives were challenged to look elsewhere for ideas of sustainability-oriented urban interventions and innovations. This was often expressed in the notion of 'not reinventing the wheel' and was especially pertinent given the municipality's capacity issues.

The final perspective on urban learning is integral in grounding learning processes in a unique urban context. A unique feature of the REMF collaboration and many of the officials, councillors and researchers participating in the IIC and IPC had strong vested interests in the functioning and wellbeing on this urban system—beyond their formal responsibilities. Many of them lived in Stellenbosch, or had worked in the town or wider region for many years meaning their personal lives were closely intertwined with the urban system for which they were formally responsible. Their lived experiences of Stellenbosch meant that there was a far deeper understanding of the particularities of this urban system. The vested interest also meant that for many participants there was a higher motivation for committing

time and energy into tackling these seemingly intractable problems. In facilitating the IIC and IPC, effort was made in consistently grounding discussions in the vast array of lived experiences and urban realities existing in Stellenbosch—interventions could not just serve a limited proportion of the greater Stellenbosch region’s residents. Taking officials on outings around the town was a successful in bringing to the fore the urgency of the infrastructure and mobility challenges for example but also for inspiring creative thinking about how a ‘compact, inclusive and sustainable town’ could be achieved in Stellenbosch. The public campaign as part of Shaping Stellenbosch was built around an appreciative inquiry approach and thus recognised the insights that residents of the town could offer in imagining a positive future for their neighbourhood and the wider town.

Reflecting on the case of collaborative governance in Stellenbosch Municipality, evidence of each modality of urban learning is identified, all three of which were instrumental in structuring this intermediation space and its accompanying learning processes. Social learning is about challenging groups of actors to address, adjust and often radically transform their perceptions and understandings about complex sustainability challenges in such a way that joint and progressive action is made possible. In many ways, this is true for this case since divergent and often conflicting perspectives about urban development were mediated in such a way that allowed a shared problem statement to provide the basis for meaningful collaboration in reality. The Quo Vadis Document and the SSDF are tangible expressions thereof.

Drawing conclusions from this case, transition management highlights how instrumental a strong transition arena and effective transition team is in coordinating transition efforts as well as mediating agenda-building processes. The Learning Cities approach demonstrates how cities can urban actors can look elsewhere for lessons that can be translated into applications in their particular urban contexts. And finally, the assemblage approach reminds urban actors to be sensitive to the particularities of the urban system under their jurisdiction—interventions needs to be modified or applied in ways that are sensitive to the political, cultural and socio-ecological conditions in that specific locality. Ultimately, learning must be grounded in a particular place since rather than conceived of in abstract ways and applied naively, without careful consideration of its context.

7. Conclusion and Recommendations

It was the intention of this research to develop a framework of urban learning, supported by insights from a transdisciplinary case in Stellenbosch Municipality, to contribute to sustainability transitions and literature. It was an attempt to articulate a case of alternative development strategies in a southern African context, based on more collaborative and resilient governance arrangements and grounded in the particularities of a unique urban system. I believe that this framework of urban learning, underpinned by transdisciplinary research and oriented towards social learning for sustainability, is a useful and novel contribution to the sustainability transitions literature. As such, it demonstrates the integrative

nature of transdisciplinary research approaches in emphasising the existing different dynamics of learning, akin to each of the reference modalities of urban learning. Going forward, this transdisciplinary engagement strategy that emphasises the importance of all these modalities of learning, might serve to support experiments in urban governance and collaboration in urban systems elsewhere in southern Africa.

As part of a wider transdisciplinary collaboration, this research project begins to demonstrate in practice how a mode of researching grounded in the ethos of ‘science with society’ takes form. This is pertinent in advocating for transdisciplinary research as a strategy to address challenges of the polycrisis in a way that delivers value to academic and societal stakeholders. In this case, from an academic or scientific perspective, this research depicted a methodological approach that contributes to redefining and extending transdisciplinary research in an African context.

8. List of References

Altenburg, T. & Pegels, A. 2012. Sustainability-oriented innovation systems—managing the green transformation. *Innovation and Development*, 2(1): 5-22.

Avelino, F. & Rotmans, J. 2011. Power in Transition: An Interdisciplinary Framework to Study Power in Relation to Structural Change. *European Journal of Social Theory*, 12(4): 543-569.

Blok, A. 2013. Urban Green Assemblages. *Science & Technology Studies*, 26(1), 5-24.

Bontenbal, M. 2009. Cities as partners: The challenge to strengthen urban governance through North-South city partnerships. Delft: Eburon Uitgeverij BV.

Burns, M., Audouin, M., & Weaver, A. 2006. Advancing sustainability science in South Africa: commentary. *South African Journal of Science*, 102(9 & 10), 379-384.

Campbell, T. 2009. Learning cities: Knowledge, capacity and competitiveness. *Habitat International*, 33(2): 195-201.

Campbell, T. 2012. *Beyond smart cities: how cities network, learn and innovate*. Oxon: Routledge

Coenen, L., Benneworth, P., & Truffer, B. 2012. Toward a spatial perspective on sustainability transitions. *Research policy*, 41(6), 968-979.

Davids, R. 2014. Personal Interview. 28 May, Tygervalley.

Davidson, B. 2014. Personal Interview. 28 May, Stellenbosch.

De la Bat, B. 2014. Personal Interview. 5 May, Stellenbosch.

- Ewert, J. 2013. Poverty and inequality in Stellenbosch – the key role of education. *Cape Times*. 5 February. [Online] Available: <http://blogs.sun.ac.za/news/2013/02/06/opinion-editorial-poverty-and-inequality-in-stellenbosch-the-key-role-of-education/>
- Fariás, I. 2011. The politics of urban assemblages. *City*, 15(3-4): 365-374.
- Farla, J., Markard, J. & Coenen, L. 2012. Sustainability transitions in the making: a closer look at actors, strategies and resources. *Technological Forecasting and Social Change*, 79: 991-998
- Ferguson, B. C., Brown, R. R., de Haan, F. J., & Deletic, A. 2013. Analysis of institutional work on innovation trajectories in water infrastructure systems of Melbourne, Australia. *Environmental Innovation and Societal Transitions*, 15: 42-64.
- Geels, F.W. 2002. Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case study. *Research Policy*, 31(8-9): 1257-1274.
- Geels, F.W. 2004. From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. *Research Policy*, 33(6-7): 897-920.
- Guy, S., Marvin, S., Medd, W., Moss, T. 2011. *Shaping urban infrastructures: intermediaries and the governance of socio-technical networks*. London: Routledge.
- Guy, S., Marvin, S., Medd, W., Moss, T. 2011. *Shaping urban infrastructures: intermediaries and the governance of socio-technical networks*. London: Routledge.
- Hekkert, M. P., Suurs, R. A., Negro, S. O., Kuhlmann, S., & Smits, R. E. H. M. 2007. Functions of innovation systems: A new approach for analysing technological change. *Technological forecasting and social change*, 74(4): 413-432.
- Herdijs, C.M. & Grin, J. 2010. Contextualising Reflexive Governance: the politics of Dutch Transitions to Sustainability. *Journal of Environmental Policy & Planning*, 9(3-4): 333-350.
- Hirsch Hadorn, G. Bradley, D. Pohl, C., Rist, S. & Wiesmann, U. 2006. Implications of transdisciplinarity for sustainability research. *Ecological Economics*, 60(1): 119-128.
- Hodson, M., & Marvin, S. 2009. Cities mediating technological transitions: understanding visions, intermediation and consequences. *Technology Analysis & Strategic Management*, 21(4): 515-534.
- Hodson, M., & Marvin, S. 2010. Can cities shape socio-technical transitions and how would we know if they were?. *Research policy*, 39(4): 477-485.
- Hodson, M., & Marvin, S. 2012. Mediating low-carbon urban transitions? Forms of organization, knowledge and action. *European Planning Studies*, 20(3): 421-439.
- Hodson, M., Marvin, S., Robinson, B. & Swilling, M. 2012. Reshaping Urban Infrastructure. *Journal of Industrial Ecology*, 16(6): 789-800.

- ICLEI 2014. Operationalising the Urban Nexus.
- IIC. 2014a. Meeting Minutes 21 February.
- IIC. 2014b. Quo Vadis Document. (Unpublished). Stellenbosch.
- Jahn, T. 2008. Transdisciplinarity in the practice of research. In Bergmann, M. & Schramm, E. (Eds.) *Transdisziplinäre Forschung. Integrative Forschungsprozesse verstehen und bewerten*. Frankfurt/New York: Campus Verlag. 21–37 (English translation, not yet published).
- Jørgensen, U. 2012. Mapping and navigating transitions—The multi-level perspective compared with arenas of development. *Research Policy*, 41(6): 996-1010.
- Kajikawa, Y., Tanco, F., & Yamaguchi, K. 2014. Sustainability science: the changing landscape of sustainability research. *Sustainability science*, 9(4): 431-438.
- Kauffman, J., & Arico, S. 2014. New directions in sustainability science: promoting integration and cooperation. *Sustainability Science*, 9(4): 413-418.
- Loorbach, D. 2007. *Transition Management: New mode of governance for sustainable development*. Unpublished doctoral thesis. Utrecht, the Netherlands: International Books.
- Markard, J., Raven, R. & Truffer, B. 2012. Sustainability transitions: An emerging field of research and its prospects. *Research Policy*, 41(6): 955-967.
- McFarlane, C. 2009. Knowledge, learning and development: a post-rationalist approach. *Progress in Development Studies*, 6(4): 287-305.
- McFarlane, C. 2011. *Learning the city: knowledge and translocal assemblage*. Chichester, United Kingdom: John Wiley & Sons.
- Meadowcroft, J. 2009. What about the politics? Sustainable development, transition management and long-term energy transitions. *Policy Sciences*, 42(4): 323-340.
- Moss, T. 2009. Intermediaries and the governance of sociotechnical networks in transition. *Environment and planning. A*, 41(6): 1480-1495.
- Nicks, S. 2011. *Sustainable Stellenbosch—a new rural and urban spatial vision for Stellenbosch: the 2009 SDF*. (Unpublished). Stellenbosch.
- Nicks, S. 2012. Spatial planning – planning a sustainable Stellenbosch. In Swilling, M.,
- OECD. 2001. *Cities and Regions in the New Learning Economy*. [Online] Available at: <http://www.oecd.org/internet/citiesandregionsinthenewlearningeconomy.htm> (2015, June 10).
- Parnell, S. & Pieterse, E. A. 2014. *Africa's urban revolution*. London: Zed Books.
- PDG. 2013. *Results of a Municipal Services Financial Model for Stellenbosch Local Municipality*.

- Pelling, M., High, C. Dearing, J. & Smith, D. 2008. Shadow spaces for social learning: a relational understanding of adaptive capacity to climate change within organisations. *Environment and Planning A*, 40(4): 867-884.
- Pohl, C. & Hirsch Hadorn, G. 2007. Principles for Designing Transdisciplinary Research. Oekom Verlag: München.
- Pohl, C., Rist, S., Zimmermann, A., Fry, P., Gurung, G. S., Schneider, F., Speranza, C.I., Kiteme, B., Boillat, S., Serrana, E. Hirsch Hadorn, G. & Wiesmann, U. 2010. Researchers' roles in knowledge co-production: experience from sustainability research in Kenya, Switzerland, Bolivia and Nepal. *Science and Public Policy*, 37(4): 267-281.
- Polk, M. 2014. Achieving the promise of transdisciplinarity: a critical exploration of the relationship between transdisciplinary research and societal problem solving. *Sustainability Science*, 9(4): 439-451.
- Raven, R., Schot, J. & Berkhout, F. 2012. Space and scale in socio-technical transitions. *Environmental Innovation and Societal Transitions*, 4: 63-78.
- Reed, M., Evely, A. C., Cundill, G., Fazey, I. R. A., Glass, J., Laing, A., Newig, J., Parrish, B., Prell, C., Raymond, C. & Stringer, L. 2010. What is social learning? *Ecology and Society*.
- Reyers, B., Roux, D. J., Cowling, R. M., Ginsburg, A. E., Nel, J. L. & Farrel, P. O. 2010. Conservation planning as a transdisciplinary process. *Conservation Biology*, 24(4): 957-965.
- Robinson, B. 2014. *Shaping Stellenbosch: Innovative, participatory spatial planning connecting economic development, well-being and ecological sustainability*. [Online] Available: <http://www.wdccapecapetown2014.com/projects/project/351> (Accessed 20 May).
- Safarzyńska, K., Frenken, K. & van den Bergh, J. C. 2012. Evolutionary theorizing and modeling of sustainability transitions. *Research Policy*, 41(6). 1011-1024.
- Schauppenlehner-Kloyber, E. & Penker, M. 2015. Managing group processes in transdisciplinary future studies: How to facilitate social learning and capacity building for self-organised action towards sustainable urban development?. *Futures*, 65: 57-71.
- Schneider, F. & Rist, S. 2014. Envisioning sustainable water futures in a transdisciplinary learning process: combining normative, explorative, and participatory scenario approaches. *Sustainability science*, 9(4): 463-481.
- Scholz, R. W., & Tietje, O. 2002. Embedded case study methods: Integrating quantitative and qualitative. California: Sage Publications, Inc.
- SITT. 2013a. Meeting Minutes 21 October.

- SITT. 2013b. SITT Terms of Reference.
- Smith, A. Stirling, A. & Berkhout, F. 2005. The governance of socio-technical transitions. *Research Policy*, 34: 1491-1510.
- Stamm, A., Dantas, E., Fischer, D., Ganguly, S. and Rennkamp B. 2009. Sustainability-oriented innovation systems: Toward decoupling economic growth from environmental pressures? Bonn: German Development Institute (DIE), Bonn.
- Stellenbosch Municipality. 2014. Stellenbosch Environmental Management Framework.
- Stellenbosch Municipality. 2015. Integrated Development Framework. 2015 / 2016.
- Swilling, M. & Anneke, E. 2012. *Just transitions: Explorations of sustainability in an unfair world*. Cape Town: UCT.
- Swilling, M. 2013. Infrastructure Innovation Committee, Email to SITT committee [Online], 1 August. Available email: mark.swilling@spl.sun.ac.za.
- Swilling, M. 2014. Personal Interview. 17 February, Stellenbosch.
- Swilling, M., Robinson, B., Marvin, S. & Hodson, M. 2011. *Growing Greener Cities*. UH Habitat for Expert Group Meeting in Nairobi.
- Swilling, M., Sebitosi, B. & Loots, R. (eds). 2012. *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: African Sun Media. 24-30. [Online] Available: <http://www.africansunmedia.co.za/Portals/0/files/extracts/Sustainable%20Stellenbosch%20Extract.pdf> [20 May 2013].
- Van den Bergh, J.C.J.M., Truffer, B. & Kallis, G. 2011. Environmental innovation and societal transitions: Introduction and overview. *Environmental Transition and Societal Transitions*, 1: 1-23.
- van Lente, H., Hekkert, M., Smits, R. & van Waveren, B. 2003. Roles of systemic intermediaries in transition processes. *International journal of Innovation management*, 7(3): 247-279.
- Voß, J. P., Smith, A. & Grin, J. 2009. Designing long-term policy: rethinking transition management. *Policy sciences*, 42(4): 275-302.
- Wals, A.E.J. & van der Leij, T. 2007. Introduction. in Wals, A.E.J (Ed.) *Social learning towards a sustainable future*. The Netherlands: Wageningen Academic Publishers. Chapter 1: 17-32.
- Wittmayer, J. M. & Schöpke, N. 2014. Action, research and participation: roles of researchers in sustainability transitions. *Sustainability science*, 9(4): 483-496.
- Yin, R. K. 2011. *Applications of case study research*. London: Sage Publications.

