

**FROM THEORY TO PRACTICE: AN ANALYSIS OF TRANSFORMATIVE  
SOCIAL INNOVATION AT THE UNIVERSITY OF BRITISH COLUMBIA**

by

Seyedeh Paniz Pajouhesh

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## **Abstract**

Higher education institutions are striving to become both models and leaders in innovation for sustainable development, as sustainability is becoming a growing priority around the world. The approaches adopted by many universities, however, are typically implemented as an add-on to existing structural and social frameworks, which often constrain new ideas and practices that transcend traditional institutional structures or, at best, promote incremental change for sustainability. Incremental change, however, may not suffice to cope with prevailing sustainability challenges. In fact, it may only serve to perpetuate unsustainable trajectories that are embedded in institutional processes and practices characterized by inertia and path-dependency. It is necessary to overcome the limitations of piecemeal improvement to develop purposive approaches that enable, accelerate and scale-up transformative social innovations. This thesis examines the activities that have informed and guided innovation processes for sustainability at the University of British Columbia over the past twenty years, through the lens of socio-technical transitions theory, in order to gain greater insight into the dynamics, mechanisms and agency that the theory suggests is necessary for engendering transformative social innovation. Based on an extensive literature review, document analysis, and expert interviews with key stakeholders, the findings suggest that the institution exhibits the necessary conditions to foster transformative change for social innovation. An analysis of its sustainability policies, practices and processes over the past twenty years reveal that the University has created and continues to sustain the conditions for this complex, long-term and multi-level systemic change through experimentation and learning and multi-level coordination and synchronization – with exception of a few institutional barriers that have challenged non-conformism and innovation development or the diffusion of ideas and practices across scales. Recommendations are provided for the University, and for other institutions, to better govern a transition to sustainability. Though the University of British Columbia model will not necessarily suit a generic application to other universities, as the

context in which they operate will be different, the findings from this study shed light on best practices, and possible barriers and challenges, to governing sustainability transitions at higher education institutions.

## **Preface**

This thesis is the original, unpublished, independent work of the author, Seyedeh Paniz Pajouhesh. The research was approved by the UBC Behavioural Research Ethics Board, under certificate number H14-02557.

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## List of Abbreviations

AASHE	Advancement of Sustainability in Higher Education
ADES	Academic District Energy System
BoG	Board of Governors
BRDF	Bioenergy Research and Demonstration Facility
C+CP	Campus + Community Planning
CAP	Climate Action Plan
CERC	Clean Energy Research Centre
CIRS	Centre for Interactive Research on Sustainability
CLL	Campus as a Living Laboratory
CNAR	Carbon Neutral Action Report
CSO	Campus Sustainability Office
EPI	Energy Planning and Innovation
EWS	Energy and Water Systems
GTC	Greening the Campus
IRES	Institute for Resources, Environment and Sustainability
ISCN	International Sustainable Campus Network
MOU	Memorandum of Understanding
RNP	Regenerative Neighbourhoods Project
SDRI	Sustainable Development Research Institute
SEEDS	Social, Ecological, and Economic Development Studies
STARS	Sustainability Tracking, Assessment and Rating System
UBC	University of British Columbia

UNA University Neighbourhoods Association  
USI University Sustainability Initiative

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## **Chapter 1: Introduction**

As sustainability is becoming a growing priority around the world, higher education institutions are aspiring to be both models and leaders in innovation for sustainable development. Universities are responding to worldwide imperatives by committing to operational sustainability goals and targets, realigning resources, and redefining academic priorities to coincide with international sustainable development goals. Many universities have publicly committed to establishing initiatives that emphasize environmental best practice in both academic and operational activities, with some becoming signatories to international agreements or acting collaboratively within international networks, all of which have similar aims of promoting the development of best practice models in sustainability (König, 2013). The approaches adopted by many universities, however, are typically implemented as an add-on to existing institutional frameworks, which often constrain new ideas and practices that transcend traditional institutional structures or, at best, promote incremental change for sustainability. However, such incremental change may not suffice to cope with prevailing sustainability challenges (Markard et al., 2012; Frantzeskaki and Loorbach, 2010). In fact, incremental change may only serve to perpetuate unsustainable trajectories that are embedded in institutional processes and practices characterized by inertia and path-dependency (Burch et al., 2014).

The true challenge, then, is to overcome the limitations of piecemeal and incremental improvement to develop purposive approaches that enable, accelerate and scale-up transformative social innovations within and across multiple dimensions. In this context, social innovations are novel actions, strategies and processes, which under certain conditions, lead to systemic, transformational change (BEPA, 2014; Caulier-Grice et al., 2012). Universities are in fact well positioned to be a major locus of discussion and debate on how to achieve transformative social innovation since it is, in essence, a microcosm of the larger community that can provide unparalleled opportunities to teach, conduct

research, and demonstrate and learn about all aspects of sustainability (Cortese, 2003). Research at universities is also becoming much more pragmatic by providing a mechanism through which staff and faculty from various disciplines, whose research and teaching have applications for sustainability, to engage with real-world challenges in an applied setting (König, 2013). Central to these issues is the view that universities have a responsibility to serve as a model and leader in the community; and that higher education has a critical role in allowing space for novelty and experimentation when real alternatives to business as usual are required. There will certainly be barriers and failures along the way, but universities are natural homes for such experiments and ultimately have great potential to contribute to a wider societal transition to sustainability.

In order to explore these issues, this thesis examines the sustainability endeavours at the University of British Columbia (UBC) over the past twenty years. The theoretical lens of sustainability transitions studies is used to analyze these activities. The literature on transitions, discussed more thoroughly in the succeeding chapter, has played an important role in helping to understand the dynamics and patterns of transformational change, and the complex and multidimensional shifts necessary to move societies to more sustainable modes of development (Eames et al., 2013). It is precisely concerned with evaluating the impact and potential of transformative social innovations by identifying how innovations are nurtured, accelerated and up-scaled to the level of systemic change, and how actor networks perform strategic interventions that support such transition processes (Markard et al., 2012; Jørgensen, 2012; Loorbach, 2010). These conditions, in essence, theoretically contribute to destabilizing and transforming or replacing the existing regime (Geels and Schot, 2010). To date, however, the use of transitions theory has been relatively limited in the context of academic institutions (Naess and Vogel, 2012).

The intent of this thesis, then, is to explore the activities that have guided and informed institutional innovation processes for sustainability at the University of British Columbia, and analyze if these activities exhibit the conditions that transitions theory suggests is necessary for engendering

transformative social innovation. Sustainability transitions theory, as described above, provides a dynamic framework to follow and identify these innovations. According to this theoretical framework, experimentation and learning in innovation processes and the role of actors and coalitions in empowering innovation processes are two critical conditions for fostering transformative social innovation, and are therefore at the core of the research questions:

1. Have activities at the UBC nurtured innovation through experimentation and learning processes
2. Have multi-level actor networks empowered innovation?

The second chapter of this thesis introduces the key concepts of sustainability transition studies, describes the conceptual framework of transition studies used for the case study, and briefly describes the methodology used to collect and analyze data to address the research questions. The third chapter examines the activities of the case study to assess if it exhibits the experimentation and learning competencies that theoretically nurture transformative social innovation for sustainability. The fourth chapter presents the analysis of the case study by comparing findings with the enabling conditions of multi-level alignment, coordination and adaptation that, in theoretical terms, also foster and empower transformative change. Finally, the fifth chapter reflects on findings and summarizes the lessons learned in the thesis, highlights main research contributions, and provides suggestions for further research.

## **Chapter 2: Theoretical Approaches to Transformative Social Innovation: Transitions Studies**

Sustainability transition studies constitute a field of research that is of high societal relevance given the magnitude and pervasiveness of current sustainability challenges. Our societal challenges suggest that existing models of urban development will need to be altered dramatically (Burch et al., 2014). As socio-technical systems are highly intertwined with regulations, technologies, institutional structures, as well as political structures, systems generally undergo incremental change rather than transformative change (Frantzeskaki and Loorbach, 2010). However, it is clear that such incremental change will not suffice to cope with prevailing sustainability challenges (Markard et al., 2012). In fact, incremental change may only serve to perpetuate unsustainable trajectories that are embedded in institutional procedures, technological pathways and cultural practices characterized by deep inertia and institutional gridlock. The true challenge, then, is to overcome the limitations of piecemeal and incremental improvement to develop purposive approaches that enable, accelerate and scale-up transformative social innovations within and across multiple dimensions.

In this context, social innovations are novel actions, strategies and processes, which under certain conditions in transitions-theoretical terms, lead to systemic, transformational change (BEPA, 2014; Caulier-Grice et al., 2012). In other words, sustainability transitions studies is precisely concerned with evaluating the impact and potential of transformative social innovations by identifying how innovations are nurtured, accelerated and up-scaled to the level of systemic change, and how actors navigate and perform strategic interventions that support such transition processes (Markard et al., 2012; Jørgensen, 2012). To this end, several theoretical frameworks in transitions studies have been developed and empirically tested to analyze the transformative potential of innovation processes in relation to socio-technical systems change.

## **2.1 Theoretical framework**

In the theoretical lens of sustainability transitions, socio-technical systems are the interrelationships between networks of actors (individuals, firms, and other organizations) and institutions (societal and technical norms, regulations and standards of good practice), as well as material artefacts and knowledge (Geels, 2004; Markard, 2011). The elements of the system interact, and together provide specific services for society, such as energy supply, water supply or transportation. A sustainability transition, then, is characterized as a set of processes that lead to a fundamental shift in socio-technical systems, causing associated changes along technological, organizational, institutional, political, economic and socio-cultural dimensions (Geels and Schot, 2010). Sustainability transitions are therefore long-term, system-oriented, multi-dimensional, and fundamental transformation processes where societal systems shift to a desired development pathway.

The traditional core of sustainability transition studies may be grouped into three frameworks that are central for the theoretical framing of sustainability transitions and to identify the seeds of transformational change. The approaches include the multi-level perspective on socio-technical transitions, strategic niche management, and transition management. Taken together, these branches of transition studies highlight the importance of non-linear change at multiple socio-technical scales, institutional barriers to change, and the enabling conditions for governing shifts toward more sustainable pathways (Burch et al., 2014; Markard et al., 2012).

### **2.1.1 Multi-level perspective**

The first framework, the multi-level perspective, explains change in socio-technical systems through the interaction of an interrelated three-level framework of the landscape at the macro level, which forms the exogenous environment and creates pressure on the regime; the sociotechnical regime at the mesolevel, which is dynamically stable and path dependent but where its destabilization creates windows

of opportunity for niche-innovations; and the niche, at the microlevel, where innovations incubate and proliferate (Geels and Schot, 2010; Hodson and Marvin, 2010). The nested interrelationships between these levels are illustrated in Figure 2.1. The multi-level perspective approach has become an important tool for transitions analysis, and it is regarded as a productive framework to describe and analyze historical transitions.

The concept of landscape is important in the multi-level perspective in seeking to describe the broader conditions, environment and pressures for transitions (Hodson and Marvin, 2010). The landscape operates at the macrolevel, is driven by cultural norms and values, focuses on issues such as political cultures, economic growth, macroeconomic trends and so on, and applies pressures on existing socio-technical regimes to create windows of opportunities for responses (Geels and Schot, 2007). Landscapes, in this context, are characterized as being external pressures that have the potential to impinge upon, but cannot determine, the structure of regimes and niches, and create a broader context of opportunities and constraints within which actors operate (Burch et al., 2014).

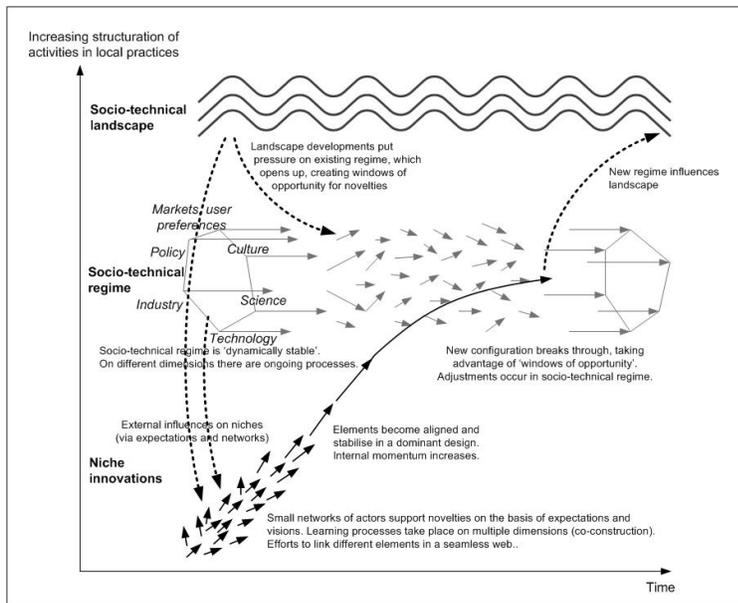
Socio-technical regimes, which operate at the mesolevel, develop from the stabilization of technologies and institutions within sectors of society, and in turn situate existing or incumbent changes within a dynamically static configuration. Stability and regularity in the regime, in turn, may create inertia and varying degrees of path dependencies that constrain the opportunity for change (Geels and Schot, 2007). The emphasis on regimes, therefore, highlights the opportunities and constraints on new development paths breaking through where “reconfiguration processes do not occur easily, because the elements in a socio-technical configuration are linked and aligned to each other. Radically new technologies have a hard time to break through, because regulations, infrastructure, user practices, maintenance networks are aligned to the existing technology” (Geels, 2002, p. 1258).

The source of change in socio-technical systems, then, is most likely to occur at the microlevel, the niche (Burch et al., 2014; Seyfrang and Smith, 2007; Schot and Geels, 2007). As discussed, the multi-

level perspective claims that socio-technical regimes become stabilized over time due to the accumulation of processes promoting lock-in and path dependency (Hodson and Marvin, 2010). Niches, however, provide spaces for experimentation that are shielded from wider political, economic or cultural pressures, in which radical novelty can develop and flourish to compete with established practices (Geels and Schot, 2007).

Later studies have nuanced the bottom-up perspective of the multi-perspective approach by investigating how niches grow, stabilize or decline in interaction with the dynamics of prevailing regimes (Raven, 2006). Smith et al. (2005) make a constructive contribution to this debate by questioning the view that regime change simply begins in niches and works upwards, arguing that this underplays the importance of the interrelationship and interactions between landscape pressures, regimes and niches (Hodson and Marvin, 2010). Specifically, they argue that the crucial aspect of socio-technical systems theory has to do with the dynamics that take place between levels and, to a lesser extent, the dynamics that take place within each of the three levels (Smith et al., 2005).

In summary, the multi-level perspective argues that transitions are developed through interactions between processes at three levels: niche-innovations build up internal momentum, through learning processes, and support from a patchwork of actors, institutions and organizations operating with formal and informal rules at diverse scales; changes at the landscape level create pressure on the regime; and the destabilization of the regime creates windows of opportunity for niche-innovations. The interactions and alignment of these processes enables the breakthrough of novelties in mainstream markets, where they eventually compete with existing socio-technical regimes (Burch et al., 2014; Geels and Schot, 2007).



**Figure 2.1 Multi-level perspective (Geels and Schot, 2010)**

### 2.1.2 Strategic niche management

The second branch of transition theory, strategic niche management, focuses on the intentional creation and nurturing of protected spaces, or niches, through socio-technical experiments such as pilot projects, community initiatives, sustainability experiments and low carbon technologies (Raven and Geels, 2010). Public subsidies or strategic investments in new technologies, or legislation in the case of innovative policy and governance arrangements, for instance, may create niche spaces and spark a sustainability transition.

According to strategic niche management researchers, three key factors determine the successful development and diffusion of niches within socio-technical systems. These include the joint articulation of expectations to direct the learning process and provide mutual understanding of the transition experiment; the creation of new heterogeneous networks to bring in the diverse resource types required for implementation (human, scientific, technological, organizational, institutional and financial); and the

stimulation of learning processes in the social context of communities, organizations or institutions (Geels et al., 2010; Schot and Geels, 2008).

Transition scholars also propose that fostering innovation in niche spaces and triggering a sustainability transition requires intentional action in the realms of policy and practice (Geels, 2005), such as strategic investments in new technologies or legislation of innovative policy and governance arrangements, while others suggest that pressure from the landscape level or build-up of internal regime tensions are significant contributors to systemic change (Markard et al., 2012; Papachristos, Sofianos and Adamides, 2013).

### **2.1.3 Transition management**

The third framework, transition management, combines technical transitions with complex adaptive systems theory (Holling, 2001) and theories of governance (Smith, Stirling, and Berkhout, 2005) to analyze transformative innovation processes. While strategic niche management is centered on the management of protected spaces, transition management expands the scope of the analysis to the management of societal systems that span all levels of society. The end point of transitions is not assumed to be known, but will reveal itself through a participatory process of testing and learning, and adapting problems and solutions (Loorbach, 2010).

The guiding principles for transition management are derived from conceptualizing existing sectors as complex and adaptive societal systems, and understanding management as a reflexive governance process (Markard et al., 2012). Since the management of transitions from one socio-technical system is a complex process, transition management analyzes change using a long-term, systems-level perspective that acknowledges the dynamic coevolution of actor-technology-institution interactions that guide the creation of new development paths, the non-linear potential of niche innovations, and the

importance of social learning (Frantzeskaki, Loorbach, and Meadowcroft, 2012; Loorbach and Rotmans, 2010).

Operationally, transition management is conceived as a cyclic process as shown in Figure 2.2, comprising of four governance activities in the context of societal transitions: strategic, where activities consider a longer time horizon, relate to structuring a complex societal problem, and create alternate futures through problem structuring and long-term envisioning of cultural and societal change; tactical, where activities relate to the build-up and break-down of system structures (institutions, regulation, physical infrastructures) through collaboration, long-term envisioning and problem structuring; operational, where activities relate to short-term decisions and action, and actors either recreate system structures or choose to restructure them; and reflexive, where societal issues are continuously restructured and reframed through structured evaluation, assessment and research (Loorbach, 2007).



**Figure 2.2 Transition management cycle (Loorbach, 2010)**

#### **2.1.4 Summary of theoretical frameworks**

In summary, the common view in all three frameworks is that transitions are understood as the outcomes of development at the micro, meso and macro level. The central framework of this approach is the multi-level perspective, which presents a systemic model of the three interconnected levels defined by the notions of niche, regime and landscape. The multi-level perspective in itself does not provide prescriptions on how to design or implement potentially transformational actions. It does, however, provide analysts and decision-makers with a highly useful heuristic framework to gain insight on the institutional, cultural, technological, economic and ecological structures of the established regime; where an intervention will best induce change; and where barriers or strong resistance to change may be encountered (Geels, 2010; Smith et al., 2010). This systemic model is also at the heart of strategic niche management and transition management, and therefore provides new content to and links processes at different levels, where niche-innovations build up internal momentum; changes at the landscape level create pressure on the regime; and the destabilization of the regime creates windows of opportunity for niche-innovations (Geels, 2010).

Strategic niche management, which builds on the heuristic framework of the multi-level perspective, is specifically centered on the niche-level and nurturing path-breaking innovations in these protected spaces. The key niche nurturing processes in the strategic niche management literatures include assisting learning processes, articulating expectations, and facilitating networking processes (Geels et al., 2010; Schot and Geels, 2008). More specifically, a review of case studies suggest that expectations contribute to successful furthering of the novelty when they are shared by many actors, specific, and of high quality; social networks contribute when their membership is broad (plural perspectives) and deep (substantial resource commitments by members), and learning processes are broad, therefore encompassing issues on a variety of socio-technical dimensions (Schot and Geels, 2008).

While the focus of strategic niche management is on the management of protected niches, transition management expands its scope to all levels of socio-technical systems, analyzes change using a long-term, systems-level perspective as also exhibited in the multi-level perspective, and conceptualizes management as a reflexive governance process (Markard et al., 2012; Loorbach, 2010). Though it is typically conceived as a cyclic process of development phases at various scales, the key dimensions of transition management overlap with those of strategic niche management, which include the strategic establishment of a transition arena through problem structuring and long-term envisioning of change; the development of transition agendas and coalitions, a vision of sustainable development and the associated pathway; the mobilization of actors, and the execution of projects and experiments; and the evaluation, monitoring and reflexive learning processes from projects and experiments (Loorbach, 2010). Taken together, these branches of transition studies highlight the conditions necessary for governing shifts toward more sustainable pathways. Table 2.1, below, summarizes these key characteristics.

It is important to note that there is an array of other relevant theoretical approaches to study and explain the particularities of transitions. These include general theories, such as evolutionary economic theory and actor network theory, as well as approaches with a more specific focus on technology, such as social construction of technology, constructive technology assessment, technology future studies, reflexive governance and sociology of expectations (Markard et al., 2012). There is also a related strand of research on sustainability issues, such as the literature on sustainability sciences, green management and corporate responsibility, and eco-innovation (Kemp, 2010). For this analysis, however, the scope is delimited to the framework of socio-technical transitions theory as it arguably adopts a more systemic and comprehensive approach to sustainability transitions, and perhaps most importantly, unpacks the enabling conditions for institutionalizing innovation processes that bear potentials towards transformative change.

Framework	Description of transformational change
<b>Multi-Level Perspective</b> (Geels and Schot, 2010; Hodson and Marvin, 2010; Seyfrang and Smith, 2007)	Changes in technologies as well as perceptions (worldviews) must go together to induce transformation.
	Transformational change is more likely if there is protected space for innovations to develop.
	Outside pressure increases the chances for a transformational innovation to be taken up by the mainstream.
<b>Strategic Niche Management</b> (Markard et al., 2012; Geels et al., 2010; Raven and Geels, 2010)	Protected spaces for transformation evolve into a dominant design through the support of powerful actors.
	Broad interactive learning processes through social interaction enhance the possibility of the emergence of new sustainable patterns.
	Niches stabilize within an environment conducive for performance improvement as well as strong expectations for further improvements.
<b>Transition Management</b> (Frantzeskaki, Loorbach, and Meadowcroft, 2012; Loorbach, 2010; Loorbach and Rotmans, 2010)	Transformations require long-term envisioning of change supported through mid-term articulation of transition agendas, sustainability visions and pathways.
	Transformations occur when innovative activities are envisaged as experiments with actors forming a specific arena.
	Transformation is fostered best through reflexive reorientation (of visions, agendas and coalitions) in strategic directions based on evaluation, monitoring and learning of progress towards change.

**Table 2.1 Key characteristics of transformational change (adapted from Mersmann et al., 2014)**

**2.1.5 Analytical framework**

Collectively, the theoretical frameworks of transitions theory share two critical characteristics that hold the potential to foster transformative social innovations: the link between transformative sustainability and niche-innovations; and the importance of multi-level actor networks in empowering and mobilizing social innovations.

As outlined in all transition frameworks, innovation and transformative sustainability are interlinked. In other words, continuous innovation in protected spaces, or niches, is regarded as an important element for nurturing societal transitions to sustainability (Raven and Geels, 2010). Innovations, such as pilot projects, low-carbon technologies and sustainability experiments, are nurtured and empowered in niches to compete with established practices in the socio-technical regime (Geels and

Schot, 2007). To that end, niches are conceived as concrete projects on the ground that develop best practices, institutionalize and consolidate social learning, network with other societal actors, and act as carriers of novel ideas and practices (Geels and Raven, 2006). To become successful, the theory postulates that innovations developing in niches must encompass a strong experimentation and reflexive learning dimension. This includes creating platforms that foster experimentation and innovation development; stimulating monitoring, evaluation and reflexive learning processes to enhance the possibility of the emergence of new sustainable patterns; and nurturing conditions for the emergence of heterogeneous coalitions and partnerships across scales (Geels et al., 2010; Loorbach, 2010; Schot and Geels, 2008).

Second, as illustrated in the literature, coordination and commitment from coalitions are pertinent factors for nurturing innovation. Inclusion and active involvement of multiple actors is crucial for co-constructing pathways to achieve sustainability and ensuring societal cohesion. To that end, transition theory proposes that integrated decision-making (coordination and alignment of visions, pathways and activities across scales), adaptive management (reflexive reorientation of visions, agendas and coalitions as a result of monitoring, evaluation and learning processes), and systems-thinking and longer time horizons (shifting from a single socio-technical system framework to an exploration of linkages between many systems across a longer timeframe) are other key characteristics for cultivating transformative social innovation (Loorbach, 2010; Loorbach, 2007).

In essence, experimentation and learning in innovation processes, and the role of actor networks in empowering innovation processes, are two critical conditions for transforming the socio-technical system, and therefore are at the core of this thesis. In other words, the thesis explores the enabling conditions of transformative social innovation toward more sustainable development pathways by asking two key questions that cut across the criteria in transitions theory:

1. Do activities nurture innovation through experimentation and learning processes?

2. Do multi-level actor networks, across various scales, empower innovation?

To explore these levers of transformative social innovation, key criteria from the literature have been distilled and summarized in Table 2.2, which essentially forms the analytical framework guiding the case study. The framework is by no means exhaustive, but for the objectives of the analysis serves to highlight the most important conditions in the literature, and their characteristics, for institutionalizing innovation processes that bear potentials towards transformative rather than incremental change.

Enabling condition	Characteristics
1. Experimentation and learning	<ul style="list-style-type: none"> <li>▪ Innovation development and diffusion: Creating protected spaces conducive to nurturing and empowering experimentation and innovation development/diffusion (Raven and Geels, 2010).</li> <li>▪ Monitoring, evaluation and reflexive learning: Stimulating monitoring, evaluating and learning processes through social interaction to enhance the possibility of the emergence of new sustainable patterns (Geels et al., 2010; Schot and Geels, 2008).</li> <li>▪ Network and coalition development: Nurturing conditions that allow the emergence of partnerships and heterogeneous networks, which provide the diverse resources required for innovation implementation (i.e. human, scientific, technological, organizational, institutional, financial) (Geels et al., 2010; Schot and Geels, 2008).</li> </ul>
2. Multi-level coordination and alignment	<ul style="list-style-type: none"> <li>▪ Integrated decision-making: Enabling the coordination, commitment and alignment of long-term visions, pathways and activities between the diversity of actors and governance structures in a socio-technical system (Loorbach, 2010).</li> <li>▪ Adaptive management: Based on monitoring, evaluation and learning insights, offering opportunities for reflexive reorientation, restructuring and reframing, of visions, agendas and coalitions, in strategic directions (Loorbach, 2010).</li> <li>▪ Systems thinking and longer time horizons: Prioritizing strategic activities that consider linkages between many complex systems and function along longer timeframes (Loorbach, 2007).</li> </ul>

**Table 2.2 Analytical framework for analyzing the transformative potential of activities**

## **2.2 Case study and research methodology**

### **2.2.1 Sustainability at the University of British Columbia**

As sustainability is becoming a growing priority around the world, higher education institutions are aspiring to be both models and catalysts of transformative change. Universities are responding to global imperatives by committing to strong operational sustainability goals and targets, realigning resources, and redefining academic priorities to coincide with international sustainable development goals. In fact, universities have the potential to be a major locus of discussion and debate on all aspects of sustainability, including resource conservation, habitat preservation, climate change, social equity and justice, livelihoods and community, and economic viability, and resiliency (Cortese, 2003). Universities also have a unique advantage to influence change as they are connected locally and globally to civil society, business and government, and as such, can influence practices and stakeholders beyond the communities to which they belong (Lozano et al., 2013). There will certainly be barriers and failures along the way, but universities are natural homes for such experiments and therefore have the potential to contribute directly to the transitions required to reach a sustainable future.

Over the past twenty years, the University of British Columbia (UBC) has made a consistent effort to embed sustainability in operational decision-making, long-term strategic planning, and their services. In 1990, UBC signed the Talloires Declaration, an international commitment to incorporate sustainability and environmental literacy into teaching, research, operations and outreach at the institutional level. In 1991, UBC signed the Halifax Declaration, another commitment to the importance of university leadership on the path to sustainable development. In 1997, UBC was the first university in Canada to adopt a sustainable development policy, and a year later, to open a campus sustainability office. UBC was also a pioneer in the development of green buildings, which began with the construction of the CK Choi Building for the Institute of Asian Research in 1996. In 2001, the University launched the largest energy and water retrofit project, EcoTREK, on a Canadian campus, achieving significant

reductions in emissions and energy consumption (University of British Columbia, 2012). In 2007, as a result of EcoTREK, the University reached its Kyoto targets, reducing GHG emissions on core academic buildings by 6 percent below 1990 levels, despite a 35 percent growth in floor space and a 48 percent growth in the student population (Cayuela et al., 2013).

Since then, UBC developed a new strategic plan, Place and Promise, in 2009 that encompasses nine commitments tailored to realize a vision for the future. Sustainability is one of the key commitments, and the plan outlines how the University, as part of this commitment, intends to explore and exemplify all aspects of economic, environmental and social sustainability (University of British Columbia, 2009). In the fall of 2009 and in support of Place and Promise, the University developed an academic strategy for sustainability, the Sustainability Academic Strategy (SAS). The SAS report recognized sustainability as a societal imperative and a topic of growing interest to students, faculty, staff and UBC's partners in the community. In this context, the University adopted a view of sustainability not as a prescribed set of outcomes but, rather, as the emergent property of a societal conversation about the kind of world we want to live in, informed by an understanding of the ecological, social, and economic consequences of our individual and collective actions (Robinson, 2004).

The SAS process promoted new forms of research, teaching and learning on sustainability, stimulated coalitions and collaborations between the University and the broader community, and encouraged UBC to demonstrate best practices in operational sustainability (Robinson et al., 2013). To that end, two crosscutting goals were established to align teaching and learning, research and partnerships, and operational and administrative activities and functions. The first, to transform the UBC campus into a living laboratory for sustainability, and the second, to cement UBC's role as an agent for change for sustainability beyond its campus (Cayuela et al., 2013).

In response to the recommendations in the SAS report, UBC's president at the time, Professor Stephen Toope, announced the establishment of the UBC Sustainability Initiative (USI) in 2010, an

ambitious sustainability initiative responsible for the integration of operational and academic sustainability across the University. This deep integration catalyzed the development of a portfolio of activities that sought to transform the University into a living laboratory for sustainability – a 402-hectare community in which faculty, staff and students and private, public and NGO partners use the physical plant, combined with the University’s education and research capabilities, to test, study, teach, apply and share the outcomes of their inquiries (Robinson et al., 2013).

In addition to the campus as a living laboratory initiative, the University has developed an agent of change principle intended to encompass activities aimed at developing partnerships with organizations and sectors in various communities outside UBC, with a view to working together to foster mutual learning and implement sustainability solutions beyond the campus. In this role, the campus offers the opportunity to implement and test innovative technologies, programs and policies at the neighbourhood scale, in keeping with the living laboratory approach, while partners offer the potential to take such innovations into the wider community through the processes of commercialization, policy development or community engagement (Cayuela et al., 2013).

Most recently, in 2014, the 20-year Sustainability Strategy was finalized to provide a long-term framework for the integration of sustainability across teaching, learning and research, operations and infrastructure, and the community. Building on the SAS report, this strategy is a framework enabling UBC to further integrate sustainability efforts through the lens of regenerative sustainability (where sustainability is defined as simultaneous improvements in human and environmental wellbeing as opposed to reductions in damage or harm), further leveraging the campus as a societal test-bed, and creating academic, operational and community collaborations (University of British Columbia, 2014).

At present, there are numerous projects of the built environment that aim to meet the sustainability goal of making the University a living laboratory in both environmental and social sustainability through the integration of research, learning, operations, and industrial and community

partners. These projects, such as the Centre for Interactive Research on Sustainability, completed in 2011 and designed to be the most innovative and high performing building in North America; the Academic District Energy System, underway since 2011, designed to be the largest steam to hot water conversion projects in North America and reducing GHG emissions by 22 percent; and the Bioenergy Research and Demonstration Facility, operational since 2012 and constructed to reduce campus GHG emissions by 9 percent, have been developed to meet UBC's ambitious GHG reduction goals, and to address, in various ways, sustainability issues of climate change, energy efficiency, spatial planning, water management, storm water management and community development (University of British Columbia, 2012). There have also been a substantial number of publications and case studies on the evolution of sustainability initiatives at the University, including a study examining sustainability education initiatives at UBC, and the barriers and pathways to creating sustainability education programs at the institutional level (Moore et al., 2010); the academic and operational initiatives at the University in achieving transformative institutional change for sustainability (Cayuela et al., 2013; Robinson et al., 2013); as well as various case studies examining the living laboratory model, its effectiveness and replicability (i.e. Save, 2014).

UBC is undeniably at the forefront of university sustainability worldwide. Over the past twenty years, the University has received numerous provincial, national, and international awards for its leadership and ongoing dedication to deeply integrating operational and academic efforts in sustainability. However, further analysis is required to understand if these activities, specifically operational sustainability activities, are conducive to fostering transformative social innovation. Social innovations, in this context, are novel actions, strategies and processes, which under certain conditions in transitions-theoretical terms, lead to fundamental transformative change. As the efforts to achieve these systemic aspirations are in a relatively early phase of development at UBC, the focus of this research is on institutional innovation processes and their potential to engender transformative change. Sustainability transitions theory, as described above, provides a dynamic framework to follow and identify these

innovations – how innovations are grown, accelerated and up-scaled to the level of systemic change, and how actors navigate and perform strategic interventions that support such transition processes. According to this theory, experimentation and learning in innovation processes and the role of actors and coalitions in empowering innovation processes are two critical conditions for fostering transformative social innovation, and are therefore at the core of this thesis.

The intent of this thesis, then, is to explore the activities that have guided and informed institutional innovation processes for sustainability in the built environment at UBC, and analyze if these activities exhibit the conditions that the theory suggests is necessary for engendering transformative social innovation. Though this thesis, as stated, is predominately concerned with exploring operational sustainability, it soon became apparent that UBC's attempt to integrate the academic and operational realms is what has made the University both distinctive and successful in its endeavours. As a result, the analysis will also build references to the connection between operational and academic sustainability where appropriate, especially as it relates powerfully to our theoretical framework. However, the analysis will also assess the applicability of the theory by being sensitive to new observations emerging from the data and suggest whether the theoretical lens should be modified to better reflect practice.

In summary, this thesis explores the enabling conditions of transformative social innovation for sustainability by asking two key questions that cut across the analytical framework in transitions theory (Table 2.2):

1. Have activities at UBC nurtured innovation through experimentation and learning processes?
2. Have multi-level actor networks, both internal and external to the University, empowered innovation?

### **2.2.2 Research methodology**

To address the research questions, the thesis follows an exploratory research approach with sustainability transitions theory as the central field of investigation for transformative change. As the

research questions and analytical framework suggest, a qualitative research design best suits the study in order to generate an in-depth understanding of the organizational case and support the development of theory. To validate the findings, the research is based on a triangulation of three different approaches for data collection, including a literature review of sustainability transitions theory, semi-structured interviews with key decision-makers in operational units at UBC, and documentary analysis of institutional practices that have guided social innovation at the University.

Prior to collecting data, a literature review was conducted to provide context and background information on sustainable transitions theory in order to further elaborate the research focus, and to develop a conceptual framework for analyzing the transformative potential of innovation activities (as outlined in Table 2.2). The main sources of information consisted of peer-reviewed publications, book chapters and conference papers.

Secondly, fourteen expert interviews were conducted to serve both a historical function to understand sustainability initiatives in the past, as well as a prospective role to understand current and forthcoming ones from the participants' perspective. A benefit of this approach is that it allowed for a deeper understanding of the contexts and complexities of individuals' real lived experiences and opinions. Interviewees were selected through purposive sampling based on the individual's engagement with operational sustainability initiatives at UBC, and snowball sampling through the recommendation of interviewees. Specifically, interviews were conducted with key stakeholders involved in the creation and implementation of sustainability practices and activities in the built environment. As far more people satisfied that criterion than could be interviewed in the time available, an attempt was made to canvass from that list a fairly diverse range of participants so as to permit a reasonable balancing of different perspectives. The sample included operational executives, key operational departments (building and facilities management), academic experts in various aspects of sustainability, and operational staff.

Interviews were conducted according to interview scripts individually tailored for each respondent on the basis of the conceptual framework. In this sense, the specific wordings of questions varied from interview to interview, but all appealed to the enabling conditions for path-breaking experimentation and innovation, including their roles in supporting learning and networking processes; and the nature of multi-level governance networks in coordinating and aligning activities across scales to overcome inertia and institutional lock-in.

All interviews conducted were held in person at public locations of the interviewee's choosing, carried out from December to February 2015, and lasted between 30 to 60 minutes in length. The interview proceedings were obtained and recorded with signed consent of respondents. Field notes were also taken during each interview session to document the conversation, as well as noteworthy discussion points. The interviewees were transcribed verbatim, coded and analyzed for content and themes utilizing the conceptual framework outlined in Table 2.2. The sources of quotes in the analysis are deliberately kept anonymous in order to ensure that statements are not directly linked to an individual. It was particularly important to maintain strong anonymity given the thesis supervisor's close association with the sustainability activities analyzed in the study, as well as with the individuals interviewed. It was assumed during the research design and planning phase of the study that such anonymity would allow interview participants to speak more freely about their experiences and perceptions about the evolution of sustainability at the University. The sources of quotes, however, are attributed with general affiliations in order to provide better context for the reader.

Document analysis was combined with interview methods to evaluate the enabling conditions for transformative social innovation at the University. Institutional documents were obtained through online research or by recommendations from interviewees in order to identify landscape trends, regime characteristics and niche activities. The documents include public electronic documents, such as online reports and public announcements, publications from external organizations, as well as internal working

documents, publications and policies pertaining to the sustainability initiatives at the University. Once gathered, the documents were examined according to the principles of content analysis, and provided an overarching historical and contextual framework by which interviews could be compared and supplemented. Once coded and categorized according to the conceptual framework in Table 2.2, the insights gained from the documents were integrated with the interview data and incorporated into the final analysis.

### **Chapter 3: Experimentation and Learning**

As described in the previous chapter, sustainability transitions theory is a valuable heuristic framework for evaluating the impact and potential of transformative social innovations by identifying how innovations are nurtured, accelerated and up-scaled to the level of systemic change, and how actors navigate and perform strategic interventions that support such transition processes (Markard et al., 2012). Social innovations, in theoretical terms, are developed and empowered in protected niche spaces, and therefore can be conceptualized as niche-innovations (Geels and Schot, 2007). Niche-innovations, in essence, are concrete projects on the ground that act as carriers of novel ideas and practices, advance best practices, and network with other societal actors at various scales to consolidate social learning for systemic change (Geels and Raven, 2006). The diffusion or scaling-up of a niche-innovation to the level of the socio-technical regime requires the empowerment of innovation strategies, actions and processes.

Sustainability transitions theory identifies the essential elements that have the potential to nurture and empower social innovation to become a driver of systemic change. As noted in the preceding chapter, these elements include experimentation and learning, which is the focus of this chapter, and multi-level alignment, coordination and adaptation, which will be explored in the following chapter. Therefore, to thrive and eventually become transformative, it is imperative to create an environment for innovation that values and prioritizes experimentation and reflexive learning. In other words, the environment must create platforms that foster experimentation and innovation development; stimulate monitoring, evaluation and reflexive learning processes to enhance the possibility of the emergence of new sustainable patterns; and nurture conditions for the emergence of heterogeneous coalitions and partnerships across scales (Table 3.1) (Geels et al., 2010; Loorbach, 2010; Schot and Geels, 2008).

These conditions, derived from the conceptual framework in the literature review chapter and outlined in Table 3.1 below, are useful criteria to assess the potential of existing innovative activities in

fostering change, to articulate the gaps and opportunities for strengthening experimentation and learning processes, and to consciously guide emergent innovations and organizational activities. The following chapter uses this conceptual framework to examine the activities at UBC and to assess if it exhibits the competencies, specifically the experimentation and learning competencies that nurture transformative social innovation for sustainability.

<b>Experimentation and learning</b>	
1.	<b>Innovation development:</b> Creating protected spaces conducive to nurturing and empowering experimentation and innovation development
2.	<b>Monitoring, evaluation and reflexive learning:</b> Stimulating monitoring, evaluating and learning processes through social interaction to enhance the possibility of the emergence of new sustainable patterns
3.	<b>Network and partnership development:</b> Nurturing conditions that allow the emergence of partnerships and heterogeneous networks, which provide the diverse resources required for innovation implementation and diffusion

**Table 3.1 Key characteristics enabling experimentation and learning (derived from Table 2.2)**

### **3.1 Innovation development**

Innovation development, the first characteristic of the experimentation and learning dimension in our conceptual framework, helps to determine whether an environment has the potential to nurture and empower niche-innovations. These environments, specifically, engender innovative processes and provide windows of opportunity for social innovation to flourish. In the context of UBC, regional and municipal pressure to be at the forefront of innovations for sustainability, a supportive institutional climate for innovation development, and a view of the campus as a societal test-bed for sustainability, have collectively played an important role in forming a protected environment for innovation.

### **3.1.1 Regional and municipal pressure**

The Province of British Columbia's climate leadership is a critical contextual factor at the landscape level that has facilitated the adoption of social innovations for sustainability. In 2008, British Columbia became the first North American jurisdiction to enact legislation for climate action (Province of British Columbia, 2016). In addition to an escalating carbon tax regime, British Columbia's Greenhouse Gas Reduction Targets Act (now streamlined into a single legislative and regulatory system known as the Greenhouse Gas Industrial Reporting and Control Act), passed in 2007, mandated the public sector to become carbon neutral by 2010, and overall provincial emissions to be reduced by 33 per cent compared to 2007 levels by 2020, and further reduced by at least 80 per cent below 2007 levels by 2050 (Province of British Columbia, Province of British Columbia, 2008). The province's Climate Action Plan, which was released in 2008, outlines strategies and initiatives to meet these targets.

As part of the carbon neutral government mandate, overseen by the BC Climate Action Secretariat, all public sector organizations, such as universities, are required to track their emissions for the province-wide Community Energy and Emissions Inventory and offset any remaining emissions. All public sector organizations are also required to public report on their emissions levels, actions they have taken to reduce these levels, and their plans for continuous emission reductions (Province of British Columbia, 2008). To that effect, the province founded the Pacific Carbon Trust, designed to collect funds generated through these mandatory carbon offsets in order to reinvest them in GHG-reduction projects in British Columbia. The government has also created a range of regulations and programs to promote sustainability in the public sector, including a requirement that all new provincially owned or leased buildings in British Columbia must be built to achieve LEED Gold certification (Province of British Columbia, 2008).

The City of Vancouver is also a relatively progressive city in the North American context vis-à-vis its approach to climate change policy and action. The City of Vancouver is a signatory to the

Federation of Canadian Municipalities-led Partners for Climate Protection and the BC Climate Action Charter, and a member of the UN Climate Neutral Network, working toward carbon neutrality. In 2011, the City of Vancouver initiated the Greenest City 2020 Action Plan, a plan with ten goal areas and fifteen measurable targets for the city toward becoming “the greenest city in the world by 2020” (City of Vancouver, 2015). In pursuit of these goals, the city has made continual, progressive steps in consultation and concert with the architecture and development communities locally to set one of the most aggressive green building codes in North America, from the 2005 Green Building Strategy to the 2011 Carbon Neutral Building Strategy (City of Vancouver, 2015).

As a public institution in Vancouver, British Columbia, UBC is therefore legally required to maintain an inventory of its emissions, pay the carbon tax, demonstrate action being taken to reduce institutional emissions, offset any remaining emissions and adhere to ambitious provincial green building policies for all developments on campus. The provincial and municipal contexts not only embed a long-standing political culture of awareness, and attention to, the risk of climate change and an overall ethos of environmental urbanism, but these contexts also provide a strong impetus to champion innovation for low-carbon solutions that meet the provincial and city-level climate targets. This regional and municipal pressure is undeniably a key driver in social innovation for sustainability, especially as the University’s annual carbon tax and mandatory offset liabilities amount to \$3 million Canadian dollars per year, a strong incentive to wean off fossil fuels and invest in cleaner and more efficient innovations (Robinson et al., 2013). The key decision-makers at the University, specifically operational staff in planning and infrastructure development, also view the regional and municipal factors as significant drivers for innovation for sustainability and describe how UBC was a leader in LEED standards before it became a provincial requirement in 2008, as exemplified by the development of the Life Sciences Centre that received LEED Gold certification in 2005 (UBC Sustainability Office, 2009):

The standards of the industry have risen, I think, in terms of what is viewed as the acceptable base standard for development in terms of sustainability performance. Even though we were doing LEED Gold buildings before it became a provincial mandate, it was very helpful to have that provincial mandate. Whereas before, we had to argue every time we were building a LEED Gold project, and we would have to deal with all the arguments as to why that was too risky or too expensive. Once that became the standard, we could move to the next level. In general, the City of Vancouver is very progressive about trying to increase the requirements under their building by-law around energy efficiency and we are seeing that across the board.

The University has to buy offsets for its greenhouse gas emission so there is an incentive to lower those greenhouse gas emissions and to lower the cost of those offsets. So there is a legal incentive for the University to look deeper into innovative projects.

There is the government leadership that happens in terms of political leadership to help drive policy innovation. A great example of that is the provincial government's Climate Action Plan, which then instituted a whole series of other regulations around mandating a carbon-neutral government by 2010, so that all government service organizations, including higher education institutions like UBC, had to be carbon-neutral by 2010. So, that became a big driver.

I think that the provincial government's policy has helped over the past five or six years. Because, the last thing UBC ever wants to be is adequate and just meeting the norm of the province. And so for that reason, it has driven us to figure out how we can be better than what is a fairly progressive level of provincial legislation. I also think that these pressures, from, say the provincial government, helps to ensure we do not lose momentum and to make sure we are staying ahead of the game operationally.

Not only do these provincial mandates facilitate and drive innovation development for sustainability at the

University, but, in their view, they also provide an incentive to aim for continuous improvement in its operations and infrastructure.

### **3.1.2 Supportive institutional climate**

In addition to provincial-level policies and municipal climate action initiatives, UBC's internal sustainability plans and policies at the regime level have provided windows of opportunity for social innovation. The University's Strategic Plan, Place and Promise, encompasses nine commitments tailored to realize a vision for the future, and sustainability is one of these commitments. The plan, created in 2009, outlines how the University, as part of this commitment, intends to commit its infrastructure, research, teaching and learning capabilities to innovate solutions for economic, environmental and social sustainability (University of British Columbia, 2009a). Specifically, the plan outlines actions to strengthen the strategic and financial planning culture at the faculty and unit level; provide a solid financial foundation for long-term success through continuous improvement; demonstrate novel solutions by deploying innovative technologies; and endorse the agent of change principle through innovation, integration and demonstration. This high-level plan also guides the principles, policies and strategies for growth and development of the campus' institutional lands, outlined in the University's Vancouver Campus Plan (University of British Columbia, 2010).

In support of the Place and Promise, the University developed an academic strategy for sustainability in 2009, referred to as the Sustainability Academic Strategy (SAS), under the President's Advisory Council on Sustainability. The SAS promoted new forms of research, teaching and learning on sustainability, encouraged the University to demonstrate operational transformation toward greater sustainability, and supported investments in innovation that advance sustainability solutions responsive to the needs of the broader community (University of British Columbia, 2009b). More importantly, the SAS proposed that operational and academic sustainability activities be integrated under one umbrella,

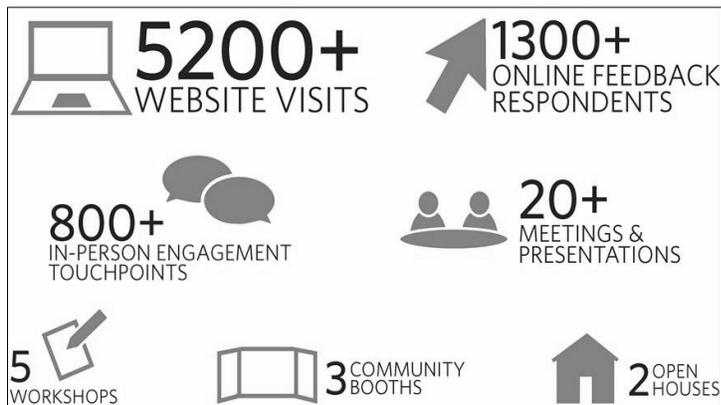
something that has rarely been done in the university sector (Robinson, personal communication, May 15, 2016).

To that end, the strategy proposed two cross-cutting themes intended to link teaching and learning, research and partnerships, and operational and administrative activities on campus (University of British Columbia, 2009b). The first theme, the Campus as a Living Laboratory, intends to transform the campus into a living laboratory for sustainability in order to demonstrate sustainable practices and technologies that engage faculty, students, staff and community partners and leverage operational innovations. The second theme, the University as an Agent of Change, aims to strengthen UBC's role as an agent of change for sustainability beyond its campus by facilitating dialogue and fostering partnerships between the University and other relevant stakeholders seeking sustainability ideas and solutions (Robinson et al., 2013). By linking the academic realm with operational activities on campus, the nature of operational decisions and role of operational staff at UBC also shifted from a role limited to services and infrastructure, to a role where infrastructure and operational sustainability activities now develop and evolve as part of the academic agenda. The cross-fertilization of operational and academic sustainability has, as a result, catalyzed a portfolio of initiatives that aim to transform the University into a test-bed for sustainability and an agent of change in the wider community (Cayuela et al., 2013).

Most recently, in 2014, the 20-year Sustainability Strategy was finalized to provide a long-term framework for the integration of sustainability across teaching, learning and research, operations and infrastructure, and the community. In developing the strategy, UBC convened a Steering Committee chaired by the Associate Provost, Sustainability and composed of community members, including students, faculty, staff, and external partners. The Steering Committee provided oversight on the engagement process, considered community feedback and drafted the strategy. The process engaged over 2,000 individuals, both online and in-person, and was finalized and reported to the Board of Governors in Fall 2014 (Figure 3.1). The 20-year Sustainability Strategy, which builds on SAS, is, in essence, a

framework with the intent to further integrate dispersed sustainability efforts through the lens of regenerative sustainability, leverage the campus as a societal test-bed, and create academic, operational and community collaborations and connections. The strategy provides long-term direction for sustainability and is considered a living document that is responsive to changing conditions. In fact, it should be noted that very few universities have such a long-term visionary document (University of British Columbia, 2015c).

Taken together, these institutional sustainability plans and policies not only demonstrate a deeper integration of sustainability decision-making and practices into various aspects of the University, but they also offer interdisciplinary research opportunities, integrate academic and operational sustainability deeply across the institution, and ultimately foster an environment conducive to innovative practices and new discoveries for sustainability.



**Figure 3.1 20-Year Sustainability Strategy engagement process (Robinson, 2016)**

The University's track record in operational sustainability has also set the institutional framework for innovation for sustainability solutions. Driven in part by faculty and staff in the 1990s for action on what was then described as a sustainable development agenda, UBC developed a teaching-based Greening the Campus (GTC) program that linked students, faculty and staff on sustainability projects, and

in 1997, was the first university in Canada to adopt a sustainable development policy, and a year later, to open a campus sustainability office (Moore et al., 2010; University of British Columbia, 2012a). The University was also a pioneer in the development of green buildings, catalyzed by the construction of the CK Choi Building, an award-winning building recognized for its sustainable design features (Robinson et al., 2013; University of British Columbia, 2012a). Completed in 1996, the CK Choi Building was designed to utilize energy efficient systems and recycled materials previously unseen in Canada, and in so doing, ultimately set new standards for sustainable design, construction and operation for the University and the wider professional and research communities. Administrators and operational staff in infrastructure development and policy planning at UBC also commonly referred to the CK Choi Building as one of the main catalysts for sustainable development on campus:

The Choi Building was the start of green building in Canada in some ways. It was one of the first buildings where there was a purposeful focus on developing the most sustainable project possible at the time. So, I think that was a starting point and then we flowed through with CIRS, which was the next iteration of that development, but on a larger scale.

CK Choi was not only transformative for UBC, but it also held as an example at the time and helped to drive a lot of policy for sustainability. It created a lot of the groundwork for UBC to be a leader in the green building world, and it also had a profound ripple effect on the industry.

Though the CK Choi Building set new standards for sustainable development, building authorities encountered various institutional challenges and barriers as a result of the development's novel and holistic design approach. At the outset of the design, charrettes and seminars were held to explore, learn and establish the goals for the project. The team of design professionals, architectural, landscaping, structural, mechanical and electrical and cost consultants, worked together with all the stakeholders,

including the University representatives and building users, to determine the sustainable goals of the project. However, as the project progressed, there was not always consensus on the goals that had been set. As a result, approvals required to implement the goals from various authorities had to be fought for one by one. Furthermore, achieving these goals often meant deviating from building codes and returning to first principles of design. This involved research by the design team and discussions with the building authorities to ensure that the intent of the code was met and safety standards maintained. There were also inconsistencies with provincial laws, as building codes in British Columbia at the time were not compatible with the use of recycled materials or alternate water and sewer systems (Raynard and Klein, 2002).

In addition to the challenges of working with diverse stakeholders to achieve common goals, there were also challenges in obtaining relevant certificates to verify both the source of recycled steel for the structural system of the building, and the recycled content used for fabrication. To that end, it took considerable work and tracking to achieve the design goal of having 100% of the structural steel pieces with 75 per cent of recycled content. Additional challenges were encountered with the use of timber. In order to achieve the required strength and to meet the minimum size code requirements for heavy timber beams, the existing timber were bolted together; however, the building authorities did not initially agree that this met the heavy timber code requirement for fire rating. To overcome this challenge, investigation and research followed to present the philosophy to the authorities that the fire code was, in actuality, being met (Raynard and Klein, 2002).

In 2003, the University completed the largest energy and water retrofit program on a Canadian university campus. From 2001 to 2008, EcoTREK involved retrofitting 288 academic buildings to reduce energy and water consumption. In the four years prior to launch, UBC's utility costs had doubled as a result of climbing energy prices (University of British Columbia, 2012a). The project goal was to reduce energy and water consumption in core academic buildings, along with associated GHG emissions, thereby

reducing the University's energy costs. In essence, EcoTREK provided a mechanism to fund the renewal of campus facilities, and use new technologies to replace aging utility management infrastructure. Through this program, the University achieved a 27 per cent reduction of non-renewable energy consumption in institutional buildings from 2000 levels, and a 48 per cent reduction in potable water use (Robinson et al., 2013). The entire project was also self-funded from the energy and water cost savings, and also addressed about \$12 million of deferred maintenance campus facilities and infrastructure (Knight and Marques, 2008). These developments, and their significant financial and environmental benefits, provided the necessary credibility and legitimacy for subsequent sustainability initiatives at the University:

EcoTREK and retrofit projects, which stem from our Climate Action Plan, gave the University the confidence to go forward with subsequent sustainability projects.

The University's position as regulator, developer and landowner is another key element that has supported and facilitated innovation development, particularly when compared to non-university settings. Universities have distinct traits that provide the freedom to explore, creatively and collaboratively, the technological, environmental, economic and societal aspects of sustainability (University of British Columbia, 2009b). As the regulator, developer and landowner, UBC has a significant amount of control over the decisions concerning development, and that differentiates the institution from municipalities that struggle with the tensions that are often prevalent between developers, regulators and landowners. Coupled with the University's education and research mandates, this unique situation, in turn, shapes and creates opportunities to become early innovators in areas where others may not be prepared or equipped to do so (Robinson et al., 2013). Few societal institutions have this mix of capabilities, and as a result, universities with these characteristics have a significant academic and operational opportunity to be at the

forefront of the sustainability transition. Administrators in infrastructure development and community planning also commonly referred to this distinctive institutional environment when asked about the factors that, in their view, have contributed to creating the operating context for innovation:

We can make important decisions at the University because we are the landowners and regulators. The Province ultimately approves our land use plan, but we have control over the details, so we are the regulator. We are also the developer through UBC Properties Trust, which is an arm's length body but also directed by the University. So, having that amount of control over the process is one reason why it is easier to try new things at UBC.

We are really unique at UBC, because we are the owners, the regulators and the developers. So, there should be a lot we could do to move forward towards our notion and ideas of sustainability. Our unique ownership and regulatory context give us that ability.

At UBC, we are single decision-makers so we have a significant opportunity in respect to capital stock that many municipalities do not have. Within this framework, we can pretty much try anything and it allows us to apply innovation and new ideas on a bigger scale than you might on a project-by-project basis in a certain municipality.

### **3.1.3 Campus as a societal test-bed**

In 2010, in response to one of the recommendations of the SAS, UBC's president at the time, Professor Stephen Toope, announced the establishment of the UBC Sustainability Initiative (USI) (Cayuela et al., 2013; Robinson et al., 2013; University of British Columbia, 2009b). The USI is essentially a voice, a clearinghouse, and an enabler for sustainability at UBC (Cayuela et al., 2013). One of its principal responsibilities is to integrate operational and academic sustainability across the

University, a particularly important endeavor as in most universities operational and academic sustainability are quite separate, resulting in many missed opportunities for fruitful collaboration (Robinson et al., 2013). The integration of operational and academic sustainability, in turn, catalyzed the development of a portfolio of activities that sought to transform the University into a societal test-bed, or living laboratory, for sustainability – a 402-hectare community in which faculty, staff and students and private, public and NGO partners use the physical plant, combined with the University’s education and research capabilities, to test, study, teach, apply and share the outcomes of their inquiries (Robinson et al., 2013). As part of this process, UBC has added faculty members to key operational committees of the University, evaluates its main operational initiatives through a sustainability lens, and builds teaching and research opportunities in conjunction with campus infrastructure and operational activities (Robinson et al., 2013; University of British Columbia, 2012a).

Since its inception, the Campus as a Living Laboratory (CLL) model has continued to provide an opportunity to further explore, test and demonstrate innovations for sustainability by combining campus operations and administration (e.g. energy and water management, land use and ecosystem management, buildings and infrastructure, planning) with the education, research and outreach mandates of the University (University of British Columbia, 2009b). The CLL model has also created a niche space for experimentation and learning, where niche-innovations are supplied with the necessary resources to develop and thrive. Most of the operational staff and administrators interviewed cited the University’s unique experimental capabilities through the CLL model when asked about specific institutional elements that nurture innovative projects on campus:

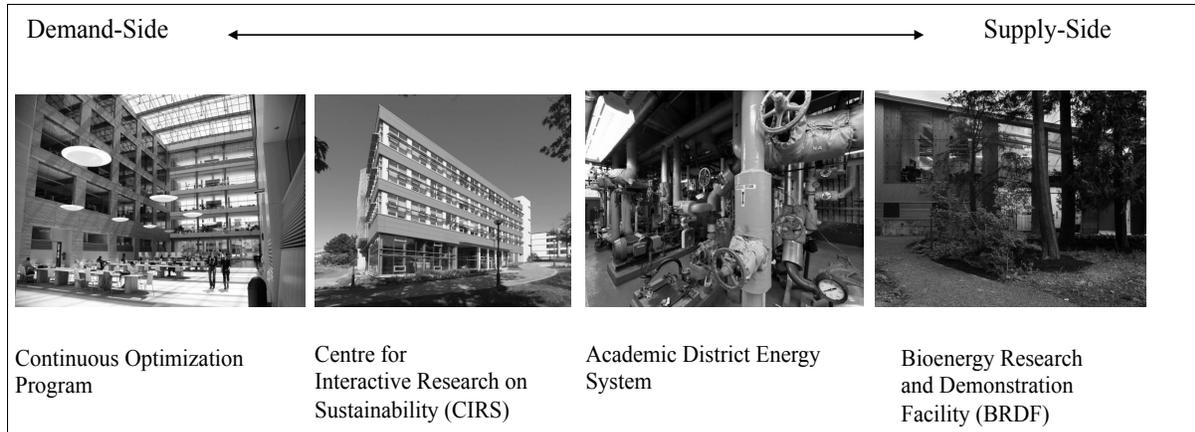
The concept of the campus as a laboratory is an opportunity to operationalize on innovative projects and to marry interesting and relevant work from the academic side of the University with operational needs.

These campus as a living lab projects are really driven by research agendas. For example, let's consider the Copp Building, which is designed to be a campus as a living lab project. With this approach, there is an opportunity for researchers to really drive the development process because the project will be largely driven by specific research agendas, as opposed to administrative ones. That is an opportunity to have a pretty interesting and innovative project on campus.

I think the living laboratory approach is really exciting aspect of the University. There is a unique opportunity to do innovative tests, and to try out other things that might not necessarily be the norm.

At UBC, we have this amazing opportunity to bridge the applied operational pragmatics of sustainability with an academic foresight. I think that is largely why UBC has been so successful.

By transforming its entire campus into an experiment in sustainability, the University has institutionalized a mandate and created a model for making discoveries to advance sustainability scholarship in order to meet provincial and city-level climate targets. In order to meet these targets, the UBC Board of Governors approved \$150 million in funding for several key living laboratory projects, notably the Continuous Optimization Program; a campus-wide tune-up program for 72 core academic buildings from 2010 to 2015; the Centre for Interactive Research on Sustainability, completed in 2011 and designed to be the most innovative and high performing building in North America; the Academic District Energy System, underway since 2011, designed to be the largest steam to hot water conversion project in North America and to reduce GHG emissions by 22 per cent; and the Bioenergy Research and Demonstration Facility, a biomass gasification co-generation plant operational since 2012 and constructed to reduce campus GHG emissions by 9 per cent (Figure 3.2) (University of British Columbia, 2012). From a sustainability transitions perspective, these projects represent investments in sustainability.



**Figure 3.2 Signature capital projects at UBC (Robinson, 2016)**

In 2010, the University launched the campus-wide Continuous Optimization, or Building Tune-Up, Program in partnership with BC Hydro’s Continuous Optimization program and Pulse Energy. The Continuous Optimization Program, in essence, is a key component of UBC’s Climate Action Plan and involves re-commissioning 72 buildings to reduce the energy and emissions in core academic building by 10 per cent. In order to manage existing building systems more efficiently, all major and academic buildings on campus are fitted with meters for electricity and heat monitoring, which are linked to real-time energy management software. The UBC Energy Planning and Innovation (EPI) group, in turn, continuously monitors all metered buildings to help maintain and improve energy efficiency (University of British Columbia, 2012b). Following successful building tune-up pilots in the Buchanan Tower and the Neville Scarfe buildings in 2010, which has conserved 13 per cent of electricity and 35 per cent of gas consumption annually, an additional 17 tune-ups were completed in 2013. All remaining academic buildings are expected to receive tune-ups by the end of 2016/2017 (University of British Columbia, 2012b).

In 2011, the Centre for Interactive Research on Sustainability (CIRS) was constructed and designed to operate at the frontier of sustainable performance in both environmental and human term both

within and beyond the building boundary, and to serve as a research test-bed for net-positive performance and sustainable urban development practices over its lifetime (Robinson et al., 2013; University of British Columbia, 2009b). The building was originally conceived by Professor John Robinson, a professor at UBC and former executive director of the USI, as an opportunity to create a sustainability showcase in British Columbia (Robinson et al., 2013; Centre for Interactive Research on Sustainability, 2011; University of British Columbia, 2009b).

CIRS continues to be a key component of a campus-level planning approach to discover design strategies for sustainable energy, water, waste and food systems through practical implementation and learning. The building systems and infrastructure, as well as the process of planning, designing, building and operating the facility are integral components of the CIRS research program. Through research, every aspect of the building is studied over the course of its useful life, and optimized through innovative system design and the application and demonstration of new technologies (Centre for Interactive Research on Sustainability, 2011). One recent study by Fedoruk et al. (2013) examined the performance gaps of the building, and discovered that the main barrier to achieving its desired performance outcomes were predominately institutional – not technical – in the sense that they arose from the way various stages of the building lifecycle were specified, contracted and implemented. In essence, the study emphasized the importance of having meaningful and effective building energy monitoring capabilities, an understanding of energy system boundaries in design and analysis, crossing the gaps between different stages of a building life cycle, and feedback processes throughout design and operation (Fedoruk et al., 2015).

Another research study by Salehi et al. (2015) conducted a detailed analysis of CIRS to diagnose its energy performance gap. The study revealed that the major sources of the performance gap were due to discrepancies between the design intent of the building and its performance. Specifically, the study compared the whole-building energy modeling results with the overall measured energy consumption,

and it was discovered that the building revealed approximately 60 percent higher energy consumption during its first year of operation than the initial model prediction. The analysis revealed that the performance gap was, in fact, due to design and commissioning deficiencies, which ultimately affects the water treatment process load, transformers efficiencies, and pumping work (Salehi et al., 2015).

The lessons learned from these case studies, among others, have meaningful implications for future developments both on and off-campus, and therefore can contribute to making subsequent performance advances for building stakeholders and the wider professional and research community. To that end, the culture of innovation and learning fostered by CIRS has not only reinforced the important role of universities in becoming transparent living laboratories for sustainability, but it has also permitted academics and operational personnel to engage in and learn from such experiments. These notions also resonate with key decision-makers in infrastructure development and energy planning at the University:

I think that the CK Choi was a starting point, and then CIRS was really the next iteration of that on a much more intense scale and scope in the idea of using the building as a laboratory. So, not just building a sustainable building, but also using it to learn and experiment over time.

CIRS has been an important project at UBC. It has really allowed the University to leverage the campus as a living laboratory concept, and to test and learn from these experiments in sustainability.

The CIRS building is our most aggressive building yet in terms of sustainable design. The roof water reuse, the black water treatment for irrigation, the photovoltaics – though not necessarily cutting edge – are innovative in that not many stakeholders are applying them at a commercially-relevant scale.

The second flagship CLL project, the Bioenergy Research and Demonstration Facility (BRDF), is the first biomass co-generation, or combined heat and power, project of its kind in North America. In

partnership with Nexterra Energy Corporation and GE Power and Water, the facility demonstrates a novel wood waste gasification process and a co-generation application utilizing a GE Jenbacher internal combustion engine and electricity generator (University of British Columbia, 2015a). The facility is also one of the first buildings in North America to be constructed from local cross-laminated timber, a renewable alternative to steel construction that sequesters carbon in the structure (Robinson et al., 2013). One of the major benefits of the BRDF has been the successful demonstration of the associated technologies' viability both individually and when operating as a system. The ongoing opportunity to demonstrate the conditioning of synthesis gas and the utilization of the ECES (a unique combination of battery and energy management technologies) for back-up power, however, remain unmet objectives due to mechanical failure and operator hesitancy, respectively. To overcome these issues, UBC is verifying the reliability of, and cost savings generated by, the ECES systems, in order to build operator confidence and justify the potential expansion of the network (University of British Columbia, 2015a).

Operational since 2012, the facility continues to produce cleaner electricity for the campus' heating and thermal needs, and therefore will contribute to reducing institutional GHG emissions by 33 per cent by 2015 (University of British Columbia, 2015a). Prior to this project, UBC had not, within their operations group, undertaken a seemingly risky endeavour. In addition to fundamentally contributing to the reduction of the University's overall emissions, the project has required the University to embrace and enable the opportunity to integrate new technologies and processes that would not normally be chosen. The living laboratory forum of the facility also created an opportunity to overcome the economic and technical tensions that, in conventional environments, have the potential to inhibit a project from being realized. Despite limited financial and technical resources, the project was able to move forward by using campus infrastructure as a real-world demonstration laboratory, and in so doing, leverage meaningful partnerships with developers to collaborate on relevant and replicable solutions to urban sustainability

challenges (University of British Columbia, 2015a). These contributions were also made explicit by interviewees involved in the development of the facility:

One of the main attractions at UBC is that we have this amazing opportunity to bridge the applied operation pragmatics of sustainability with an academic foresight. The BRDF, for example, started as a germ of an idea, and given the kind of limited resources that UBC has, there were some economic and technical challenges not allowing the fulsomeness of the technical to proceed. But, because of the campus as a living laboratory forum, there was an opportunity to test the appetite of a number of different partners to provide funding. In the end, we raised over \$22 million to leverage the \$5 million contribution from UBC.

The bio-energy project is a coming together of a whole bunch of pieces from the academic research side of things to private partnership with local companies. These pieces are all coming together to do a whole bunch of really innovative things. One, to try to commercialize green technology that did not exist anywhere in the world; to help contribute to reducing greenhouse gas emissions; [and] to create a physical platform where operational needs of the campus are achieved, where at the same time, graduate students and researchers can do research on it.

The bio-energy facility is another example of where we really push the bar in terms of how we generate alternative energy and that has proven to be a big success in terms of what industry partners have gotten out of the project. Nexterra uses the facility as their signature project where they tour all their prospective clients – it is their showcase in a sense. We have the first biofuel generator in the world, apparently. We are using renewable natural gas in that engine to generate electricity and using cross-laminated timber, one of its first applications. So, we really pushed the bar in a lot of different things with that project.

The Academic District Energy System (ADES) is another signature project at UBC. The ADES is a network of underground piping across the northern half of the campus, one of the largest projects of its

kind in North America. In essence, the ADES project involves replacing UBC's aging steam infrastructure with a more efficient hot water system (University of British Columbia, 2011). The five-year conversion project began in 2011 and is an integral component of UBC's Climate Action Plan, contributing to the University's ambitious target of reducing campus-wide GHG emissions by 33 per cent by 2015, compared to 2007 levels. Specifically, it is expected for the network to reduce the University's thermal energy use by 24 per cent, GHG emissions by over 22 per cent, and operational and energy costs by \$5.5 million per year (Robinson et al., 2013). The largest source of energy cost savings will be generated from the new hot water system's ability to heat the campus while operating at a much lower temperature, which in turn, will reduce heat distribution losses significantly and allow for increased compatibility with alternative energy supply technologies (University of British Columbia, 2011). Put simply, the ADES is expected to provide a platform to achieve long-term targets of eliminating the use of fossil fuels on campus by 2050, and advance clean energy research and development opportunities (University of British Columbia, 2011). Interviewees, specifically staff members in energy and water services, also strongly endorsed the innovative potential of this project:

The District Energy System is transformational on a number of fronts. One, there is so much more you can do with the hot water system than a steam system. We do not have to burn as much natural gas because everything is new; our new heat exchangers are everywhere so they work more efficiently; and we have new insulated pipes that work better. Previously, there were estimated losses on the steam system – by the time the steam actually got to the building it lost 24% of what we produced into the ground. So, that is a huge gain on the energy savings and GHG emissions front.

The District Energy System is a kind of edgy and uncommon technology at a local and even North American level. But, we are building it in a big way, and we have actually put our heads on the chopping block for it because we really need to make this leap. And it is a giant leap to go forward with this system.

Our aging steam distribution system is being replaced with a hot water system, and that is going to be 24% more efficient than the old controller system. That is a real step towards change.

Though highly significant in terms of sustainability, it was later realized that the ADES project did not fulfill all of the requirements of a CLL project, since it does not embody research or teaching connections. This realization in turn emphasized that, in general, minimum sustainability standards for CLL projects do not exist at UBC. The evaluations of proposed projects, rather, are based on alternative but incomplete analyses such as those supported by life-cycle assessment and life-cycle costing methodologies. These types of assessments in turn disregard social and community sustainability issues and do not explicitly incorporate externalities. Another key challenge with the CLL initiative has been to counter a natural tendency to predominately focus on engineering and technology or energy and emissions initiatives. Social sustainability, as represented by social justice, equity, and intercultural understanding imperatives, needs to be equally represented and addressed (Vallance et al., 2011). To address these issues, UBC is developing a sustainability evaluative framework to refine its CLL program and the USI is consulting with relevant groups to articulate a coherent conception of social sustainability (Cayuela et al., 2013).

A deeper analysis of the interviews also reveal that a strong business case for operational niche-projects, such as CIRS, BRDF or ADES, has proven to be key in enabling innovative projects to develop and thrive. For instance, a clear alignment between the project and the fundamental mission of the University undoubtedly contributes to making the project defensible and necessary for pursuing institutional, municipal or regional targets. In the context of living laboratory projects at UBC, the business case of the project also plays an important role in helping to advance the project, especially when

financial resources are limited. As most public sector institutions have limited resources, institutions increasingly support standalone projects with a positive return on investment:

It is hard to find the resources, especially when a project is so experimental. At what point are we throwing good money after bad? I am not saying that we are doing that here, but I am saying that it is very difficult to know what the balance point is, and that is probably the biggest challenge.

The biggest challenge, I think, is financial. We are always constrained on our projects, either by how much a donor is able to give, you know, or how much money we can get from the provincial government for a given project.

For instance, in the case of the ADES and BRDF, an economic return on investment was critical to their progress and success, as expressed by project managers of these specific initiatives:

The business case is really important. Of course there is a principle commitment to sustainability, but ultimately the University has a fixed amount of resources and it can be difficult to make a compelling case if a project is going to be a cash draw. So, I think the District Energy System project is a great example of a project with a strong business case because we save money by converting to this system.

For the BRDF project, we learned that cleaner wood waste would not only emit cleaner emissions, but cleaner wood actually has a better business case because it is typically drier – the drier the wood, the less moisture we have to remove. And so actually, the financials worked out better and it made it easier to sell the rest of the project.

For this project [ADES] we were taking into account that we were replacing a 40-year old heat exchanger with a brand new one, but what we did not take into account was that the brand new one was going to be 10-

15% more efficient than the old one so it would not need as much heat as it did before. If you were to holistically look at the impact on UBC, there was an additional 10% benefit, much similar to the million dollars that you did not have to put in the mechanical.

At a smaller scale, to help alleviate the financial burdens often associated with innovative projects, the University has launched a Sustainability Revolving Fund pilot in 2014-2015 to provide projects on campus access to capital, with the purpose of reducing consumption of resources including electricity, water, heating, and materials. The savings of these projects are tracked and used to replenish the fund for subsequent investments (University of British Columbia, 2015). Put simply, the fund, which provides a minimum loan of \$10,000, helps create new project opportunities by facilitating access to project funding, helping UBC's research laboratories achieve cutting-edge performance, and building on UBC's social innovation capabilities (Sustainable Endowments Institute, 2015). This fund, however, is only relevant to smaller projects, ultimately making it inapplicable to larger projects such as the ADES or BRDF. This raises the question, then, if there should be a revolving fund to provide capital for high-performance campus design, operations, maintenance, and occupant behaviour projects, in order to alleviate the financial burdens associated with larger, innovative capital projects.

Generally, however, the availability of funding or access to capital for infrastructure projects has been a considerable constraint. Within this is the limited capacity of public organizations to take on additional debt through external borrowing, which is partly due to the rule change from the provincial government that inhibits public institutions from taking on additional debt unless approved by the provincial government. Without access to external funding, these organizations are in essence limited to pursue only those infrastructure projects that can be funded internally or from donations. These infrastructure projects, then, have to compete against other university priorities to gain internal funding (Lau, 2013). Fortunately, UBC has managed to secure funding, for the BRDF project for instance, from

government agencies, including federal grants, due to the development's research component. The University has also partnered with private sector partners, such as Nexterra, BC Hydro, and General Electric.

In addition to a strong business case that accounts for a favourable return on investment, there is undoubtedly an element of risk associated with the pursuit of any innovative idea, process or technology. Combined with financial restraints, public sector institutions are also traditionally risk-averse as they may not be able to afford the risk of failure. In the context of UBC, risk has the potential to be a considerable barrier for innovation development, as expressed by administrators in infrastructure and services planning:

I think the more risky and out of the box it is, the more challenging it becomes to get support... You want to be a leader, but you do not want to necessarily be on the bleeding edge with a high risk of failure, losing your investment.

I do not think there is a strong desire to be particularly risky. I think the University's investment strategy is pretty conservative. And you know, I think the board likes to think of themselves as quite conservative in the way that the University invests its money.

Though the element of risk has undeniably been a key consideration, the University has overcome risks, and therefore encourages ongoing experimentation, by approaching the management of innovation risk differently. In addition to the living laboratory forum that has created a culture celebrating innovation, and therefore tolerates risk to some extent, proactive engagement with the process of risk has proven to be fruitful as well. Consider, for example, the development of the BRDF that took an active approach to managing the risks of their investment portfolio, systematically measuring those risks to generate returns (University of British Columbia, 2015). Rather than terminating the project when it ran

into difficulties with the original concept, the project team utilized alternative solutions to mitigate the anticipated risks:

With certain projects we are willing to push the risk factor because we know that there are benefits around research that are worth it. It is worth taking the risk if we know that there is a broad range of benefits that will benefit the academic mission of the campus, in that we know we can mitigate the risks with their different strategies. With the bioenergy project, we had a failure with the original concept around using syngas to generate electricity; we knew that we could switch gears. We knew we still had a valuable asset that we could use in a different way, and at the end of the day, we were able to mitigate that risk.

In the same vein, small-scale experimentation, or conducting projects in phases, has helped to mitigate risks associated with particularly innovative and risky projects. Though not necessarily the easiest method from an operational standpoint, conducting projects in phases not only allows project stakeholders to manage the risks of their investment portfolio and suggest alternate solutions as necessary, but, according to key decision-makers and operational managers in infrastructure development and energy services at the University, it also contributes to building senior acceptance, actively testing theories, and continually assessing the outcomes of each phase to inform subsequent ones:

I am a bit of the gatekeeper for living lab infrastructure projects for the campus. So, a living lab project, an aggressive project to pursue some sustainable design or practice, is feasible if we are doing it on a localized area and figuring out how well it works. But, I would have a hard time allowing for it to happen for the whole campus, because the consequence of failure can be really large if it is a very edgy proposal. When it is edgy and risky, then we will make it an isolated living laboratory project, and if there is a problem with it, the consequence of failure is not too bad.

Doing it in phases helped senior acceptance that we knew what we were doing. From a pure operational standpoint, doing it in phases was a pain. But, I do not think it would have been approved if we had done it all at once.

The folks proposing these projects are knowledgeable about the world, and they recognize that we are not going to do something completely outlandish. And also, in many cases, the research project does not allow them to do the larger-scale work. So, I think the order of work requires that you do the little thing, show proof of concept. Then, you can run a test-bed on a much larger scale.

### **3.2 Monitoring, evaluation and reflexive learning**

Monitoring the processes, impacts and outcomes of social innovation has the potential to play a key role in enabling social learning and in empowering social innovation actors (Geels et al., 2010; Schot and Geels, 2008). For actors to be empowered and intrinsically motivated to contribute to systemic change through social innovation, they need to be able to value the impact of their endeavours. In other words, knowing how and to what extent social innovation initiatives are succeeding in their goals, and providing suggestions on how to increase this success, is a crucial element for increasing the chances of successful diffusion beyond the innovation (Loorbach, 2010). At UBC, the institution supports pursuits that contribute to innovation and knowledge development within and across disciplines, as exemplified in the sections above, and has institutionalized several platforms for monitoring, evaluation and learning processes to examine and share the outcomes of their projects more broadly. As of date, these methods include comprehensive monitoring mechanisms for knowledge diffusion and the evaluation of social innovation outcomes to develop best practices, consolidate social learning, and inform continuous improvement efforts.

### **3.2.1 Internal monitoring and reporting mechanisms**

The University has institutionalized a multitude of monitoring and reporting mechanisms to track its progress towards meeting municipal and regional climate targets, and associated institutional goals, for carbon neutrality. A core component of UBC's energy management and building performance monitoring is the ION Historian, a publicly accessible database that provides real-time and long-term trending of energy and water consumption data for major academic and administrative buildings at the University. In essence, over 100 buildings are linked to a central Building Management System, monitored and administered by Building Operations, in order to identify deviations from normal building energy use and to make adjustments as necessary (University of British Columbia, 2012b). Researchers, students and energy managers commonly use this data to track energy saving projects, compare the energy performance of various buildings, and evaluate best practices in new building construction. In 2010, the Continuous Optimization Program was launched in partnership with BC Hydro to manage existing building systems more intelligently, and therefore monitors the performance of each building using real-time energy management software. To that end, monthly and annual progress reports are produced to track whether buildings are on course to maintain their optimized states (University of British Columbia, 2012b).

The performance metrics from the University's real-time monitoring and reporting software are ultimately used to supplement institutional reporting processes. Since 1998, the University has produced Annual Sustainability Reports to provide an overview of the performance metrics, and more generally, to highlight the milestones and achievements of sustainability-related portfolios at UBC. The most recent report, the 2014-2015 Annual Sustainability Report, highlights key achievements for UBC's Vancouver and Okanagan campuses from the fiscal year in teaching, learning and research, operations and infrastructure, community, and communications and engagement (University of British Columbia, 2015c). Specifically in the academics realm, the reports illustrate how the University is working to extend

sustainability across the curriculum and community to create opportunities for connection and collaboration. These initiatives include embedding sustainability in courses and programs across disciplines, fostering student leadership through sustainability leaderships, on-campus experiential learning projects, and student engagement services, and building capacity of UBC's teaching community to develop and deliver sustainability learning opportunities (University of British Columbia, 2015c). In regards to operations and infrastructure, the reports outline how the University leverages campus infrastructure and the built environment to demonstrate innovative solutions at the municipal scale. These include energy and emission reduction strategies, waste diversion and reduction efforts, water conservation mechanisms, green building design and performance achievements, including progress reports on signature living laboratory projects, as well as strategic priorities for the following year (University of British Columbia, 2015c).

In essence, the Annual Sustainability Reports provide an opportunity to monitor and track the University's progress in regards to institutional sustainability aspirations, identify areas of opportunity or improvement, and foster continued dialogue with the broader community around sustainability. The interviewees explicitly acknowledged the benefits of these annual reports, particularly those pertaining to assessing performance metrics to inform continuous improvement and increasing transparency about the University's progress on sustainability:

I think that the annual reports are very crucial to have on an ongoing basis as a touch point for engaging with our stakeholders, assess the current status of our programs or initiatives, and also use that as an opportunity to identify areas of improvement or opportunity.

Another important thing is, on an annual basis, we are reporting on our progress on our performance metrics. So, where performance is not on the trajectory to meeting the ultimate target, then we have to do an assessment and ask: why is that happening? Is it that we do not have a resource assignment? Is it that the

resource assigned does not completely understand their role and responsibility? Is there a mismanagement or miscommunication that is happening? It is that we have not built the necessary operational budgets to complement what they need? This is the continuous improvement cycle I was talking about.

In addition to the Annual Sustainability Reports that monitor and evaluate performance campus-wide, in 2013, the University began development of an Operational Sustainability Strategy to specifically outline UBC's strategic framework for improving the campus' operational sustainability performance. As part of this process, the Campus and Community Planning department at UBC began working with key operational departments, helping them to identify strategic sustainability objectives and actions that will enable the University to achieve long-term campus-wide targets in energy, climate, waste, and water. Department-level sustainability frameworks, which identify a series of actions toward meeting departmental targets, were completed for UBC Building Operations, Student Housing and Hospitality Services, Payment and Procurement Services and UBC Information Technology departments (University of British Columbia, 2015c). These reports are not currently accessible to the public, but according to one of the project leads, the intent is to have them online in order to create greater transparency:

We want to put these online. And they have not been in the past, but I think that is something we want to create, a transparency about how we are doing. Also, when it is out in the open, there is greater pressure to bear. So, my ambition is to actually get these more formalized and onto our public website.

The Carbon Neutral Action Report is another annual report produced by UBC. Required under the province's Carbon Neutral Governmental Regulation, the Carbon Neutral Action Reports are reports and GHG inventories that track the University's actions and progress towards carbon neutrality and in achieving the targets of its Climate Action Plan:

We are required, through the provincial government, to report our carbon neutral action report on an annual basis. This report essentially calculates our total emissions that are source one and source two reported emissions. It is an important report to inform us as to how we need to curb emissions, and it also helps to inform our Climate Action Plan as we move forward.

Since 2010, the University has been required to report on and purchase carbon offsets for emissions from all properties owned and leased by UBC and its subsidiaries, as per provincial legislation (Province of British Columbia, 2011). Annually, all public service organizations, including UBC, are required to complete a checklist and certify that they have accurately measured and reported emissions according to legislated and policy requirements. The data is then entered into an online measurement tool and a report is generated for review. As with financial reporting, senior staff must sign the document to demonstrate their confidence in their organization's energy and asset management (Province of British Columbia, 2011). The University's Carbon Neutral Action Reports, specifically, are also publically accessible and contain a detailed GHG emissions profile, offsets purchased to become carbon neutral, as well as a summary of the actions that have been taken to reduce emissions. The reports also track absolute and relative emissions against a 2007 baseline to measure and demonstrate performance against the GHG reduction targets of the Climate Action Plan. For instance, the latest carbon neutral report from 2014 demonstrates that the University's offsettable emissions decreased by 22 per cent from 2007 levels, despite an 11 per cent increase in building floor space and an 18 per cent increase in student enrolment (Table 3.2). In addition to providing accurate measurement and disclosure, the carbon neutral reporting also provides an idea bank for organizations seeking to reduce their own energy use and carbon footprint, enabling organizations to learn from best practices to achieve carbon neutrality at their respective institution or organization (University of British Columbia, 2014b).

Key Performance Indicator	2007	2014	Change from 2007 to 2014
GHG Emissions (tonnes CO <sub>2</sub> e)	61,082	47,814	-22%
Staff and Faculty Employees (FTE)	12,461	12,398	-0.5%
Student Enrolment (FTE)	37,589	44,388	+18%
GHG Emissions per Student (tonnes CO <sub>2</sub> e/FTE)	1.62	1.08	-34%
Floor Space (square meters)	1,284,462	1,429,847	+11%
GHG Emissions per square meter (tonnes CO <sub>2</sub> e/m <sup>2</sup> )	0.048	0.033	-30%

**Table 3.2 UBC Climate Action Plan indicators (Robinson, 2016)**

### 3.2.2 External benchmarking processes

The University also participates in various external sustainability-benchmarking systems, including the Sustainability Tracking, Assessment and Rating System (STARS), the International Sustainable Campus Network (ISCN), and until 2010, the College Sustainability Report Card. STARS is an internationally recognized, yet voluntary, sustainability-benchmarking framework administered for the Advancement of Sustainability in Higher Education (AASHE). The self-reporting assessment tool allows the University to report its sustainability-focused activities and performance in academics, engagement, operations, planning and administration, and innovation (International Sustainable Campus Network, 2015). It is, in fact, one of the few reporting mechanisms to incorporate operational, academic and community sustainability into its criteria. As a result of the University's long-standing and integrative commitment to sustainability in the realms of academics (curriculum and research), operations (air and climate, buildings, energy, etc.), planning and administration (coordination and governance, diversity and affordability, health and well-being), engagement (campus and public engagement), and innovation, it

received Canada's first Gold STARS rating in 2011, and in 2015, achieved its second consecutive Gold rating (International Sustainable Campus Network, 2015; UBC Public Affairs, 2015). These reports represent a significant campus-wide effort, including over 70 staff and faculty contributors who report on initiatives in each of the five main categories with credits across environmental, social and economic sustainability, ultimately making the reporting process rather time-intensive. Despite being time-intensive, the publically assessable benchmarking system provides a robust platform to measure academic and operational sustainability progress over time, assess gaps and opportunities to improve sustainability performance, and receive external recognition for sustainability efforts across campus. Now that STARS is a global rating system, it also provides an opportunity to benchmark sustainability initiatives against peer institutions, and in turn, to learn from best practices around sustainability according to key decision-makers in campus and community planning at UBC:

It provides that impetus to engage with our stakeholders, assess the current status of our programs or initiatives, and also use that opportunity to identify areas of opportunity or improvement.

UBC was the first institution in Canada to achieve a Gold STARS rating, but now many Canadian institutions are participating in STARS and now it is a global rating system. Most participants are from North America, but there is both an opportunity to benchmark against our peers and communicate what we are doing well.

Prior to STARS, UBC participated in the College Sustainability Report Card, administered by the Sustainability Endowments Institute, from 2007 to 2010. The University received a top mark of A across eight of the survey's nine categories, including administration, climate change and energy, endowment transparency, student involvement, food and recycling, green buildings, transportation, and investment priorities, but a significantly low grade in stakeholder engagement for the 2010 reporting year (College Sustainability Report Card, 2011).

As a signatory to the ISCN-GULF Sustainable Campus Charter since 2012, UBC is committed to implementing the Charter's three principles, setting sustainability targets, and reporting regularly to the ISCN on its progress. The Charter's three principles include sustainability performance of buildings on campus; campus-wide master planning and target setting to ensure long-term sustainable campus development; and the integration of facilities, research and education to align the institution's core mission with sustainable development (International Sustainable Campus Network, 2015). Similar to STARS, the ISCN provides a global forum to support leading colleges, universities, and corporate campuses in the exchange of information, ideas, and best practices for achieving sustainable campus operations and integrating sustainability in research and technology (International Sustainable Campus Network, 2015). As part of its commitment to the ISCN, UBC submits annual reports to the network in order to exemplify and share its sustainability achievements and performance, which according to one of the interviewees in policy implementation, also allows the University to share best practices with other relevant stakeholders and institutions:

UBC became a signatory to the ISCN in 2012, and we recently submitted our second submission last year. The ISCN is an international forum around trying to get best practices around sustainability with our international peers. This reporting process is another great way to share best practices with one another.

By engaging in these processes, the University has been able to engage with departments and key stakeholders to formally assess the status of specific policies and programmes, reveal best practices, identify gaps and assess opportunities for improvement, and compare performance vis-à-vis other peer institutions. Particularly with the myriad of activities across campus, it has been critical to gather and monitor their outcomes, and enable social learning by communicating the findings to the wider community. However, as alluded to previously, there is a large volume of information produced by these

monitoring mechanisms, consequently making the reporting process resource-intensive and time-consuming:

We have a lot of different reports for many different audiences, for many different purposes, and trying to streamline that or align that dataset has been another challenge, especially because the reports are time-intensive so it takes a dedicated resource to do that reporting.

The ISCN and STARS reporting networks can be a complete headache to view, and can be onerous, but they are still very important.

Another central challenge pertains to long-term monitoring and continuous commissioning, according to the key decision-makers interviewed for this thesis. Even though the University has been proactive in monitoring performance, there is a need to better align performance expectations with long-term operational realities. There are significant efforts being undertaken at the University to address the gap between anticipated and measured performance, including case studies examining performance gaps within high performance sustainable buildings and numerous research portfolios exploring the reasons for and implications of this performance gap, described briefly above but discussed at length elsewhere (i.e. Fedoruk et al., 2015 and Salehi et al., 2014). Key decision-makers in energy services and infrastructure development, however, commonly referred to the need to improve process monitoring and control during commissioning, particularly as the facility requirements may change and the operational efficiencies of buildings have the tendency to degrade over time:

The biggest challenge we have, quite frankly, is that we have all these guidelines and goals, and the design of the building is put together that targets certain performance levels, and then once we build the building we discover that the performance level does not meet the design intent. There are a number of different aspects

to this – assumptions that were made during the design, that they were too optimistic or purely wrong, or there was not enough information to make a good assumption around the use of the building. Or, it could be a result of something done in construction, or whether the building was commissioned ineffectively. That has been a big challenge for us.

One of our biggest challenges have been to going in after a building is built and ensuring the systems that are put in place are operating the way they were supposed to operate. Often you find that two years later, for example, that an element of the building has never worked properly – rather silly things that you do not find until you really get in and start operating the building. You would expect that through the commissioning process they would be uncovered, and often they are not. There is a real issue with commissioning that needs to be addressed.

We have a significant performance between what you expected and how it actually performs. The pace of development is fast, and sometimes there is no opportunity to take the time to evaluate a project once it is complete. Commissioning can be very good in terms of assessing the safety elements of the building, but once you get beyond that to actual performance... that is when people find that there are a lot of challenges.

In essence, it is argued that long-term monitoring, and therefore more rigorous continual commissioning processes, can contribute to bridging the performance gap. To that end, according to one of the key decision-makers in infrastructure development, the University is working to integrate expertise from other jurisdictions to learn from commissioning best practices in order to improve its own processes.

### **3.3 Network and coalition development**

The development and coordination of partnerships is another essential condition to engender societal transitions to sustainability. The creation of partnerships, as argued by transitions theory, nurtures transformative social innovation by contributing the resources required for the implementation and

diffusion of an innovation (Geels et al., 2010; Schot and Geels, 2008). Specifically, such networks contribute to the advancement of a novelty by providing substantial resource commitments, offering plural perspectives to a societal issue, and disseminating new ideas and solutions across scales (Schot and Geels, 2008). Universities, in particular, are strongly connected to civil society, locally and globally, and therefore have a unique opportunity to develop meaningful partnerships that advance new forms of innovation, research and education for sustainability.

At UBC, strategic alliance partnerships with the private, public and NGO sectors, have enabled the University to expand its expertise on sustainability and reach beyond the campus. To date, these partnerships have contributed the necessary expertise, human capital, and resources that were otherwise unavailable to the University. In return, partners have had the opportunity to work alongside researchers and operational staff to test innovative ideas at relevant scales. Partnership development is therefore an integral component of UBC's mandate, and lies at the core of its Agent of Change principle.

### **3.3.1 University as an agent of change: partnerships between operational units and industry**

The University as an Agent of Change is the second crosscutting theme proposed for the SAS and pertains to the University's role in the world beyond the campus. The Agent of Change principle encompasses activities aimed at developing partnerships with organizations and sectors in various communities outside UBC, with a view to working together to foster mutual learning and implement sustainability solutions beyond the campus. In this role, the campus offers the opportunity to implement and test innovative academic and operational programs, policies and technologies, in keeping with the living laboratory approach, while partners offer the potential to take such innovations into the wider community through the processes of commercialization, policy development or community engagement:

Our partnerships with industry, or any external partnerships, can have a significant impact because you get a different perspective. So I think that anytime you have those kind of meaningful partnerships, anytime you have an external force coming into this institutional context, they can push the university to rethink some of its procedures around things or the way things are done.

Although all universities engage with external partners at some level, these relationships are traditionally centered on procurement, research support or philanthropy. The Agent of Change approach, however, intends to commit the entire university into the partnership, therefore making the alliance more strategic and tailored to the common interests of each jurisdiction (Robinson et al., 2013). As an agent of change, the University is committed to working with various partners from the public, private and non-governmental sectors to deeply integrate academic and operational sustainability, and leverage the campus as a societal test-bed for sustainability. To that effect, UBC has signed Memorandums of Understanding (MOU) with industry and community organizations, which in essence, commit UBC and the partners to identifying areas of common interest and synergy in the pursuit of sustainability, and working together to implement sustainability policies and practices on and off campus (Robinson et al., 2013).

At CIRS, partnerships with industry members are essential for the continuous improvement of the building's technology, materials and components. These partnerships also extend the network of project stakeholders into non-academic fields, and enhance the project creditability and financial viability. A variety of partners were involved in the different iterations of CIRS. As of August 2011, the four CIRS strategic alliance partners were BC Hydro, the regional electrical utility; Haworth, a supplier of interior building components and furniture; Honeywell, a supplier of building control and monitoring systems; and Modern Green Development Company Ltd., a green building developer based in China. Each of these

groups provided the expertise and financial contributions necessary for the design and construction of the building (Centre for Interactive Research on Sustainability, 2011).

The Continuous Optimization, or Building Tune-Up Program, is in partnership with BC Hydro's Continuous Optimization program. That program is designed to help building owners identify and correct energy wasting operational faults, and continuously monitor building performance to help maintain and improve energy efficiency, resulting in reduced operating costs. By participating in this program, BC Hydro provides funding towards the cost of re-commissioning services to study the University's buildings and recommend energy efficiency improvements, as well as access to an energy management information system to assist in tracking building performance after the re-commissioning work is complete (FortisBC, 2016). In return for BC Hydro's investment in UBC's buildings, the University must commit to implementing the energy efficiency measures recommended in the re-commissioning phase, that when bundled together, provide a two-year payback (BC Hydro, 2012).

The BRDF is a multi-organization partnership between UBC and two of the world's leading developers of green technology, Vancouver-based Nexterra Energy Corporation and GE Power and Water. Specifically, the BRDF is the culmination of more than four years of product development work and collaboration between Nexterra and GE's Jenbacher business, making it the first commercial demonstration of a new application that combines Nexterra's gasification and syngas cleaning technologies with GE Energy's Jenbacher engines (University of British Columbia, 2015a). UBC research groups from CIRS, the Clean Energy Research Centre (CERC), the Institute for Resources, Environment and Sustainability (IRES), the Faculty of Applied Science, and the Sauder School of Business are also involved with the project (The Energy Industry Times, 2012).

### **3.3.2 University as an agent of change: partnerships through teaching and learning**

In addition to the signature living laboratory projects, another example of a program that promotes the use of the Agent of Change principle is the UBC Social, Ecological, and Economic Development Studies Program (SEEDS), which aims to enhance the sustainability of campus operations through coordinating applied, accredited project opportunities for UBC students. The program seeks to integrate academic and operational work on sustainability across the campus, facilitating student, staff and faculty collaborations. Through SEEDS, UBC staff members are linked with faculty and students to collaborate in the design and implementation of sustainability research on campus (University of British Columbia, 2009b). Over the past 15 years, SEEDS has created partnerships across the academic and operational realms to enable innovative and high-impact sustainability research projects. Such projects, in turn, have enabled students to build career capital through experiential learning (Robinson et al., 2013). Furthermore, by aligning projects with university plans, strategies and frameworks, these projects have implemented policy to produce tangible and lasting results for campus operations:

We have the SEEDS Program that addresses a question that has been posited or where we want more focused research, and pulls students from different faculties on very specific topics. We harness that information to actually address the kind of core questions that we want to pose that will either inform us around the barriers or opportunities, best practices, analytics around existing conditions, and where innovation can be applied.

The SEEDS program has been around for a long time, where we have students looking at problems on campus related to sustainability, figuring out solutions, writing up reports, and making recommendations. Those recommendations and feedback are then implemented by our operations crew.

The Greenest City Scholars Program is another internship program for graduate students at UBC. Since 2010, the USI has collaborated with the City of Vancouver to sponsor graduate students to work on

sustainability projects with the City in support of the Greenest City 2020 Action Plan. In 2014, based on the success of the Greenest City Scholars Program, the USI expanded this model and launched the UBC Sustainability Scholars Program. Through UBC Sustainability Scholars, USI collaborates with both on and off-campus partner organizations to offer UBC graduate students the opportunity to be immersed in real world learning where they can apply their research skills and contribute to advancing organizational sustainability goals (University of British Columbia, 2015b). To date, the Greenest City Scholars Program and the UBC Sustainability Scholars Program have partnered and collaborated with the City of Vancouver, the Community Energy Association, the City of New Westminster, the City of Surrey, the City of Victoria, the Musqueam First Nation, Provincial Health Services Authority and Health Shared Services, Vancouver Coastal Health and Health Shared Services, BC Hydro and FortisBC (University of British Columbia, 2015b).

### **3.4 Summary of experimentation and learning at UBC**

Experimentation and learning are conclusively critical for fostering transformative social innovation. In the context of UBC, the University has created an environment with a capacity that, according to the theoretical framework of sustainability transitions, is conducive to innovative practices and new discoveries for sustainability. At the landscape level, the regional and municipal contexts provide legislative incentives to champion innovation for sustainability, which have generally facilitated experimentation and innovation development across scales, specifically at higher education institutions. At the regime level, the University's supportive institutional climate, its track record in sustainability and innovation and its unique position as regulator, developer and landowner, and its unprecedented integration of academic and operational sustainability, have created the necessarily environment to explore, creatively and collaboratively, innovation for sustainability. Furthermore, a strong business case and proactive engagement with risk also have the potential to notably facilitate the adoption and

development process of an innovation; however, in almost every case the barriers to experimentation and innovation were predominately institutional, particularly when stakeholders challenged standard policies, practices and models for funding, financing or development.

Monitoring and reporting the processes, impacts and outcomes of innovation is another important factor for fostering social learning and empowering actors to contribute to systemic change through social innovation. The University has institutionalized several platforms for monitoring, evaluation and learning processes to inform innovation development and diffusion. Specifically, UBC has implemented internal real-time monitoring and reporting software to supplement institutional reporting processes, which, in essence, monitor and track the University's progress in regards to institutional sustainability aspirations, identify areas of opportunity or improvement, and foster continued dialogue around best practices with the broader community. The University also participates in various external sustainability-benchmarking systems to measure academic and operational sustainability progress over time, identify best practices, and understand progress vis-à-vis other peer institutions across North America. There are, however, several prominent challenges with the monitoring mechanisms at the University, which include resource-intensive monitoring and reporting processes, as well as a disconnect between performance expectations and long-term operational realities.

Finally, partnership development is another essential condition to nurture transformative social innovation, as such networks contribute to the advancement of an innovation by providing substantial resource commitments, offering plural perspectives to a societal issue, and disseminating new ideas and solutions across scales. UBC's Agent of Change principle has created an incentive to build strategic alliance partnerships with the private, public and NGO sectors, allowing the University to expand its expertise on sustainability and reach beyond the campus through the processes of commercialization, policy development or community engagement. To date, these partnerships have contributed the necessary expertise, human capital, and resources that were otherwise unavailable to the University. In

addition to partnerships between operational units and the industry, the University has also participated in various partnerships through teaching and learning initiatives, which immerse students in real world learning where they can build career capital through experiential learning, while at the same time producing tangible and lasting results for sustainability. That said, it is essential to build on existing partnerships and networks, and to continuously identify communities undertaking sustainability projects off-campus that would be interested in collaborating with UBC researchers to add a living laboratory element to their projects that could not otherwise be undertaken. Especially relevant are ongoing partnerships with Metro Vancouver in order to test and implement innovative projects at a municipal scale, to provide research opportunities for students, and to advance scholarship on social innovation for sustainability.

## Chapter 4: Multi-level Alignment, Coordination and Adaptation

In addition to nurturing environments for experimentation and learning, as explored in the previous chapter, it is also crucial for institutions to be united in their efforts by facilitating collaborative leadership between governance structures and actors, offering opportunities for adaptive management, and prioritizing systems-thinking and long-term planning. In other words, as expressed by sustainability transitions theory, coordination, alignment and adaptation between multi-level actor networks are pertinent factors for nurturing innovation and co-constructing pathways for sustainability and societal cohesion (Kemp, Loorbach and Rotmans, 2007). It is therefore not sufficient only to create a common vision, but it must be implemented with actionable strategies and coordinated efforts along various scales in order to facilitate and create social innovation for sustainability. Specifically, transition theory postulates that the coordination and alignment of visions and activities across scales; the reflexive reorientation of visions, agendas and coalitions; and a shift from a single socio-technical system framework to an exploration of linkages between many systems across a longer timeframe, are other key characteristics for cultivating transformative change for sustainability (Loorbach, 2010, Loorbach and Rotmans, 2006). In other words, these elements, derived from the conceptual framework in the literature review chapter and outlined in Table 4.1 below, are the enabling conditions of multi-level alignment, coordination and adaptation that, in theoretical terms, foster and empower transformative innovation for sustainability. These conditions, in the context of UBC, are explored at depth in this chapter.

### Multi-level alignment, coordination and adaptation

1. **Integrated decision-making:** Enabling the coordination, commitment and alignment of long-term visions, pathways and activities between the diversity of actors and governance structures in a socio-technical system
2. **Adaptive management:** Based on monitoring, evaluation and learning insights, offering opportunities for reflexive reorientation, restructuring and reframing, of visions, agendas and coalitions, in strategic directions

3. **Systems-thinking and long-term planning:** Prioritizing strategic activities that consider linkages between many complex systems and function along longer timeframes

**Table 4.1 Key characteristics enabling multi-level alignment, coordination and adaptation (derived from Table 2.2)**

#### **4.1 Integrated Decision-Making**

Integrated decision-making, as argued by transitions theory, is one of the crucial components within multi-level alignment, coordination and adaptation for enabling transformative change for sustainability (Loorbach, 2010; Kemp, Loorbach and Rotmans, 2007). To accelerate and foster this level of change, it is essential for the University to articulate and synchronize visions for sustainability across levels, and implement the necessary actions for achieving these changes by making connections with committed stakeholders in the socio-technical system. More specifically, a strong strategic vision, explicitly across governance and actor scales, enables opportunities that support the vision and infuses sustainability throughout the organizational culture of the University. UBC has had many visions since its inception, but over the past twenty years, a vision and shared commitment for sustainability has noticeably penetrated the institutional climate:

It's an assumption that each and every one of my project managers makes - that sustainability is part of what we do and that it is part of the fabric of the University. It really has become embedded into what people do. Because UBC is seen as a leader in sustainability, when we are interviewing new staff to come into work at UBC, sustainability is something that gets mentioned by every candidate who is coming to work here. They recognize that and they assume, therefore, that the projects that they are working on will have that as a lens through which decisions are made; that there will be that broader institutional understanding; that our emissions matter; and that energy savings matter.

People have bought into the vision of the campus as a sustainable community, and seeing that these are important elements of it, that there is a social and kind of economic case to be made for them, and to put the relevant resources aside to prove it.

#### **4.1.1 Alignment and coordination between governing policies, plans and guidelines**

The University's policies and plans provide frameworks for the campus' current and future development, and in so doing, enable and prioritize certain development pathways over others. In 1997, during Professor David Strangway's presidency, the University became a signatory to the Halifax Declaration and the Talloires Declaration, both non-binding declarations, which led to the creation of the sustainable development policy (UBC Policy #5). The policy, legislated by the Board of Governors, states that the campus should adhere to sustainable practices in all of its actions and mandates in order to develop an environmentally responsible campus community that is economically viable and reflects the values of the campus community; to ensure the integration of ecological, economic and social considerations at all levels of strategic planning and operations within the University, to work towards a sustainable future in cooperation with organizations beyond the campus; and to assume a leadership role through practicing sustainable development and instilling sustainable development values in its students and employees, through research, teaching and operations (UBC Board of Governors, 1997).

It is important to emphasize that this policy originated from grassroots efforts of faculty committed to sustainable development that sought effective policies that would follow-up on the University's participation in the Talloires and Halifax declarations. The policy has roots in an earlier program called Greening the Campus (GTC), an initiative of the Sustainable Development Research Institute (SDRI) at UBC. In the early 1990s, GTC aimed to bring sustainable development issues to the university, and engage students in projects that would not only broaden their awareness of sustainable

development issues and solutions, but would also benefit the university through opportunities for practical on-site application (Gudz, 2004). As part of the GTC program, SDRI and the program's steering committee participated in the development of the sustainable development policy. Even though some members of senior administration had difficulties with the approval process due to budgetary concerns, the Board of Governors ultimately approved it in the spring of 1997 (UBC Board of Governors, 1997).

The policy, however, was altered during the approval process. Instead of having an ombudsperson for sustainable development that would have both academic and operational responsibilities, report to the Vice President, Administration and Finance and work closely with the coordinator of the GTC program, the new policy stated that the ombudsperson would assume responsibility for only operational aspects of sustainability including GTC, eliminating the original coordinator position in the process (Gudz, 2004). As a result, GTC would become purely operational without any academic line of authority or mandate. Despite the good intentions of the policy, this is an example of the common narrative that academic and operational issues are to be addressed separately. This artificial separation, in essence, inhibits fruitful coordination and collaboration between the academic and operational realms, whose integration is crucial for infusing sustainability throughout the organizational culture of the University (Robinson et al., 2013).

A year following the creation of the sustainable development policy, further changes had occurred and a Director of Sustainability was hired, and the Campus Sustainability Office (CSO) was established in 1998 within the division of Land and Building Services. The office maintained an operational focus with limited academic ties (Moore et al., 2005; UBC Board of Governors, 1997). The policy, however, can nevertheless be considered an overall success as it created accountability and propelled the University into action on sustainability issues, and generally fostered a supportive climate for sustainability. The administrators in infrastructure development and planning interviewed expressed their satisfaction with the policy, particularly as they felt that it helped the University assume a leadership

role by mandating sustainable development values and practices:

There have been some good policies put in place that give you the mandate to do things. We have a sustainable development policy that was put in place in 1997. You can call up sections of the policy, which led to having a Director of Sustainability, for example. In the end, energy management efforts stem from that in some respects as well, so that is always something you can look to as being a mandate for transforming the campus.

We often talk with this sustainability being in the DNA of the University. We were an early adopter of sustainable development policy in UBC back in the nineties, so there was a foundation very early on about wanting to do things in a sustainable way.

Following the creation of the CSO, the Office of the President, under the leadership of Professor Martha Piper, released a new high-level strategy document, *Trek 2000*. The early versions of this plan, however, had relatively unclear intentions that were not necessarily geared towards sustainability (Moore et al., 2005). In 2005, the Office of the President released the fifth revision of the University's plan, *Trek 2010*, whose vision statement more clearly reinforced that sustainability was becoming a priority to the highest levels of the administration:

The University of British Columbia, aspiring to be one of the world's best universities, will prepare students to become exceptional global citizens, *promote the value of a civil and sustainable society*, and conduct outstanding research to serve the people of British Columbia, Canada and the world (UBC Board of Governors, 2005, emphasis added).

Furthermore, one of the explicit goals listed in this document was to “ensure that the principles of sustainability as expressed in UBC Policy #5 are incorporated into all levels of strategic planning and university operations” (UBC Board of Governors, 2005). This was notable as it reinforced upper-level commitment to the University’s sustainability precepts and policy implementation; however, it is worth noting that it still retained an operations-centric view of sustainability.

Following the adoption of the University’s Trek 2010 framework, the Sustainability Office began to develop a university-wide sustainability strategy, consistent with Trek 2010 and Policy #5. It proceeded to consult stakeholders on the creation of its first-ever sustainability strategy. In all, 20 departments, all faculties, all major student organizations and over 100 people were consulted. In 2006, the university launched its five-year campus-wide strategy, entitled *Inspirations and Aspirations: The Vancouver Campus Sustainability Strategy 2006-2010*, which outlined social, ecological and economic goals with specific targets and action commitments to sustainability in teaching, research and operations (University of British Columbia, 2008).

In 2009, under a new president, the Place and Promise Plan succeeded Trek 2010 to guide the institution through the next decade of academic, demographic, economic and social change. While Trek 2010 looked outward and retained an operations-centric view, Place and Promise shaped a more systemic direction for the University by committing its infrastructure, research, teaching and learning capabilities to innovate solutions for sustainability under the Campus as a Living Laboratory (CLL) context. It was also made explicit that the intent of the plan was to better integrate operational sustainability with the University’s academic plan in order to maximize its relevance:

Make UBC a living laboratory in environmental and social sustainability by integrating research, learning, operations, and industrial and community partners (University of British Columbia, 2009a).

At present, Place and Promise, together with the Land Use Plan, Vancouver Campus Plan, and Public Realm Plan, guide the physical planning of the University. The Land Use Plan is a high-level land use governance document that establishes generalized land uses, consistent with regional objectives, and provides policies and criteria for development of UBC's Vancouver campus. For so long as this plan is in effect, the University must ensure that all agreements entered into by the University - all rules, resolutions or similar authorities issued or adopted by the Board of Governors - and all permits, licences and land development undertaken or authorized by the Board of Governors are consistent and in alignment with the Land Use Plan:

On the regional level, there is a formal requirement in the law, that the province passed, that gave UBC land use planning powers. That said, we have to link everything in our land use plan to the region's growth strategy. The goals of the growth strategy are big things like creating a compact sustainable community, those kinds of principles. So, we have to say in our land use plan how we intend to meet those broader goals.

The Vancouver Campus Plan, also governed by the Land Use Plan, provides a framework for the campus' current and future development, and it is focused on five major sustainability-centered strategies that emerged from a technical and consultation process with students, residents, alumni and other stakeholders from 2005 to 2010 (University of British Columbia, 2010). Finally, the Public Realm Plan directs planning and investment in the outdoor public spaces of the academic core of campus. Provided are strategies for setting investment priorities, processes for design development, and direction for management throughout the life of these public spaces. This plan, in essence, serves as a roadmap to implement key objectives set out by the university community in the Vancouver Campus Plan process (University of British Columbia, 2009b).

Collectively, the high-level institutional plans and policies are intended to embed the notions of sustainability into decision-making that guide the campus' development and growth. Policies and plans,

as expressed by transition theory, are essential for not only governing decision-making, but also for creating a greater vision for the University to which all activities on campus can be aligned. For operational staff in policy and community planning, these governing documents clearly embed the vision of sustainable development into the University's strategic direction and formulate a shared agenda for moving in this direction:

On the policy side, I think we have a very clear planning framework that supports the work we are doing on further supporting this notion of a complete and sustainable community. That is clearly defined in our land-use plan and our campus plan.

I would say that, on the big picture, the culture of sustainability that allows for innovation projects is embedded at the institutional level at UBC - whether it is a strategic plan that governs everything that the university does, or a specific planning document that governs land use. That principle of sustainability is embedded in all those things, and because of that I think it enables these kind of innovative projects.

I think as a whole we have the ability to make change because we have strategic, high-level support that has been outlined. And then we have the ability to deliver on that because of the support of strategic visions that have been created.

In addition to high-level visionary plans, the University has a host of mid-level guidelines and processes to guide the development and growth of the campus towards more sustainable pathways. Notably, the Technical Guidelines, created in the context of university policies and planning documents, outline standards and strategies for architects, engineers, contractors and consultants who provide development services to the University (University of British Columbia, 2016). These guidelines, which specifically outline mandatory minimum standards, acceptable practices, performance criteria, procedural

standards and environmental impact requirements, are aligned and informed by the University's high-level visions and targets, including the UBC Policy #5: Sustainable Development, the Climate Action Plan, the 20-Year Sustainability Strategy and the Vancouver Campus Plan, in order meet UBC's standards and best practices for sustainability in the built environment:

The technical guidelines are a reflection of everything we have learnt, and then putting it into a document that any consultant or contractor that comes to do a project at UBC, or architect or engineer knows this is how UBC wants it done. So codes are one thing - they speak to the bare minimum that you need to do from a safety or a regulatory standpoint. The technical guidelines speak to best practices.

The Technical Guidelines also align with the Province of British Columbia's Energy Efficient Strategy and UBC's corresponding LEED Implementation Guide, which mandate that all new provincially owned or leased buildings and facilities must meet the standards of LEED Gold or equivalent certification (Province of British Columbia, 2008). The LEED Implementation Guide, specifically, is a companion document to the UBC Vancouver Campus Plan Design Guidelines and UBC Technical Guidelines, serving to coordinate LEED Canada BD+C implementation and certification. It also identifies LEED credits that are mandatory and/or expected because they align with UBC policies, as well as those that have been identified as less beneficial as they do not directly align with policy (University of British Columbia, 2013).

In regards to development processes, all major capital projects, as of 2014, follow UBC's Sustainability Development Process that integrates sustainability goals into the development process (University of British Columbia, 2014). The development process supports sustainable development by ensuring that stakeholders are engaged and that sustainable goals are thoroughly explored in an integrated process. The Sustainability Development Process emerged out of one of the Centre for Interactive Research on Sustainability's (CIRS) research portfolios related to sustainable buildings and urban

development practices. The research portfolio, referred to as the Regenerative Neighbourhoods Project (RNP), is a long-term, multi-phase interdisciplinary research program, established in 2013 in the context of the CLL initiative, which examines the complex issue of how buildings and cities can become catalysts for significant improvements in ecological health and human quality of life (Waldron et al., 2013). Based on its review of emerging regenerative and neighbourhood-scale sustainability theory and practice, the RNP proposed participatory and integrative principles to guide project design processes in a white paper, which ultimately led to enhancing the University's respective design process and hence the development of its Sustainability Development Process:

The sustainability development process was born out of the Regenerative Neighbourhoods Project. This process is moving ahead from that first white paper. That white paper was a driving force behind it. So all major capital projects that are under construction now, or in design from two years ago, have started to implement this process.

During this process, a project design brief is developed where project stakeholders are engaged to identify each project's social, economic and environmental sustainability goals prior to the engagement of the design team. This participatory and integrated co-creative process, in turn, provides a platform for the UBC community to demonstrate its shared interests in sustainability and articulate aspirations that respond to both academic and operational issues. Campus + Community Planning (C+CP) staff then assess the goals and priorities of the emerging project to ensure it adheres to relevant regional bylaws and University policies, plans and guidelines, including high-level visionary documents that aim to transform the campus into a living laboratory for sustainability. On campus academic lands, the Land Use Plan and the Vancouver Campus Plan are applied, whereas the Land Use Plan, Vancouver Campus Plan, and Public Realm Plan serve as guiding documents for changes to the design of the public space. Following the development of the design brief, architects review the design brief and discuss goals with the project

team. At this point, the first workshop takes place to provide early focus on building massing, orientation and sustainable energy and water systems. The second workshop, which is a more general sustainability workshop, investigates design strategy synergies intended to meet the goals outlined in the design brief. The final workshop takes place during design development and utilizes interactive energy modeling to evaluate trade-offs between energy performance, lifecycle cost and system complexity. For all projects, sustainability objectives and requirements are evaluated prior to the issuance of permits for building and construction to ensure their adherence to high-level institutional sustainability visions and targets (University of British Columbia, 2014).

In essence, according to a decision-maker in the realm of green building, the Sustainability Development Process has encouraged sustainability, alignment and coordination between visions, and ultimately a more integrated and participatory multi-stakeholder process to overcome the siloed organizational structure of universities, into the early stages of the development process:

The sustainability development process has been great. It really encourages more integrated thinking and integrated design, so we are really clear on what our objectives are for the project. Having smart objectives, and clearly articulating them at the beginning of the project is really important and then following up on it through the design stages and also at the end as well.

I think the design brief in itself has made a huge difference in the way we look at projects, the way that sustainability looks at the social side and the urban planning side, and ties in with the economic and environmental side. So I think the sustainability development process has been very positive, especially compared to what we had previously.

I think the process in general, in terms of the UBC stakeholders; it is excellent having everybody in the room right at the beginning of the project with a sustainability lens. I think that's excellent. And it does give a more holistic point of view.

The Sustainability Development Process is integrated into the University's development process, and overall, according to administrators, it has made a significant difference in aligning development with high-level sustainability policies, plans and guidelines, formalizing stronger interactions with the UBC community, and ultimately enabling dialogue around sustainability earlier in the development process. However, according to staff involved with the application of the development process, it is more of a subset to the whole development process as it stands, and more work remains to be done to better incorporate it into projects across various departments:

I think there is more work to do to have everything really well aligned, to have it all very clear and across our different departments. There are some references to it in the development process, but it would be really good if it could be directly linked online to the infrastructure and development process.

Every project takes something positive from the process. I think there's a long way to go, as well, to have it really well integrated into projects.

#### **4.1.2 Commitment and support from senior leadership**

The commitment and support from senior leadership has been another important factor to not only institutionalize policies and plans for sustainable development, but to also mandate the diffusion of sustainability, and alignment to this vision, across scales. This support, for instance, has been central to making sustainability one of the institution's nine strategic commitments in the Place and Promise.

UBC's former President from 2006-2014, Professor Stephen Toope, and his executive team were fully

invested in sustainability to the point that it is now a consideration in every key campus infrastructure and operational decision. Professor Stephen Toope was also one of the first university presidents to sign the Climate Change Statement of Action for Canada, a statement committing the institution to provide leadership on global climate change and to develop an institutional climate action plan to catalyze solutions for climate change.

Professor Stephen Toope was also a driving force behind the Place and Promise and the Sustainability Academic Strategy (SAS). Over the last five years of his appointment, Professor Toope and his team created and formally enacted the Place and Promise Plan in 2009, a significant contribution to integrating sustainability research and operations. As previously mentioned, his predecessor, Professor Martha Piper, inaugurated the Trek 2010 vision that aspired to make UBC one of the world's best universities, prepare students to become exceptional global citizens, promote the values of a civil and sustainable society, and conduct outstanding research to serve the people of British Columbia, Canada, and the world (UBC Reports, 2006; UBC Board of Governors, 2005). While Trek 2010 looked outward and to research, the Place and Promise focused on internal systems and the strategic direction of the University by committing academic, research and operational capabilities to innovate solutions for sustainability under the Campus as a Living Laboratory (CLL) context. The CLL initiative, as previously described, aspires to link teaching and learning, research and partnerships, and operational and administrative activities on campus by transforming the campus into a living laboratory for sustainability (University of British Columbia, 2009a).

In support of the Place and Promise, in 2009, the University launched a comprehensive process to develop an academic strategy for sustainability. The process for the Sustainability Academic Strategy (SAS) was led by the President's Advisory Council on Sustainability, chaired by Professor John Hepburn and included members representing staff, faculty, students, and external community partners (Cayuela et al., 2013). The SAS, also described in the previous chapter, was explicitly concerned with better

integrating academic and operational efforts in sustainability (University of British Columbia, 2009b). In essence, two goals emerged from the strategy to link teaching and learning, research and partnerships, and operations and administrative activities and functions. The first goal, the Campus as a Living Laboratory, intends to transform the campus into a living laboratory for sustainability in order to demonstrate sustainable practices and technologies that engage faculty, students, staff and community partners and leverage operational innovations. The second goal, the University as an Agent of Change, aims to strengthen UBC's role as an agent of change for sustainability beyond its campus by fostering partnerships between the University and other relevant stakeholders seeking sustainability ideas and solutions (Robinson et al., 2013).

In 2010, following the signing of the Climate Change Statement of Action for Canada, Professor Toope announced the establishment of UBC's Climate Action Plan (CAP). The CAP, following a multi-year climate action planning process, was adopted to advance the campus towards a low-carbon future, and in so doing, committed the University to bold GHG emission reduction targets: 33 per cent by 2015, 67 per cent by 2020, and 100 per cent by 2050. Since the implementation of the plan, the University has developed various operational projects to achieve these GHG reduction targets, including converting the district heating system from steam to hot water to reduce emissions by 22 per cent; optimizing academic building performance and improving behaviour change programs through the Building Tune-Up Program to reduce emissions by 10 per cent; and generating heat and electricity through the Bioenergy Research and Demonstration Facility to reduce emissions by 9 per cent (University of British Columbia, 2010):

We are pushing through a huge district energy system. In fact, it is kind of edgy technology at a local as well as a national level. But we are building it in a big way and we have actually put our heads on the chopping block for it because we really need to make this leap. And it's a giant leap to go with this system. It has been so important to have this imperative from senior leadership.

For the bio-energy facility, the president has put his name forward, supporting this project and trying to build support with the provincial governments as well. So that is a huge thing, when you have the president of the university and other senior leaders behind it - it really makes a difference.

Stephen Toope came out and he put these ambitious targets out there, and it was challenging to figure out how we were going to do that. But, it sure made it easier to put forward transformative projects, like the steam to hot water system, which would help us reach those targets.

Professor Toope's commitment to sustainability and support for the living laboratory approach also contributed to the introduction of provincial legislation in 2010 that transferred control of local land use planning for UBC's Vancouver campus from the Metro Vancouver regional government to the Province of British Columbia (UBC Properties Trust, 2010). Toope endorsed this new legislation, claiming it would accelerate the University's leadership in sustainability by making the campus the sole approver of any new development:

A new pilot project to harness biomass for heat and electrical energy generation, construction of North America's most sustainable building for the new Centre for Interactive Research in Sustainability, as well as aggressive targets to reach zero greenhouse gas emissions by 2050, are just some of the clean and green initiatives underway. This legislation ensures this kind of innovation can continue well into the future, fulfilling the historic promise of UBC's land endowment (UBC Properties Trust, 2010).

Of importance to Professor Toope's success were not only his support and leadership on sustainability, but also his willingness to compromise with the student body on important sustainability issues. For many years, the UBC Farm, a 24-hectare parcel of land on the endowment lands, was a working farm used partly as a lab for the Faculty of Land and Food Systems and partly as an urban

agricultural playground for all of Metro Vancouver. In 2008, the University presented three options for the area, all of which proposed significantly reducing the size of or moving the farm to soil unsuitable for agricultural production (Morgan, 2008). In response, as the threat of losing the farm to housing development drew closer, UBC students, faculty, staff, as well as Vancouver residents, mobilized to start a 'Save the Farm' movement. The grassroots organization quickly gained campus-wide and city-wide support, where 15,000 petition signatures were given to Professor Toope that implored UBC to re-evaluate the development plans for the area (McElroy, 2014). Backed by Professor Toope's support, the Board of Governors issued a press release declaring that no market housing would be pursued on the 24-hectare parcel, symbolizing a turning point in the University's public stance towards the farm (UBC Media Release, 2008).

While Professor Toope's recorded leadership on sustainability played a critical role, he is not the senior decision-maker on campus. Rather, the UBC Board of Governors (BoG) is the University's highest decision-making and governing body, and under the University Act, is vested with the power to oversee the management, administration, business, property and revenue of the institution (UBC Counsel, 2014). In other words, power is concentrated in particular pockets at the University, especially when it relates to decision-making for the development and growth of the campus:

The only reason internal sustainability champions have any power is because of groups like the Board of Governors and their willingness to push sustainable development.

The majority of board members are appointed by the provincial government rather than elected by the UBC community, ultimately creating an atmosphere where accountability and transparency are not always present. This became particularly apparent during the aforementioned consultation sessions for the farm, where the opposing response of the public was reportedly unheeded in the official feedback from

the consultations presented to the BoG (Morgan, 2008). The operating procedures of the board have also received accusations of a lack of transparency, accountability and oversight when the BoG gave its consent to UBC's Policy 92: Land Use and Permitting (UBC Board of Governors, 2009). The creation of the policy, which states that all land development issued by the BoG must be consistent with the Land Use Plan, brought to light a virtually unknown practice of the Board of Governors: e-mail voting using implicit consent (UBC Insiders, 2010). This practice raised a number of concerns since there is a distinct lack of transparency with e-mail voting, particularly because records are not generated for business conducted via e-mail.

More recently, the UBC Faculty Association has issued a call for an external review of the BoG and its operations in order to restore public trust in the institution and its governance structure (UBC Faculty Association, 2016). Some current members of the Board, including the Chancellor of UBC, have been shown in recent, now public, documents to have been involved in activities around the resignation of Professor Arvind Gupta, UBC's most recent president, that appear to contravene standard and expected board practices. Specifically, these documents reveal that the BoG scheduled secret meetings without any subsequent public documentation of the decisions made, from these meetings. Moreover, many of the rules, procedures, and protocols around the board seem to be established through informal advice from the Board Secretary and the University Counsel, which in essence makes it difficult to compare UBC's board practices to provincial guidelines for public boards or to best practices for university boards (UBC Faculty Association, 2016).

In a general sense, there is a need for better transparency between the BoG and the university it governs. Even though the minutes of the BoG meetings are public, faculty and staff members admit that little documentation exists as to the reasons for decisions (Moore et al., 2005), or, as in the case of Policy 92 and more recent events, crucial decisions are kept private and hidden from public view (UBC Faculty Associate, 2016). This imparts a lack of accountability and transparency to decision-making at the

University therefore disconnecting the BoG from the community, which is ultimately counterproductive to achieving the required change for social innovation. The decision-making process needs to be open and transparent in order to allow all actors to be involved in the process. Though connecting academic plans with sustainability policies is a strategic way to infuse sustainability throughout the organizational culture of the University, the transparency and accountability of its management practices is equally, if not more, important.

#### **4.1.3 Coordination and collaboration between middle management**

Embedding sustainability across the institution requires distributed ownership, commitment and responsibility, which UBC has encouraged through a variety of target campus engagement programs. In 1998, a year following the creation of the sustainable development policy, Dr. Freda Pagani was entrusted with the task of creating an organization that would implement this policy by coordinating sustainability initiatives across campus. The Campus Sustainability Office (CSO) was established in 1998 as a self-funded entity, and initially led by Freda Pagani and Geoff Atkins, both operational staff at UBC (Abramson, 2009). One of the first major tasks of the organization was to create a sustainability strategy for the University. Rather than centralizing and creating a silo for all decision-making within CSO, the office conducted a stakeholder consultation spanning two academic years to develop the campus' comprehensive sustainability strategy (UBC Sustainability Office, 2005). In total, twenty departments, all faculties and all major student groups were engaged to create a strategic plan for sustainability, whose cumulative effort resulted in the production of the *Inspirations and Aspirations: UBC's Sustainability Strategy* in 2006. This document outlined specific targets in the areas of social, economic and ecological sustainability, each with a department or group specifically responsible for their implementation, and accountability if not implemented (UBC Sustainability Office, 2008).

The Sustainability Office, now known as the Sustainability and Engineering & Community Development units within Campus and Community Planning (C+CP), also implemented the Sustainability Coordinators' program, another example of how the University pursued collaborative models for implementation and for building a culture of sustainability across actor-levels (UBC Sustainability Office, 2004). The program recruited faculty and staff from various units on campus to work with their colleagues to advance more sustainability in the operations of their respective departments or faculties, including matters such as energy and materials reduction, alternative transportation and other areas. In essence, the Sustainability Coordinators program not only integrated sustainability into existing projects and shifted them to a common goal of sustainability, but it also played a vital role in institutionalizing sustainability at the mid-level and ensuring it permeated throughout campus (Knight and Marques, 2008).

The Social, Ecological and Economic Development Studies (SEEDS) program, also described in the previous chapter, is another program that has built teaching and research around campus infrastructure and operational activities, and involved various stakeholders to produce academic research on important sustainability topics of interest to the UBC community. Through SEEDS, UBC staff members are linked with faculty and students to collaborate in the design and implementation of sustainability research on campus (University of British Columbia, 2009b). The SEEDS program has created partnerships to enable innovative and high-impact sustainability research projects at the University, and by aligning projects with the University's vision for sustainability, these projects have also contributed to addressing barriers, opportunities, and best practices at the University, according to staff in policy implementation:

We have the SEEDS Program that addresses a question that has been posited or where we want more focused research, and pulls students from different faculties on very specific topics. We harness that information to

actually address the kind of core questions that we want to pose that will either inform us around the barriers or opportunities, best practices, analytics around existing conditions, and where innovation can be applied.

The UBC Sustainability Initiative (USI) has also played an important role in fostering collaborations and partnerships across scales. In response to one of the recommendations of the SAS, Professor Stephen Toope announced the establishment of the USI in 2010 (Cayuela et al., 2013; University of British Columbia, 2009b). The USI, led by Professor John Robinson, was specifically tasked with integrating the University's academic and operational efforts in sustainability across campus, a factor that was overlooked during the adoption of the sustainable development policy, and enabling a process through which sustainability could be embedded in UBC operations, teaching and research. Under the two crosscutting themes of the Campus as Living Lab and Agent of Change, the organization works actively with faculty, staff and students at multiple levels to embed sustainability into the operational and academic culture of the University, and collaborates with partner communities and organizations off-campus to contribute to sustainability in the wider community (Robinson et al., 2013). This integrative model has continued to provide an opportunity to further explore, test and demonstrate innovations for sustainability by combining campus operations and administration with the education, research and outreach mandates of the University (University of British Columbia, 2009b):

With the help of the USI, we have this amazing opportunity to bridge the applied operational pragmatics of sustainability with an academic foresight. I think that is largely why UBC has been so successful.

The USI is currently composed of a Central Office, a Communications and Community Engagement Office, and a Teaching, Learning and Research Office. The Teaching, Learning and Research Office, particularly, is a key focus area for the USI, and also works to address the main SAS recommendation for going beyond connecting operational activities to academic opportunities to

transform the University's curriculum in regards to sustainability. Specifically, the long-term aspiration is to embed Sustainability Learning Pathways across all teaching programs, in all disciplines. The Sustainability Learning Pathways are loosely defined as any combination of curricular experiences that when combined prepare undergraduate students with a firm understanding of four student sustainability attributes, or key competencies in sustainability: holism (ecological systems thinking), sustainability knowledge (working knowledge of fundamental, overarching concepts central to sustainability), acting for positive change (change agency, leadership and strategic competence), and awareness and integration (interdisciplinary, cross-disciplinary and transdisciplinary understanding) (Figure 4.1) (Robinson et al., 2013). In 2009, the University expressed that all students should have access to an education in sustainability, and in 2014, the 20 Year Sustainability Strategy revitalized this institutional commitment by proposing to strategically embed sustainability across all undergraduate teaching programs by 2035. This university-wide goal is therefore unique as it transcends disciplinary boundaries and aims to expose sustainability to all students across disciplinary contexts.

The Teaching, Learning and Research Office has also developed the USI Teaching and Learning Fellowship Program, in which cohorts of full-time faculty leaders in sustainability teaching and learning are brought together to work collectively on sustainability curriculum issues and provide an interdisciplinary forum for development and promotion of sustainability across academia (Cayuela et al., 2013). In fact, the first cohort of fellows developed the four sustainability attributes described above. Since the inception of the program in 2010, the University has supported 28 Sustainability Fellows from 8 faculties to lead the development of a sustainability learning pathway within their department or faculty, or to revise an existing course with a sustainability lens (University of British Columbia, 2016).



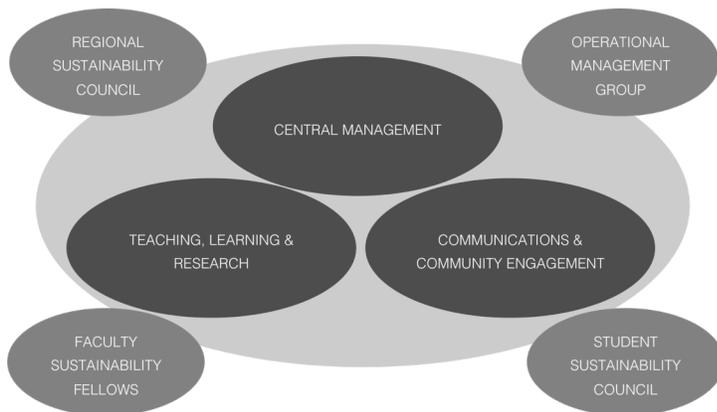
**Figure 4.1 Student Sustainability Attributes (University of British Columbia, 2016)**

In regards to operations, the USI also works closely with the Sustainability and Engineering and Community Development offices through the Operational Management Group, a partnership of key operational groups on campus formed in 2011 that also includes representatives from Infrastructure Development, Building Operations, Campus and Community Planning, Student Housing and Hospitality Services, Payment and Procurement Services, and UBC Properties Trust, to coordinate the University’s operational sustainability initiatives. A staff member in water and energy services expressed the role the USI has played in facilitating the integration and credibility of sustainability, specifically regenerative sustainability principles, into the operational and academic culture of UBC and the broader community:

The principle actors, particularly the leaders of the USI, have been proven right. They started talking about a lot of sustainability over 20 years ago, and over time this thinking started to permeate into us. It is permeating into the government levels, so eventually it is going to get into the private sector as well. Now, when leaders are talking about the regenerative neighbourhood concept, not just regenerative building, they have already

established a bunch of credibility. I think the neighbourhood project will happen faster because folks go well; they were right about this, so let's start pushing these notions on a slightly larger scale.

In addition to working with staff, faculty and students on operational and academic sustainability initiatives, the USI also has a steering committee that provides strategic guidance and oversight to UBC's campus-wide sustainability initiatives, including academic, research, operational, and policy decisions. The USI Steering Committee also works closely with a Student Sustainability Council and a Regional Sustainability Council (Figure 4.2). The Student Sustainability Council, composed of student representatives, acts as an advisory body to provide feedback on USI projects and programs. The Council is also a conduit for communicating student-originated sustainability priorities in teaching and learning programs, research and partnerships opportunities, and campus operations (University of British Columbia, 2014). The Regional Sustainability Council, on the other hand, is comprised of leaders from both the University and the broader sustainability community, from the private, public and NGO sectors in the Vancouver region. The committee provides input on priorities in research and partnerships, teaching and learning, operations and policy recommendations, and meets twice a year with the Steering Committee (University of British Columbia, 2014).



**Figure 4.2 Structure of USI and corresponding councils and groups (Robinson, 2016)**

The CLL Steering Committee and CLL Working Group are also part of a broader USI initiative, consisting of a group of individuals from various areas and levels of authority that review CLL projects. In essence, the intent of this review process is to ensure that a majority of stakeholder representatives have had a chance to provide input before a project is proposed to the BoG for approval. Not only does this provide an opportunity to refine the scope of a project, but it also creates greater alignment between the intent of the project and the needs of the institution and broader community. Furthermore, as breaking down silos and fostering greater interdisciplinary collaboration is a predominant goal of the CLL initiative, the Steering Committee and Working Group are also accountable for integrating relevant researcher expertise and capabilities into CLL projects (Save, 2014).

#### **4.1.4 Collaboration and engagement with the community**

In addition to coordination and engagement between mid-level management, universities also have a responsibility to be more accountable to the communities within which they exist. Such constructive interactions create opportunities to develop and strengthen mutual learning, accountability, and societal impact, which are at the heart of the relationship between the academy and society (Robinson, 2008). As part of the University's earlier commitments to community engagement, the Georgia Basin Futures Project (GBFP) involved developing highly interactive processes of partnership with a number of private, public and NGO sector organizations to explore the potential for achieving sustainable futures at the regional level (Robinson and Tansey 2006). An important component of that project was the development of interactive gaming tools to allow the creation and exploration of alternative future scenarios for the Georgia Basin that would allow non-expert users to see the trade-offs and consequences associated with different collective policy choices (Rothman 2002; Carmichael 2004).

One important lesson from these projects was the difficulty of connecting academic research

activities to real world societal problems in ways that met the needs of both the researchers involved, and also the partner organizations outside the academy. These latter organizations tended to have needs and timelines that did not correspond strongly with academic requirements (Robinson, Carmichael et al. 2006). This suggested that new ways of engaging with non-academic partners were required. Consequently, in 2010, following the adoption of SAS and the establishment of the USI, the Agent of Change initiative was developed to commit the entire university to build strategic alliance partnerships with the private, public and NGO sectors, allowing the University to expand its expertise on sustainability and reach beyond the campus through the processes of commercialization, policy development or community engagement:

Our partnerships with industry, or any external partnerships, can have a significant impact because you get a different perspective. So I think that anytime you have those kind of meaningful partnerships, anytime you have an external force coming into this institutional context, they can push the university to rethink some of its procedures around things or the way things are done.

To that effect, UBC has signed MOUs with industry and community organizations, which in essence, commit UBC and the partners to identifying areas of common interest and synergy in the pursuit of sustainability, and working together to implement innovative sustainability practices on and off-campus (Robinson et al., 2013).

More recently, Campus and Community Planning (C+CP) created ten engagement principles to enable dialogue with the community. Approved by the Board of Governors (BoG) in September 2014, these principles intend to create clarity and transparency on how the organization defines, designs, and implements public engagement in land use and community planning processes. Through these principles, C+CP is launching a new initiative, UBC Community Conversations, in partnership with the University Neighbourhoods Association (UNA). Designed to strengthen communication and coordination with

students, faculty, staff and residents, these conversations intend to include updates on upcoming planning, development projects and community programs (University of British Columbia, 2016). C+CP also recently released its first annual review of the engagement principles, and overall, there has been positive feedback on the quality of engagement in planning and design processes since the principles have been in place, particularly because it provides an opportunity to better integrate activities across the sustainability portfolio (University of British Columbia, 2016). However, since this initiative is in its early stages, there are opportunities to improve the principles specifically, and the community engagement process of the University overall. As outlined in the annual report, these include clearer descriptions of how different types of projects relate to the University's plans and processes, refining the internal coordination across departments involved in planning processes and projects, and increasing the transparency and availability of information among relevant stakeholders (University of British Columbia, 2016).

In a general sense, the engagement processes of the C+CP vary in their level of public involvement, ranging from simple notification to consultation through to partnering. The types of engagement therefore vary from project to project and are determined by the mandate, impact and scope of interests for each project. For each planning and development project, C+CP informs and consults with the UBC community, including student government, faculty leadership, the University Neighbourhoods Association and off-campus neighbours (University of British Columbia, 2016). These leadership groups and community representatives also participate more closely on projects through joint problem solving, and collaborate and partner with the University on community programs, where appropriate:

When we are developing these different plans or projects, there's a massive public consultation process, so that's kind of the bottom-up impact or bottom-up feedback into the plans to ensure the community's views are represented. So with our neighbourhood plans for example, we have a big consultation process that involves different tools about consultation whether it is open houses, asking for written comments, or doing workshops where we ask people to draw how they want the community to look. And that is trying to take

what the community is looking for, the students, staff, and faculty, and embed them into these plans and processes.

Despite the University's various initiatives to collaborate, align priorities, and engage with the wider community, UBC's influence on policy and practice is limited in a regional context. Since UBC is not an elected municipality, it is not considered a member organization of Metro Vancouver and therefore has limited municipal representation, despite having a daily population of over 50,000 individuals and being an important part of the region's long-term future. Technically, voters at UBC can cast a ballot for director of Electoral Area A, an unincorporated area of the regional district, who sits with other directors on the Metro Vancouver board that govern their constituencies (Metro Vancouver, 2015). However, because the board operates fundamentally on a system of consensus, the power of the director of Electoral Area A is limited. Even though this unique governance structure provides the University with the flexibility to create a planned community and explore sustainability initiatives that would otherwise be impossible in other regions, the current system, according to a staff member in infrastructure development, limits its influence on policy and practice at the regional scale:

The challenge is we are not small. Daily population here is around 50,000 people, and our plan is to have upwards of 70,000 people here. That's bigger than a lot of the municipalities in Metro Vancouver. And we have that kind of impact on utilities and infrastructure. But because we are not an elected municipality, we cannot be part of Metro Vancouver as a member organization, and that makes things challenging because we would like to have more influence on policy and practice as it applies to the stuff that is done regionally. We would like to have a bigger voice in it, but our legal status does not allow us to be that way.

There is support from senior levels of government on sustainability, such as the regional sustainability plans and policies earlier, but the lack of influence on regional policy and practice is significant because it

inhibits effective coordination and alignment between the vision and priorities of the UBC community, and with those of Metro Vancouver:

It would be interesting to find some way to be at the table, and more present, and be able to guide things a little more from our point of view. Our interests are not necessarily going to coincide with someone else's or other municipalities, but it would be great if we had a chance to work some of the friction up on them. So it would be great to have it, but it is something we have to work on over the long term.

This lack of coordination is especially troublesome as it relates to the University's services that are governed by Metro Vancouver, such as its water and sewer systems:

Our water and sewer services from Metro Vancouver, they've got ways of handling things that may or may not affect us negatively, and we have to accommodate their changing way of delivering service, which can be a challenge at times. For example, Metro Vancouver decided they needed to save some energy, so they reduced the amount of pumping that happens in Sasamat Reservoir. However, that actually forced us to go build a pump station, and that has given us some challenges. So, sadly, we did not get a lot of talk with them on that kind of thing, we just had to adapt to a situation that we were dealt with. But if we had been able to discuss things with them a little bit better, we might have been able to negotiate or discover a better way to solve both problems.

#### **4.1.5 Internal champions**

What is particularly notable about the responses received from the interviewees is the role that the leadership of champions who have pushed innovative ideas and practices onto development at UBC. Empirical historical accounts of transitions have also revealed that such actors have the potential to play significant roles by developing new ideas (van der Brugge et al., 2005). Even though the presence of a

supportive upper administration has undeniably contributed to the institutionalization of sustainability at UBC, bottom-up initiatives driven by staff, faculty and students have played an equally important role in the campus' transition to sustainability, as expressed by staff members in infrastructure development and campus and community planning:

I think right now we are in a situation where our planning and sustainability staff are really pushing these practices onto projects, more so than the projects being aggressive from the outset. Our development model is pretty traditional, so the way we get the sustainability in is by pushing it onto building projects, and saying, you know, you have to deal with your water problems and you have to improve the performance of your building for energy, water, and sewage. There are also some folks here with some visions that are pushing these ideas and practices onto development, and we are building it into our Technical Guidelines and Campus Plan, which define where and how our institutional land is used.

It is their time and willingness to make the case with the leaders of the university that have been important resources in pushing forward these innovative projects. The champions have really helped make the case to the leadership and then the leadership has gone and said, yes let's do this.

Things do not happen unless someone is willing to champion it, especially because everyone can usually find enough work to get them through the day and do not want to take on anything new. And often these things come from champions who are willing to do that little bit extra.

Professor John Robinson was one of the champions frequently mentioned by interviewees. Dr. Robinson, until 2015, was responsible for leading the integration of academic and operational sustainability on UBC's Vancouver campus. In that capacity, he directed the USI and provided leadership for the University's academic, research and operational activities and programs in sustainability, which

has not only been invaluable to connecting operational and academic sustainability on campus, but whose perseverance and passion for sustainability also contributed to institutionalizing the campus as a living laboratory concept:

Even more important [than the policies] is having our internal champions, and I think UBC has been very fortunate. Dr. John Robinson has been one of our key champions around sustainability, and the University has been very lucky to have someone with a foresight around pushing sustainability. John also has a unique ability; he is able to move between the academic world to the practical and pragmatic, and he understands both. And that is kind of unusual for an academic. And I think his passion and leadership has been really instrumental in helping to put UBC on the map. The CIRS building, for example, is largely because of John's visions around sustainability.

It's all about people, right. John Robinson has carried the torch. Freda Pagani was really the operational person, but then John Robinson in the academic community has really been the driver and has really helped make the bridge between academia and operations at UBC, which has been a unique thing here compared to other institutions. And that has spawned the living laboratory concept, the ability to use the campus as a test bed if you will. But still, it is all about the people who were willing to take those actions and become a champion.

Dr. Robinson was also instrumental in building the Centre for Interactive Research on Sustainability (CIRS), the first capital project of the campus as a living laboratory designed to operate at the frontier of sustainable performance in both environmental and human term both within and beyond the building boundary, and to serve as a research test-bed for net-positive performance and sustainable urban development practices over its lifetime (Robinson et al., 2013; University of British Columbia, 2009b). Though there were substantial institutional barriers in approving CIRS, Dr. Robinson's emotional

investment in the project, according to a key decision-maker in infrastructure development, helped to keep a sense of forward momentum:

John Robinson was really instrumental in building CIRS from the ground up. It took a long time to get the project off the ground for a lot of different reasons; he had a lot of challenges with settling on a site. Those issues did not necessarily help or hinder the project, but at the same time, creating the space up front to take the time to realize that it was not about how many hours you were putting into the project, it was about what you were emotionally investing in it. When you become emotionally invested in a project, you bring your best in a way unlike when you don't feel that value aligned.

Freda Pagani was also commonly mentioned in the interviews. Dr. Pagani was UBC's Associate Director, Development and led the creation of the CK Choi Building, the University's first ecologically friendly building. She subsequently became the inaugural Director of the Campus Sustainability Office in 1998, charged with stewarding policy implementation (Knight and Marques, 2008). As Founder and Director of the Sustainability Office at UBC, Dr. Pagani also helped to develop green building guidelines for campus facilities, initiated an energy management program, and created the SEEDS program (Scholefield, 2009). Specifically, interviewees revered Dr. Pagani's ability to push the agenda for sustainability and inspire the UBC community to lead beyond the status quo:

I think it has really been about the people. There have been champions on campus; both on the academic side and the operational side that have been really interested in pushing the agenda and that has been really what has driven it. So we have champions like Freda Pagani who was in campus in community planning, the development manager for the CK Choi, who then went on to become the Director of the Sustainability Office. She inspired a whole crew of us, and you know, in building operations and you know, in

infrastructure development and campus planning to look for ways on new projects to try to improve performance.

It was the permission and attitude of UBC, namely Freda Pagani at the time, to explore something different. She had the foresight and the courage to bring in folks like Bob Berkebile and to say, we need to do better as an institution. So what we did was bring in folks that could take people and turn them on their heads, and allow them to let go of any preconceived notions of what they thought a building should or should not be.

Geoff Atkins was another key champion for sustainability efforts at UBC. Atkins arrived at UBC in 1996, and has overseen the creation of a pioneering deferred maintenance assessment and planning program; the creation of a leading edge community plan; and the development and implementation of the U-Pass program, which provides low cost transit passes to all students. He was also fundamental to the establishment of the UBC Sustainability Office, which led directly to the EcoTREK project, the largest energy and water retrofit project in Canada (UBC Sustainability Office, 2003). Since the Sustainability Office had no set finances following the signing of the Talloires and Halifax Declarations, Atkins' idea of a self-funding mechanism was particularly successful, where the office ran on a budget of savings accrued through the retrofit program (UBC Sustainability Office, 2003). The ability to find and secure funding, in essence, has been critical to supporting and driving sustainability initiatives on campus:

It is their support around helping to find funding, which is a principle aspect, and really their leadership and moral authority in the campus to help make the case to our Board of Governors, generally building support. But fundamentally, it is about looking for ways to direct resources. Whether it be allowing people to direct activity or their time and effort towards it or actually working on funding opportunities, such as reaching out to the federal government, reaching out to agencies for money.

It was his support around helping to find funding, which is a principle aspect, and really his leadership and moral authority in the campus to help make the case to our Board of Governors.

Professor William Rees is also well-known for his contribution to sustainability, specifically the ecological footprint analysis. In 1996, Dr. Rees, with then PhD student Dr. Wackernagel, published the book, “Our Ecological Footprint: Reducing Human Impact on the Earth”. Their influential thesis argued that the planet’s total bio-capacity is able to support only limited human demand and that our policies and planning must respond to these biophysical trends. Today, the concept of the ecological footprint is used worldwide by governments, corporations and NGOs (Knight and Marques, 2008):

Bill Rees who was in the School of Community in Regional Planning, the ecological footprint analysis was really on the cutting edge of understanding what our lifestyle imprint is having on this planet.

More generally, at UBC, there have been actors and networks that have showcased distinctive capabilities with the potential to generate change. These include the capabilities to reflect on a high level of abstraction, to look beyond the limits of their own working field, to propagate ideas in their home network, and to work creatively in a team (Loorbach and van Raak, 2006). Although the actual impact of such actors is quite diverse, all these actors have sought solutions outside their formal day-to-day responsibilities. In addition to faculty and staff, however, the agency of a generally progressive student body has also played a significant role in the University’s engagement with sustainability, according to staff in policy planning:

There is a generally progressive student body that is putting some pressure, and questioning why you are not going further on things. Our transportation plan is one example. One of its goals is to keep the price of parking pretty high and to restrict the supply so we have an incentive for people to use transit to and from

campus. When we were just updating that last year, we heard a lot of students saying that we should raise the price even higher or get ride of even more parking.

A well-known example of student leadership is the ‘Save the Farm’ movement, described above. Upon learning of the threat of losing the farm to housing development, a grassroots organization predominately composed of students quickly gained campus and city-wide support. As a result of their effort and persistence, the BoG issued a press release declaring that market housing would no longer be pursued on the farm (The Ubysey, 2009; UBC Media Release, 2008). Had it not been for students who cared about the direction of UBC, it is likely that the majority of the farm would have been converted into market housing:

The student body has also played a big role from a land use planning perspective. When we were originally updating our land use plan a couple of years ago, we had plans for the neighbourhood in South Campus that included developing the land that is the UBC Farm for a neighbourhood, and the student body felt very strongly that should not happen. That plan changed because of that input from students.

Despite the success of the student movement in preserving the farm, and others not mentioned here, a SEEDS study on student resistance at UBC expressed that one of the most common concerns with student-led sustainability movements is the difficulty of implementing change (Hodgson and Nyrose, 2008). UBC is a large institution, and although its primary purpose is said to center around post-secondary education, its bureaucratic concerns extend further than the students and their curricular needs. The study revealed that many students feel that their voice is not heard, particularly because the capacity to implement change entails a lengthy process of connecting to upper-level decision-making on campus, which, essentially, is the BoG (Hodgson and Nyrose, 2008).

As previously described, the BoG is the main body of the University responsible for the management, administration and control of the property, revenue, business and affairs of UBC. Although the student body has three representatives on the board (UBC Board of Governors, 1996), there is an overall consensus that the student's voices and concerns are not heard, alluding to the lack of a strong relationship between the student body and those in control (The Ubysey, 2013; Hodson and Nyrose, 2008). Although this is due in part to the structure of the overall bureaucracy, the absence of this relationship is also caused by students' general lack of knowledge about the formalities and processes for decision-making at the Universities. However, perhaps the issue is also the aforementioned lack of transparency between the BoG and the students.

#### **4.2 Adaptive management**

Transformational sustainability undeniably takes time, and it is an iterative process that is never fully complete but must continue to improve on itself through adaptive management (Kemp, Loorbach and Rotmans, 2007). It is therefore important to move beyond vision statements, and build shared visions and agendas that are adaptive and reflexive to context particularities (Loorbach 2010). The literature on sustainability transitions specifically emphasizes the role of adaptive management in engendering transformative change for sustainability, where, through debate, structured evaluation, assessment and research, societal issues are continuously structured and reframed (Loorbach and Rotmans, 2006). This process of social learning is linked to the ability of management to respond to feedback and direct the associated socio-technical system into sustainable trajectories. Adaptive management also relies on the collaboration of a diverse set of stakeholders operating at different levels, described above. UBC, specifically, has made it a priority to promote institutional self-reflection with the purpose of understanding and altering institutional arrangements in a dynamic and on-going process of learning-by-doing.

#### **4.2.1 Adaptability of mid-level plans, policies and processes**

As described in depth in the previous chapter, the University has institutionalized a multitude of monitoring and reporting mechanisms to track its progress towards meeting municipal and regional climate targets, and associated institutional goals, for carbon neutrality. Monitoring processes and dynamics is essential in increasing the ability to respond to change and shape institutions and management practices that sustain desirable states (Loorbach, 2007). In addition to tracking progress and critically examining the outcomes of innovation initiatives, it is equally important to continuously structure and reframe plans, policies and processes to reflect the outcomes of performance assessment and research (Berkes and Folke, 1998). In the context of UBC, the University has implemented a multitude of mechanisms to inform institutional self-reflection and adaptation on sustainable development.

A core component of UBC's energy management and building performance monitoring is the ION Historian, a database that provides real-time trending of energy and water consumption data for major buildings on campus. In essence, over 100 academic and administrative buildings are monitored and administered by Building Operations to identify deviations from normal building energy use and to make adjustments as necessary (University of British Columbia, 2012b). Researchers, students and energy managers commonly use this data to track energy saving projects, compare the energy performance of various buildings, and evaluate best practices in new building construction. These performance metrics are ultimately used to supplement institutional reporting processes, such as the Annual Sustainability Reports to Board, a requirement from UBC Policy 5 – Sustainable Development, which mandates that all operational units report to Campus Sustainability on annual progress achieved in key sustainability areas. Progress updates are then incorporated into an annual report to the BoG, and key performance indicators are included as part of UBC's Place and Promise Reports as a tool to inform areas of opportunity and improvement for future initiatives, and foster continued dialogue with the broader

community on sustainability (University of British Columbia, 2015):

Reporting on our progress is fundamental in terms of understanding our progress and on achieving our policy targets. We have a rigorous reporting process. Part of it is voluntary, but we do it because we feel that as a leading organization, we should be really transparent about our progress. Our Annual Sustainability Report gives a comprehensive view of how we are doing on both campuses, in terms of sustainability on all dimensions.

In addition to the Annual Sustainability Reports that monitor and evaluate performance campus-wide, the University began development of an Operational Sustainability Strategy to outline UBC's strategic framework for improving the campus' operational sustainability performance (University of British Columbia, 2013). As part of this process, the C+CP began working with key operational departments to help them identify strategic sustainability objectives and actions that will enable the University to achieve campus-wide targets in energy, climate, waste, and water:

We work with operational units, so building operations, infrastructure development, IT, payment procurement services, to develop an operational implementation plan that identifies a series of definitive actions with responsibilities and timelines associated with it, and then using that as a basis to create operational plans, program resources and staffing, identify champions, kind of steward those aspects along.

Accordingly, the Operational Sustainability Framework has been developed to define Building Operations' strategic priorities for improving performance on the campus' sustainability goals and targets. The framework, which also relates to campus-wide sustainability plans, includes unit-specific long-term goals and objectives, short-term priority actions, and performance metrics for tracking progress. The performance metrics, specifically, are tracked annually, submitted to Campus Sustainability as part of the

annual reporting process, and used for internal management of progress on sustainability goals, communication with senior leadership on sustainability performance, and/or inclusion of sustainability performance in public reporting (University of British Columbia, 2013):

We check in on these operational units on a regular basis, because as we go through and develop the plan, it is equally, if not more important, to understand how the plan is being executed and implemented. Then, monitoring the level of success, level of success, and where there are barriers, or hook-ups, or challenges with respect to, or delays with respect to, the implementation. Figuring out what those barriers or issues are, and then beginning to map solutions to overcome those barriers.

The Carbon Neutral Action Report (CNAR) is another report produced by UBC annually for the province. A regulatory requirement for public sector organizations under the Greenhouse Gas Reductions Target Act, the CNAR reports on plans and actions taken to reduce energy use and GHG emissions. The reports also track absolute and relative emissions against a 2007 baseline to measure and demonstrate performance against the GHG reduction targets of the Climate Action Plan. For instance, the latest carbon neutral report from 2014 demonstrates that the University's offsettable emissions decreased by 22 per cent from 2007 levels, despite an 11 per cent increase in building floor space and an 18 per cent increase in student enrolment (University of British Columbia, 2014b). These reports, in turn, are viewed as an important tool to inform the University's Climate Action Plan, and its associated priorities and strategies, in the long-term:

The Carbon Neutral Action Report essentially calculates our total emissions that are source one and source two reported emissions. It is an important report to inform us as to how we need to curb emissions, and it also helps to inform our Climate Action Plan as we move forward.

In regards to external benchmarking mechanisms, the University also participates in STARS (Sustainability Tracking, Assessment & Rating System). The benchmark not only credits institutions that measure and reduce emissions and utilize infrastructure and operations as living laboratories for interdisciplinary learning and research, but it recognizes institutions that have formal education programs and courses for sustainability (International Sustainable Campus Network, 2015). The report also has an in-depth sign-off process, requiring the signatures of the senior-level management and executives of the University, which in turn ensures that the findings of the report are put directly into the hands of key decision-makers:

There is a very in-depth sign off process. So anything that has to get signed off by the presidential level, needs to be signed off by the vice-presidents, steering committees, managing directors and directors, and then, there is a part responsible for each credit, someone whose name is attached to the credit and is actually public posted online. Through that quality-assurance, quality-control process, there is an opportunity to inform senior-level management and executives on our sustainability performance.

In other words, by briefing the administration on the University's progress on sustainability, there is an opportunity to identify barriers or areas for improvement, and ascertain how policies, plans or practices can be improved to overcome these challenges:

So that kind of mandate, from an external system that is asking us what are we doing, is an opportunity to engage with our policies and practices in a more strategic way.

In regards to CLL projects specifically, there is a process for sharing and consolidating best practices from these projects into campus operations. Formally, there are the CLL Steering Committee,

chaired by John Metras and John Robinson, and the CLL Working Group, both of which have 10-15 staff, faculty, and partner members. The agenda is to generate, discuss and review all CLL projects, and ultimately integrate best practices and lessons learned into operations. For instance, the problems uncovered by the CIRS building commissioning process have led to changes in the way the University commissions buildings, the use of design charrettes has influenced the design process in subsequent developments, and the technical guidelines for the Orchard Commons, a residential building, were developed in conjunction with CIRS.

In terms of specific governance documents, the UBC Land Use Plan, though relatively stable, is amended from time-to-time through a consultative process, involving the UBC campus community, interest groups from both on and off campus, and the public, to adapt to changing priorities and conditions:

We have land use policies and those are pretty stable but they might shift, they need to be able to adapt because circumstances change.

The plan was amended in 2011 to coordinate and align its policies with the Vancouver Campus Plan (2010), and to address “the supply of affordable housing, transfers of floor space from UBC Farm and other areas to achieve the population needed to support a complete, sustainable community and to incorporate sustainable community policies and opportunities” (University of British Columbia, 2014). Most recently, in 2014, there was another amendment to the plan to incorporate a new Regional Context Statement to respond to the 2012 Metro Vancouver Regional Growth Strategy.

The Technical Guidelines, which outline standards and strategies for professionals who provide development services for University-owned institutional buildings, are also updated regularly to reflect

ongoing developments in design and construction. In essence, the guidelines are not merely a checklist for minimum requirements, but a reflection of lessons learned and best practices in the built environment:

The technical guidelines are a reflection of everything we have learnt, and then putting it into a document for any consultant or contractor that comes to do a project at UBC, or architect or engineer, knows this is how UBC wants it done. So codes are one thing - they speak to the bare minimum that you need to do from a safety or a regulatory standpoint. The Technical Guidelines speak to best practices.

We have a formal process for closing out our project and doing a post-occupancy evaluation. We take the lessons learned from our project closeout reports, which we deliver to the Board of Governors, and we feed them back into our Technical Guidelines.

I think our plans are adaptive, like the Technical Guidelines, which we revise every year. So there are lots of opportunities to be adaptive, if you have the time.

One interviewee in energy and water services, however, highlighted that there is tension between having a full-time position on campus, and the associated day-to-day tasks, and having the time to complete tasks that are not necessarily top-priority, though still important, such as more comprehensive updates to the Technical Guidelines:

You know there is a lot of things I would like to change with Technical Guidelines but I don't necessarily have the time to do it. So I have to get my priorities straight.

#### 4.2.2 Adaptability of governance structures

Though specific guiding documents like the Technical Guidelines and Operational Sustainability Strategy are reasonably adaptive and reflect lessons learned and best practices, policies specifically pertaining to high-level decision-making authority and processes, on the other hand, are particularly stable according to staff in policy planning and implementation:

There's a whole bunch of different policies that the university has. There are policies under the Board of Governors; they are the ultimate decision-making authority for the University. Policies about financial matters or about the processes that you need to take to approve things - those are extremely stable.

There is some adaptability but policies are generally there because they were developed with a lot of process and a lot of consultation and it can be challenging to change it. I'd say that the bigger the impact of a policy, the harder it is to change.

This resistance to change is partly due to the traditional structure of decision-making at the University. The BC University Act, in essence, provides for the University's bicameral governance structure. The bicameral system used by UBC is the fundamental system used by many other public degree-granting universities in Canada, in which one group is responsible for business affairs and another for academic. The BoG, as previously mentioned, is responsible for overseeing the management, administration, business, property and revenue of the university. More specifically, the BoG has the power to maintain the condition of real property on campus; erect new buildings and structures; determine rules regarding management, governance and control of real property, buildings and structures; and regulate, prohibit and impose requirements for use of the University's real property, buildings, structures and personal property, including vehicle and pedestrian traffic, parking, activities and events (UBC Counsel, 2014).

In other words, because the BoG is vested with this power, it is unlikely for any substantial change to occur at this level unless members of the BoG specifically endorse it. However, this can be troublesome if members of the BoG do not prioritize sustainable development, and associated flexibility and adaptability, in their decision-making. Even though the BoG is required by law to act in the best interests of the University, it is unclear how committee members assess the interest of the university particularly since it interprets fiduciary duty as pertaining to donors rather than its faculty, students, and staff (UBC Faculty Association, 2016; UBC Counsel, 2014). Combined with the aforementioned lack of transparency in the BoG's management practices, it is not only unclear if the board has been operating in accordance with its legal obligations, but also to what extent high-level policies under the BoG are flexible and adaptive to the changing needs and priorities of the university it governs.

#### **4.3 Systems-thinking and long time horizons**

Sustainability transitions theory views societal systems as complex adaptive systems and studies these in terms of non-linear and long-term processes of change from an interdisciplinary and integrative perspective (Loorbach, 2010). Sustainable development, then, is perceived as a process that transcends a long time horizon and integrates many different domains, including a context-specific balance between ecological, economic and socio-cultural values (Rotmans, 1994). Sustainable development, however, is not an exclusive type of development that addresses the needs of a select few; rather, it attempts to express the interests of multiple actors in a society as well as the interests of different generations. In other words, it is a complex, long-term, multi-level and integrative process. That said, in order to empower transformative change for sustainability, it becomes critical to shift from a single socio-technical system framework to an exploration of linkages between many systems across a longer timeframe (Loorbach, 2010). Over the past few years, UBC has implemented more holistic and long-term

sustainability goals into its governance and operations to which short-term priorities and actions are aligned.

#### **4.3.1 Holistic and systems thinking**

As the transition toward sustainability is a deeply integrated challenge, transitions theory postulates that it is not only appropriate but also imperative to address sustainability in such an integrated manner. The theory therefore states that it is essential to shift from a vision that considers a single socio-technical system to an exploration of the linkages between many systems (Loorbach, 2010). In general terms, UBC's thinking on planning and design has evolved to consider sustainability in various dimensions, rather than confining the scope of a project to either social, economic, or environmental sustainability:

I think there's been a lot of evolved thinking on planning and design processes overall. Over an evolutionary process, there has been more thought given to delivering on all aspects of sustainability on project development. So, looking at social, environmental, financial sustainability as part of the ability to build a successful project. The thinking has definitely become more holistic, especially in the realm of the built environment.

Place and Promise, for instance, outlines how the University, as part of this commitment, intends to commit its infrastructure, research, teaching and learning capabilities to innovate solutions for economic, environmental and social sustainability (University of British Columbia, 2009a).

Due to the significant size of the campus, the University also has a unique opportunity to explore sustainability projects on a systems-wide scale, a capability that is not always possible for organizations in the public or private sector as expressed by a staff member in campus and community planning:

Environmental systems are now where we need to be going in terms of our sustainability thinking. You can't just look at sites. You need to look at systems and how decisions affect our broader area. You cannot underestimate this as a value, as a great thing that we have going for us here, especially because we are big enough that we can affect systems.

Even though the Place and Promise strategic plan, and corresponding mid-level plans, generally include social, economic and environmental sustainability as one of their main commitments, key decision-makers in green building admit that the University could better incorporate integrated design into its development processes:

I would say, even after all these years, we really need to push for integrated design and it doesn't always happen as well as it could.

UBC's Sustainability Development Process, in turn, has been employed to encourage integrated design into the early stages of the development process, specifically as stakeholders collectively investigate design strategy synergies and system complexity through a sustainability lens (University of British Columbia, 2014):

I think the process, in general, is really good having everybody in the room right at the beginning of the project, with a sustainability lens. I think that's excellent. And it does give a more holistic point of view.

The Public Realm Plan, which directs planning and investment in the outdoor public spaces of the campus, outlines strategies to create a network of outdoor public spaces that act as a connective tissue between individual buildings and pathways (University of British Columbia, 2009b). In addition to improving pathways and their connectivity, the plan also contains a number of initiatives that integrate

sustainability features in the design to meet the University's sustainability objectives and GHG targets. Prior to the adoption of the Public Realm Plan, however, each project was considered independently through disparate design, as expressed by campus and community planning staff. Following the implementation of this plan, individual public realm projects are implemented collaboratively through an integrated sustainability design process, tailored to the needs and complexity of each project:

Each project happened independently and in a vacuum [before Public Realm Plan]. So of consequence, there was no unity across the campus. There were not much systems thinking, but now we approach it from a whole-systems lens.

Before the campus was really only dealing with problems: how are we going to solve this problem over here, how are we going to solve this problem over here? Not looking at the whole place, not holistically.

The Public Realm Plan has an imperative to be sustainable, and to enhance the physical and mental health of students. The materials that we use, we need to be thoughtful about a life-cycle analysis of those things. The plans we select need to be mindful of water use. You know, the sustainability lens has to be applied to all developments, buildings and landscapes.

As previously stated, all new provincially owned or leased construction and major renovations projects are required to achieve LEED Gold certification, which is the Leadership in Energy and Environmental Design program for green buildings (UBC Sustainability, 2015b). While green building rating systems such as LEED have been extensively developed, there are no internationally accepted guidelines or rating systems for landscapes. One of the team leads at C+CP, however, is hoping to adopt the Sustainable Sites Initiative for landscape projects at UBC. Administered by Green Business Certification Inc., the Sustainable Sites Initiative offers a rating system designed to distinguish sustainable

landscapes, measure their performance and elevate their value (Sustainable Sites Initiative, 2016). In essence, it is used by landscape architects, designers, engineers, architects, developers, and policy-makers to align land development and management with innovative sustainable design:

We have not yet adopted the Sustainable Sites Initiative criteria on campus, but it looks at the eco-services that landscapes provide and how landscapes can be developed in a way to qualify and quantify its actual sustainability.

Ultimately, it is hoped that the Sustainable Sites Initiative can be a standard to which all campus landscapes are designed and maintained. Should a Sustainable Sites Initiative certification be pursued for future UBC landscapes, the entirety of the project from start to finish will have to be taken into consideration as these guidelines encompass the project life-cycle from the planning stages to demolition:

I am quite excited about this criteria, and I hope we'll move towards establishing that as a benchmark to the approach for how landscapes develop, get developed on this campus. And there is an aspiration that LEED and the Sustainable Sites Initiative would at some point coalesce.

#### **4.3.2 Long-term plans, policies and design**

In addition to systemic planning and design, it is also essential to incorporate long-term plans and policies that extend well beyond electoral cycles and management terms. Transition management combines an orientation toward a long-term vision of sustainable development with short-term experimental learning to probe options and discover pathways to realize the vision. Long-term policy and planning thus need to be flexible and adaptive, and cope with the inherent uncertainties of inchoate pathways of societal change (Loorbach, 2010; Loorbach, 2007). A longer timeframe is also key to

understanding system dynamics, where exploring the potential of synergies between adaptation and mitigation requires timelines that allow the emergence of longer-term benefits (Loorbach, 2010).

Evidence of long-range planning is present in the UBC Vancouver Campus Plan, for example, which provides a framework for the campus' current and future development and guides decision-making for the next 20 years (University of British Columbia, 2010). Also, in 2013, the University began development of an Operational Sustainability Strategy, which will outline UBC's strategic framework for improving the campus' operational sustainability performance. As part of this process, C+CP began working with key operational departments, helping them identify strategic sustainability objectives and actions that will enable UBC to achieve long-term campus wide targets in energy, climate, waste, and water (University of British Columbia, 2013).

Furthermore, in 2014, the University also finalized and approved a 20-year Sustainability Strategy for next generation sustainability at UBC's Vancouver campus, across teaching, learning, research, partnerships, operations and infrastructure, and the community (University of British Columbia, 2014). The 20-year Sustainability Strategy is, in essence, a framework with the intent to further integrate dispersed sustainability efforts through the lens of regenerative sustainability, leverage the campus as a societal test-bed, and create academic, operational and community collaborations and connections. The strategy provides long-term direction for sustainability and is considered a living document to reflect new discoveries, innovative practices, changing environmental conditions and stakeholder preferences. This adaptive approach to long-term operational and academic sustainability is, in essence, crucial for enabling resiliency to changes in external circumstances. In fact, UBC is one of the few universities to have such a comprehensive, long-term and flexible visionary document for sustainability (University of British Columbia, 2015c).

The University is also beginning the process to develop a new Climate Action Plan (CAP 2020) that will outline a series of actions UBC could take towards achieving a 67 per cent GHG emissions

reduction below 2007 levels. This is the second phase of climate action planning at UBC. The process to develop the CAP 2020 builds on UBC's Climate Action Plan 2010, which set a target of reducing Vancouver Campus GHG emissions by 33 per cent from 2007 levels by 2015 (University of British Columbia, 2016). The University has made progress towards achieving the first target set out in the 2010 Climate Action Plan, and is currently preparing to lay the groundwork for the next phase of reductions. Consultation on the CAP 2020 began in 2015, with engagement with key staff, researchers and external collaborators, and with a call for ideas to UBC researchers and the broader campus community:

We are just in the throes of creating the new Climate Action Plan that will take us to our next target, which is 67% reduction of GHG gases by 2020. So we've set up kind of a scope of work, a research methodology and approach, a steering committee and technical team, to look at different aspects from: buildings, transportation, food-systems, procurement, IT, operations, etc.

Long-term planning is also at the heart of the Energy and Water Services (EWS) unit at UBC. EWS, specifically the Energy Planning and Innovation (EPI) group that operates within EWS, currently leads the development of long-range energy infrastructure plans, and implements energy and water conservation and efficiency measures that reduce UBC's operating costs, defer costly infrastructure upgrades and reduce GHG emissions (UBC Energy and Water Services, 2016). The management team at EWS recognizes the importance of deeply integrating long-range planning into infrastructure development, and ensuring it is adaptive and resilient to future weather-related extreme events and climactic uncertainty:

The last I checked the university is not going anywhere in the next 25 years. We are not selling it to anybody else; we are going to be here. So if we are going to be here, then actually 25 years is a more than reasonable timeframe to look at the scope of the project.

We know that, say, sea rise is an issue or the storms are going to change. Well, how do we take what we currently have and make sure we can adapt to this new environment? So adaptation is important. Then, there's the mitigation, which is what we do to reduce the effect of what is coming. And mitigation will be less greenhouse gases. So these two things come at us, and we need to sort of roll it all together into one package.

Instead of having the storms that come in and rain for 24 hours straight, we might have storms that come in and rain for three to five hours, put down the same amount of rain that they normally would in 24 hours. That means we have to look at how we are going to handle that water, because it is going to come down very rapidly, very suddenly. How are we going to deal with it? It does change our design parameters a little bit. Thankfully, the reality is not going to hit us for a little while, so we have time to think about it. But, the reality is we have to be thinking about it now and come up with our plans. Because when we build something now, it is going to survive into the next phase.

The Academic District Energy System, or ADES, for instance, which involves replacing UBC's aging steam infrastructure with a more efficient hot water system, is perceived by staff in energy and water services as a piece of infrastructure that not only contributes to reducing GHG emissions, but also acts as a platform to enable and advance sustainable development opportunities in the future (University of British Columbia, 2011):

You have heard me say in the past that, to me the hot water grid is not just infrastructure. It is not just replacing steam with something else, it is actually enabling infrastructure in the future. We could put solar hot water panels on the roof parkades. We could do waste heat from the showers in student residence. We could do a whole bunch of things – it does not matter. But we can capture that heat and we can put it in the hot water system. We cannot capture it and put it into a steam system.

#### **4.4 Summary of multi-level alignment, coordination and adaptation at UBC**

In conclusion, multi-level alignment, coordination and adaptation are essential for fostering transformative social innovation. Though sustainability policies are well meaning, they are not generally at the forefront of decision-making. The shift to sustainability, rather, involves articulating, synchronizing and modifying visions for sustainability across levels through debate, structured evaluation and assessment, and implementing the necessary actions for achieving these changes by cultivating connections with committed stakeholders in the socio-technical system. UBC, specifically, has fostered alignment, coordination and adaptation mechanisms that, in theoretical terms, ultimately empower innovative practices and new discoveries for sustainability.

In terms of its plans and policies, UBC has, for the most part, infused sustainability throughout its organizational structure by articulating and synchronizing sustainability visions and aspirations across governance and actor levels. Even with the commitment and support from senior leadership, grassroots initiatives have had an important role in the campus' transition toward sustainability. The University has undeniably moved from policy to practice; however, meaningful upper administrative support came only after prolonged grassroots efforts. It was essential to have this bottom-up push from faculty, staff and students to demand accountability from the institution and its stated commitment to sustainability. Although connecting academic plans with sustainability policies is undeniably a tactical approach to infuse sustainability throughout the organizational culture of the University, the transparency and accountability of its management practices is equally, if not more important. The recorded management practices of the BoG, specifically, impart a lack of accountability and transparency to decision-making, which is ultimately counterproductive to achieving the required change for sustainability. There is therefore a need for better transparency between senior leadership and all stakeholders to ultimately build, and restore, cohesion and trust in the institution and its governance structure.

The University has also been able to successfully coordinate sustainability initiatives, and foster collaborations and partnerships, across scales. Armed with the commitment and support of middle-management organizations, UBC has been able to diffuse and integrate sustainability initiatives throughout the University and the broader community. There are, however, opportunities to improve the community engagement process of the University, including more clarity of how different projects relate to the University's plans and processes, refining the internal coordination across departments involved in planning processes and projects, and increasing the transparency and availability of information among relevant stakeholders. Furthermore, despite the University's various collaboration and engagement opportunities with the community, UBC's influence on policy and practice is limited in a regional context as it is not an elected municipality. Although there is overall support from senior levels of government on sustainability, the lack of influence on regional policy and practice essentially restrains effective coordination and alignment between the vision and priorities of Metro Vancouver and the UBC community.

The visionary leadership of faculty, staff and students has also been instrumental to the institutionalization of sustainability at UBC. These actors and networks have showcased distinctive capabilities that have the potential to nurture change, such as reflecting on a high-level of abstraction, looking beyond the limits of their own working field, propagating ideas in their respective networks, and working creatively in a team. Although the actual manifestation of each actor has been quite diverse, they have all sought solutions outside their formal day-to-day roles and responsibilities, and participated in informal networks to push the boundaries of conventional institutional practices and procedures. Specifically for students, however, there have been challenges with implementing change, particularly as the institution's bureaucratic concerns extend further than students and their curricular needs. Many students feel that their voices are not heard since the capacity to implement change entails an arduous process of connecting to upper-level decision-making on campus. Despite having student representation

on the board, there is an overall consensus that student voices and concerns are not effectively heard, possibly due to a weak working relationship between the student body and senior leadership.

As a public institution, the University also has a responsibility to build shared visions and agendas that are adaptive and reflexive to context particularities. The literature on sustainability transitions specifically emphasizes the role of adaptive management in engendering transformative change for sustainability, where, through debate, structured evaluation, assessment and research, societal issues are continuously structured and reframed. UBC, specifically, has addressed the importance of promoting institutional self-reflection with the purpose of understanding and altering institutional arrangements in a dynamic and on-going process of learning-by-doing. Policies under senior leadership, however, are much more stable, and therefore conducive to path-dependency, due to the traditional structure of decision-making at UBC. In other words, the highly autonomous policies under senior leadership are much less conducive to flexibility and adaptability, as they are rooted in institutional management practices that have limited or no connectivity to ever-changing practices, structures and agents at the University.

Furthermore, the transition toward sustainability is a deeply interdisciplinary and integrative challenge, where it is essential to shift from a vision that considers a single socio-technical system to an exploration of the linkages between many systems. UBC's approach to development, specifically, has evolved over the past twenty years to consider sustainability much more holistically and across various dimensions, rather than confining the scope of a project exclusively to social, economic, or environmental sustainability. A longer timeframe is also key to understanding system dynamics, where exploring the potential of synergies between adaptation and mitigation requires timelines that allow the emergence of longer-term benefits. Accordingly, the University has adopted various plans, policies and frameworks, designed to be inherently resilient and adaptive to changing conditions in the future, that combine an orientation toward a long-term vision for sustainable development.

## **Chapter 5: Discussion and Conclusions**

### **5.1 Potential for transformative change at the University of British Columbia**

As outlined in the literature review chapter, the theoretical frameworks of transitions theory suggest two key characteristics that hold the potential to foster transformative social innovations: the link between transformative sustainability and niche-innovations; and the importance of multi-level actor networks in empowering and mobilizing social innovations. In other words, to become successful, innovations developing in niches must not only encompass an experimentation and reflexive learning dimension to enhance the emergence of alternate sustainable development pathways and coalitions and partnerships across scales, but also foster effective coordination and alignment across these coalitions to enable integrated decision-making, adaptive management, and systems-thinking (Geels et al., 2010; Loorbach, 2010; Schot and Geels, 2008). These two characteristics, in essence, have been at the core of the thesis to examine if the operational activities at the University of British Columbia (UBC) exhibit the conditions that the theory suggests is necessary for engendering transformative social innovation. The findings of the study are grouped by the two main research questions, which respectively ask whether the activities at UBC have, over the past twenty years, nurtured experimentation and learning processes, and if multi-level actor networks, and their coordination and alignment, have fundamentally empowered conditions conducive to transformational change for sustainability.

#### **5.1.1 Experimentation and learning processes**

Experimentation and learning have been key components of UBC's sustainability endeavors. The University has, essentially, benefited from an environment that nurtures innovative practices and new discoveries for sustainability. Specifically, at the landscape level, the regional and municipal contexts have provided the necessary legislative incentives to champion innovation for sustainability. These

mandates, such as British Columbia's Greenhouse Gas Reduction Targets Act, the Province's Climate Action Plan and the City of Vancouver's Greenest City 2020 Action Plan, have facilitated and endorsed more experimentation and innovation development, particularly at academic institutions, and in doing so, have created the necessary space and increased momentum for new processes and practices at the niche level. This congruency has not only been essential for enabling niche-innovations, but in theoretical-terms it also plays an important role in allowing such innovations to develop and mature to either coordinate with developments or compete with undesired path dependencies at the regime level. In addition to the impact of the landscape level on experimentation and innovation, the provincial-level policies and municipal climate action initiatives have, more generally, contributed to creating an overall ethos of environmental urbanism and embedding a more robust political culture of awareness, and attention, to the risk of climate change.

In addition to provincial-level policies and municipal climate action initiatives, the University's supportive institutional climate at the regime level has provided windows of opportunity for social innovation. Internal sustainability plans and policies, such as the Place and Promise, the Sustainability Academic Strategy (SAS), and the 20-year Sustainability Strategy, have collectively institutionalized a deeper integration of sustainability decision-making and practices into various aspects of the University, specifically in both the operational and academic realms. The Campus as a Living Laboratory and the University as an Agent for Change principles have notably empowered the potential for cultivating transformational change by leveraging innovations that foster partnerships between the University and other relevant stakeholders seeking sustainability ideas and solutions. These principles, by encouraging an unprecedented cross-fertilization of the academic and operational sustainability, have also radically altered the nature of operational decisions and the role of operational staff at UBC, which, in essence, has catalyzed a portfolio of initiatives that would otherwise be impossible without this deeper interdisciplinary integration. The 20-year Sustainability Strategy has further institutionalized this

integration, and together with the above-mentioned institutional sustainability plans and policies, continues to promote an environment conducive to innovative practices and new discoveries for sustainability.

The Campus as a Living Laboratory (CLL) model, specifically, provides an opportunity to further explore, test and demonstrate innovations for sustainability by combining campus operations and administration with the education, research and outreach mandates of the University. The CLL model has also created the essential niche space for experimentation and learning, where niche-innovations are supplied with the necessary resources to develop and thrive. In essence, by transforming its entire campus into an experiment in sustainability, the University has institutionalized a mandate and created a model for making discoveries to advance sustainability scholarship in order to meet provincial and city-level climate targets. Such projects, like the Continuous Optimization Program, Centre for Interactive Research on Sustainability, Academic District Energy System, and Bioenergy Research and Demonstration Facility, collectively represent strategic investments in path-breaking innovations for sustainability. However, like many larger, institutional capital projects, they are prone to financial constraints that often impede innovative and experimental projects from coming to fruition. At UBC, signature capital projects have successfully overcome many of these limitations by ensuring there was clear alignment between the project and the fundamental mission of the University, which, in the end, made the project defensible and necessary for pursuing international, municipal or regional aspirations. In regards to the CLL initiatives, specifically, a strong business case for the project, particularly one that demonstrates a positive return on investment, has also played a critical role in advancing the development of a project where financial resources are limited.

The University's track record in sustainability and innovation, and unique position as regulator, developer and landowner, have also contributed to creating the necessary environment to explore innovation for sustainability. With regard to track record, in addition to being the first university in

Canada to adopt a sustainable development policy or establishing a campus sustainability office, UBC was a pioneer in sustainable development, such as the CK Choi Building and EcoTREK initiative, that ultimately catalyzed new standards for sustainable design, construction and operation, and provided the necessarily credibility and legitimacy for subsequent sustainability initiatives at the University. In addition, the University's position as regulator, developer and landowner has supported and facilitated innovation development, which are, in fact, distinctive qualities of higher education institutions. This unique ownership and regulatory context, in essence, has provided the University with a significant amount of control and freedom over decisions relating to development, which has, in turn, created an operating context for innovation and the advancement of sustainability.

Monitoring and reporting the processes, impacts and outcomes of innovation has been another important factor for fostering social learning and empowering actors to contribute to systemic change through social innovation. For actors to be empowered and intrinsically motivated to contribute to systemic change through social innovation, they need to be able to value the impact of their endeavours. In other words, knowing how and to what extent social innovation initiatives are succeeding in their goals, and providing suggestions on how to increase this success, is a crucial element for increasing the chances of successful diffusion beyond the innovation. The University has institutionalized various platforms for monitoring, evaluation and learning processes, such as its real-time energy management software and accompanying institutional reporting processes, to inform innovation development and diffusion, identify areas of opportunity or improvement in both the academic and operational realms, and foster transparency and continued dialogue around best practices with the community. The University's participation in various external sustainability-benchmarking systems, such as the Sustainability Tracking, Assessment and Rating System and the ISCN-GULF Sustainable Campus Charter, has also contributed to measuring academic and operational sustainability progress over time, identifying best practices, and understanding progress vis-à-vis other peer institutions across North America. Particularly

with the myriad of activities across campus, it has been critical to gather and monitor their outcomes, and enable social learning by communicating the findings to the wider community.

Partnership development is another essential condition to nurture transformative social innovation. Such networks contribute to the advancement of an innovation by providing the necessary resources, offering plural perspectives to a societal issue, and disseminating new ideas and solutions across scales. At UBC, the Agent of Change principle has created the incentive to build strategic alliance partnerships with the private, public and NGO sectors, which have enabled the University to expand its expertise on sustainability and reach beyond the campus through the processes of commercialization, policy development or community engagement. To date, these partnerships have contributed expertise, human capital, and resources that were otherwise unavailable to the University. It is important to note that these partnerships are unlike traditional partnerships that are centered on procurement, research support or philanthropy. The partnership approach of the Agent of Change forum, instead, is founded on aligning the common areas of interests of the University with those of the industry and community organizations. By doing so, the alliance becomes more strategic and tailored to the respective needs of both parties, ultimately creating mutually beneficial partnerships. As well as providing external partners with the opportunity to work with academic researchers and operational staff to test innovative ideas at relevant scales, these partnerships have sometimes provided the expertise and financial contributions necessary for the successful execution of a project, as exemplified by the cases of the Centre for Interactive Research on Sustainability, the Continuous Optimization Program, and the Bioenergy Research Demonstration Facility.

In addition to partnerships between operational and administrative units and the industry, the University has also participated in partnerships through teaching and learning initiatives, such as the UBC Social, Ecological, and Economic Development Studies Program, the Greenest City Scholars Program or the UBC Sustainability Scholars Program, which immerse students in real world learning where they can

build career capital through experiential learning, while at the same time producing tangible and lasting results for sustainability both on and off campus. These partnerships are especially unique, as they have created collaborations across the academic and operational realms to cultivate deeper interdisciplinary solutions for sustainability.

#### **5.1.1.1 Barriers, challenges and lessons learned**

Despite creating an environment with a capacity that, according to the theoretical framework of sustainability transitions, is conducive to innovative practices and new discoveries for sustainability, the experimentation and learning processes and practices at UBC have faced several barriers and challenges that have impeded or delayed projects and project stakeholders from realizing their full potential for innovation. In almost every case the barriers to experimentation and innovation have been institutional, particularly when stakeholders challenged standard policies, practices and models for development or financing.

The CK Choi Building, though it introduced new standards for sustainable development, encountered various institutional challenges as a result of its unconventional design approach. At the outset of the design, charrettes and seminars were held to explore, learn and establish the goals for the project. The team of design professionals, architectural, landscaping, structural, mechanical and electrical and cost consultants, worked together with all the stakeholders, including the University representatives and building users, to determine the sustainable goals of the project. However, as the project progressed, there was not always consensus on the goals that had been set. As a result, approvals required to implement the goals from various authorities had to be fought for one by one. Achieving these goals often meant deviating from building codes and returning to first principles of design. This involved research by the design team and discussions with the building authorities to ensure that the intent of the code was met and safety standards maintained. There were also inconsistencies with provincial laws, as building codes

in British Columbia at the time were not compatible with the use of recycled materials or alternate water and sewer systems.

The Centre for Interactive Research (CIRS) also experienced various barriers, and like the CK Choi Building, the main barriers were predominately institutional. However, unlike the CK Choi Building, CIRS was able to resolve issues relating to the development of goals. The goals of the CIRS project were clearly articulated and upheld throughout the design and development process, which ultimately helped move the design agenda forward, accelerated the adoption of sustainable building and development practices, and became a benchmark against which the team measured progress and project performance. Other unforeseen barriers, however, stemmed from how the building lifecycle was specified, contracted and implemented. In essence, this challenge, which caused performance gaps that restricted the building from achieving its desired performance outcomes, emphasized the importance of having meaningful and effective building energy monitoring capabilities, an understanding of energy system boundaries in design and analysis, crossing the gaps between different stages of a building lifecycle, and feedback processes throughout design and operation. The performance gaps of the building were also a result of design and commissioning deficiencies, which ultimately caused discrepancies between the design intent of the building and its performance.

Similarly, there are several prominent institutional challenges with the monitoring mechanisms at the University that also relate to long-term monitoring and continuous commissioning. Even though the University has been proactive in monitoring performance, there is a need to better align performance expectations with long-term operational realities. That being said, there are efforts being undertaken to address the gap between anticipated and measured performance, including case studies examining performance gaps within high performance sustainable buildings and numerous research portfolios exploring the reasons for and implications of the observed performance gap; however, at present, the

challenges with long-term monitoring and commissioning remain one of the most significant challenges for high performance sustainable buildings at UBC.

In general, despite their contributions, the CLL forum and its associated projects have had the tendency to focus predominately on engineering and technology or energy and emissions initiatives. However, social sustainability, as represented by social justice, equity, and intercultural understanding imperatives, needs to be equally represented and addressed (Vallance et al., 2011). To address these issues, UBC is developing a sustainability evaluative framework to refine its CLL program and the USI is consulting with relevant groups to articulate a coherent conception of social sustainability. There is also a lack of minimum standards for CLL projects at the University. This was exemplified by the case of the Academic District Energy System, where it was later realized that, in fact, it did not embody any research or teaching connections, which is at the heart of the CLL approach. In order for these projects to embody these important connections, it is therefore crucial to create standards that guide the design and implementation of these projects to build deeper interdisciplinary connections.

The availability of funding or access to capital for infrastructure projects has been another considerable constraint. Though the University was able to overcome some financial limitations by creating a clear alignment between the CLL projects discussed above and the fundamental mission of the University, and a strong business case with an economic return on investment, the limited capacity of public institutions to take on additional debt through external borrowing has been a key challenge. Without access to external funding, the University is limited to pursue only those infrastructure projects that can be funded internally or from donations. These projects, then, in essence, have to compete with other university priorities in order to gain capital from internal funds. Luckily, due to their research components and partnerships with external stakeholders, various projects, like the Bioenergy Research Demonstration Facility, have secured funding from government agencies and federal grants. Though there is funding for smaller institutional projects, it would be fruitful to create a revolving fund for high-

performance campus design, operations, maintenance, and occupant behaviour projects in order to alleviate the financial burdens associated with larger, innovative capital projects.

Another noteworthy barrier to experimentation and innovation has been the element of risk with the pursuit of any idea, process or technology of this nature. Combined with financial restraints, public sector institutions are traditionally risk-adverse as they may not be able to afford the costs of failure. Though the element of risk has undoubtedly been a key consideration for experimental projects at UBC, the University has been able to overcome this barrier by engaging with the process of risk proactively. This is due in part to the nature of the CLL forum that has fostered a culture that embraces innovation, and therefore tolerates risk to some extent, as well as the process of utilizing alternative solutions to mitigate anticipated risks. These risks are particularly forgiving when it is acknowledged that the project will present a broad range of benefits for the academic and operational missions of the campus, such as in the case of the Bioenergy Research Demonstration Facility where alternative solutions were developed to mitigate against the risks and failures associated with its original design concept. Furthermore, conducting projects in phases, though rather cumbersome from an operational standpoint, has also contributed to mitigating risks associated with innovative projects. This multi-phase approach has also contributed to building greater senior acceptance and to continually assess the outcome of each phase to inform subsequent ones.

### **5.1.2 Multi-level coordination and alignment**

In addition to nurturing environments for experimentation and learning for the development and maturation of innovation, multi-level alignment, coordination and adaptation are other essential conditions for creating the potential for transformative social innovation. These conditions, specifically, not only contribute to innovation development, but more importantly, influence the diffusion and upscaling of innovation. Though sustainability policies are well meaning and contribute considerably to

creating the necessary environment that incentivizes solutions for sustainability, they do not generally influence their diffusion across scales. The shift from niche-innovations to change in the socio-technical system, rather, according to transitions theory, involves articulating, synchronizing and modifying visions for sustainability through debate, structured evaluation and assessment, and implementing actionable strategies and coordinated efforts along actor, spatial and temporal scales.

UBC has, for the most part, infused sustainability throughout its organizational structure by articulating and synchronizing sustainability visions and aspirations across governance and actor levels. A multitude of visions have been adopted at the University since its inception, but over the past twenty years, a vision and shared commitment for sustainability have undeniably penetrated the institutional climate. Though the sustainable development policy maintained an operational focus with limited academic ties, it propelled the University into action on sustainability issues and fostered a supportive climate where other sustainability visions and strategies, such as sustainability strategies and high-level visionary documents, could be integrated into the decision-making framework of the University. It is worth noting that while earlier version of the University's visions and strategies retained an operations-centric view of sustainability, they progressively shaped a more systemic direction that maximized their relevance and reach, notably following the creation of Place and Promise, by better integrating operational sustainability with the institution's academic program. Collectively, these institutional policies, plans and guidelines have formalized a sustainability vision for the University, to which processes and activities on campus have been progressively aligned.

The commitment and support from senior leadership and middle management has been another important factor to not only institutionalize policies and plans for sustainable development, but to accelerate the diffusion of sustainability, and alignment to this vision, across scales. Commitment from senior leadership, specifically, has been central to making sustainability one of the main strategic commitments of the University and committing academic, research and operational capabilities to

innovate solutions for sustainability. This visionary leadership has not only contributed to altering how the institution ultimately engages with sustainability, to the extent that it is now conceived as a living laboratory for sustainability, but it has also catalyzed a myriad of innovative projects and processes, such as converting the district heating system from steam to hot water or optimizing academic building performance, to achieve the University's ambitious GHG emission reduction targets. Without this imperative from senior leadership, it would have been difficult, perhaps impossible, to propose and implement such transformative and experimental initiatives.

Middle management organizations, such as the UBC Sustainability Initiative and Campus + Community Planning, have also been critical for building a culture of sustainability across actor-levels. Projects emerging from these organizations, such as the Sustainability Coordinator's Program, Social Ecological and Economic Development Studies (SEEDS) Program, have not only integrated sustainability into existing programs, but actively built teaching and research around campus infrastructure and operational activities, and fostered collaborations across scales to produce academic research on important sustainability topics of interest to the UBC community. The UBC Sustainability Initiative, more generally, which has been tasked to work actively with actors at multiple levels to embed sustainability into the operational and academic culture of the University, has effectively institutionalized a model that has facilitated the integration and credibility of sustainability into the operational and academic culture of UBC and the broader community. This integrative model, rooted in the crosscutting themes of the Campus as a Living Laboratory and Agent of Change that aim to break down silos and foster greater interdisciplinary collaboration both with and outside the academy, have been essential to its recorded success and the overall alignment of sustainability endeavours across the institution. Such constructive interactions, in essence, have created the opportunities to develop and strengthen mutual learning, accountability, and societal impact.

The visionary leadership of faculty, staff and students has also been instrumental to the institutionalization of innovative ideas and practices onto development at UBC. While the presence of a supportive upper administration and middle management groups have undeniably contributed to the institutionalization of sustainability at UBC, bottom-up initiatives driven by staff, faculty and students have played an equally important role in the campus' transition to sustainability. These actors and networks have showcased distinctive capabilities that have the potential to nurture change, such as reflecting on a high-level of abstraction, looking beyond the limits of their own working field, propagating ideas in their respective networks, and working creatively in a team. Although the level of commitment and persistence of each actor has been quite diverse, they have all sought solutions outside their formal day-to-day roles and responsibilities, and participated in informal networks to push the boundaries of conventional institutional practices and procedures. It is also important to note that while the creation of the sustainable development policy, for example, eventually gained upper administrative support, it was predominately due to prolonged grassroots efforts of faculty who sought effective policies that would respond to the University's commitment to sustainability. This bottom-up push from faculty, staff and student leaders has been critical for not only demanding accountability from the institution and its stated commitment to sustainability, but ultimately nurturing and sustaining transformative change by making connections between various innovations within the system and policies that help to institutionalize new practices.

UBC has also addressed the importance of promoting institutional self-reflection with the purpose of understanding and altering institutional arrangements in a dynamic and on-going process of learning-by-doing. This process of social learning and adaptive management, in essence, is critical for engendering transformative change for sustainability as it is linked to the ability of management to respond to feedback generated by its monitoring and reporting processes, and direct the associated socio-technical system into more desirable states. As previously stated, the University has a multitude of monitoring and reporting

mechanisms to track the progress and outcomes of its innovation initiatives; however, more importantly, it has also adopted a few mechanisms to structure and reframe plans, policies and processes to reflect and adapt to the outcomes of performance assessment, research and other context particularities. These self-reflection and adaptation tools, such as the University's Annual Sustainability Report, Operational Sustainability Framework and Carbon Neutral Action Report, are critical as they mandate operational units to continuously track performance, identify areas of opportunity and improvement, and inform institutional priorities and strategies in the long-term.

As the transition toward sustainability is a deeply interdisciplinary and integrative challenge, UBC's approach to development has evolved over the past twenty years to consider sustainability much more holistically and across various dimensions, rather than confining the scope of an initiative exclusively to social, economic, or environmental sustainability. In addition to visionary documents that embrace and acknowledge the holistic and complex nature of sustainability, such as the integration of the operational and academic realms in the Place and Promise and other corresponding mid-level plans, the University has employed a process that encourages such systemic and integrative thinking and design into the early stages of the development process. In addition to systemic planning and design, the University has adopted various plans, policies and frameworks, designed to be resilient and adaptive to changing conditions in the future, that combine an orientation toward a long-term vision for sustainable development. Evidence of long-range planning is present in the University's Vancouver Campus Plan, Operational Sustainability Strategy, 20-year Sustainability Strategy, which are designed to be inherently resilient and adaptive to changing conditions in the future.

#### **5.1.2.1 Barriers, challenges and lessons learned**

Similar to the challenges and barriers of the experimentation and learning dimension, the barriers and challenges to coordinating and aligning visions and efforts across actor-scales have predominately

been institutional in nature. One of the main obstacles the University has had to overcome is the common narrative that academic and operational issues are to be addressed separately. Prior to the establishment of visions and strategies that institutionalized the integration of these realms, there was an artificial separation between academic and operational dimensions that viewed sustainability as either an academic or operational endeavor, rarely as a manifestation of the two. This was particularly evident during the approval process of the University's sustainable development policy, which retained a purely operations-centric view of sustainability without any academic line of authority or mandate. Since then, however, the University has adopted a fundamentally different view of the relationship between operational and academic sustainability, and armed with the vision of Place and Promise and the efforts of the UBC Sustainability Initiative, continues to connect these once disparate realms.

The lack of transparency and accountability of the management practices of the Board of Governors has been another predominant issue in the University's transition to sustainability. Even though the meeting minutes of the BoG gatherings are public, faculty and staff members admit that little documentation exists as to the reasons for decisions, or, as in the case of more recent events, crucial decisions are kept private and hidden from public view. Many of the rules, procedures, and protocols around the board also seem to be established through informal advice from the Board Secretary and the University Counsel, which in essence has made it difficult to compare UBC's board practices to provincial guidelines for public boards or to best practices for university boards. This ultimately imparts a lack of accountability and transparency to decision-making at the University therefore disconnecting the BoG from the community, which is ultimately counterproductive to achieving the required change for social innovation. There is a need for better transparency between senior leadership and all stakeholders to ultimately build, and restore, cohesion and trust in the institution and its governance structure.

In addition to the transparency and accountability issue with the Board of Governors, the governance and governability of transitions, or power in general, has been a recurring challenge for the

University's transition to sustainability. While senior leadership, specifically the past president, has played an important role in accelerating the adoption of sustainability principles in various areas, the Board of Governors is, in essence, the highest decision-making and governing body, and vested with all the power to oversee the management, administration, business, property and revenue of the institution. In other words, power is seemingly concentrated in particular pockets at the University, especially as it relates to decision-making for the overall development and growth of the campus. Though power struggles and resistance can be present over the course of a transition, without the necessary coordination, alignment and transparency between the highest decision-making body and the ever-changing practices and agents at the University, policies under senior leadership, inherently more stable and therefore conducive to path-dependency, will essentially be a common and reoccurring barrier to transformative change.

The lack of coordination and alignment between the Board of Governors and relevant stakeholders at the University has been particularly relevant as it relates to the student body and efforts to implement change on campus. Many students feel that their voices are not heard since the capacity to implement change entails an arduous process of connecting to upper-level decision-making on campus. Despite having student representation on the board, there is an overall consensus that student voices and concerns are not effectively heard, possibly due to a weak working relationship between the student body and senior leadership. UBC is a large institution, and though it is understandably challenging to address all concerns as the University's bureaucratic concerns extend further than students and their curricular needs, there is undeniably a need to reassess the structure of the overall bureaucracy in order to restore social cohesion and a better working relationship between the student body and those in control.

The University's influence on policy and practice is also limited in a regional context. Since UBC is not an elected municipality, it is not considered a member organization of Metro Vancouver and therefore has limited municipal representation. While voters at UBC can cast a ballot for director of

Electoral Area A, the power of the director is limited as the board operates on a system of consensus. Even though this governance structure provides the University with the flexibility to explore sustainability initiatives that would otherwise be unlikely, or perhaps impossible, in other municipal districts, the current system fundamentally limits UBC's influence on policy and practice at the regional scale. This lack of influence on regional policy and practice, in essence, hinders effective coordination and alignment. There is therefore a need to create greater political coherency between the priorities of the University with those of Metro Vancouver.

## **5.2 Recommendations**

As illustrated above, in almost every case the barriers to experimentation and innovation, and multi-level coordination and alignment, have been institutional in nature, and in some cases have constrained projects and stakeholders from innovating beyond standard norms and practices. It is clear that the University has encountered various obstacles and challenges on its quest to sustainability, but they are nonetheless critical for social learning and for the campus' continuous improvement efforts. In fact, identifying the obstacles in the way of operationalizing sustainability is crucial, because if existing barriers are not recognized, corrective and resolving actions cannot be undertaken. Moving forward, then, it is important for UBC to continue fostering the conditions that inculcate a culture of sustainability into the institutional culture. In particular, the following recommendations are proposed for UBC specifically to overcome the barriers observed in this study, and therefore to better govern its transition to sustainability now and in the future:

- Create standards that guide the design and implementation of Campus as a Living Laboratory (CLL) projects to build deeper interdisciplinary connections.
- Better align performance expectations with long-term operational realities.

- Improve transparency between senior leadership and all stakeholders to build, and restore, cohesion and trust in the institution and its governance structure.
- Streamline monitoring and reporting mechanisms to reduce resource intensiveness.
- Continuously structure and reframe plans, policies and processes to reflect the outcomes of performance assessment and research.
- Create greater political coherency between the university and the municipality.

In fact, these recommendations are not only of potential value to UBC’s future sustainability activities, but they can also inform ideas and practices at other institutions. These lessons, compiled and categorized by the key attributes of our conceptual framework, are listed in more detail below (Table 5.1). Though the UBC model outlined here will not necessarily suit a generic application to other universities as the context in which they operate will be different, the findings from UBC can undoubtedly shed light on best practices, and possible barriers and challenges, to governing sustainability transitions at higher education institutions.

<b>Innovation development and diffusion</b>	<ul style="list-style-type: none"> <li>▪ Create a supportive institutional climate for innovation development and diffusion (i.e. high-level institutional support, strong track record in sustainability leadership, and the campus as a living laboratory model)</li> <li>▪ Develop a business case that accounts for a favourable return on investment</li> <li>▪ Integrate academic and operational sustainability to broaden the capacity of operational decisions and role of operational staff</li> </ul>
<b>Monitoring, evaluation and reflexive learning</b>	<ul style="list-style-type: none"> <li>▪ Develop monitoring and reporting mechanisms to track performance, identify opportunities for continuous improvement, increase transparency, and share outcomes with the community</li> <li>▪ Participate in external benchmarking of performance to measure progress over time, share best practices, and compare progress vis-à-vis peer institutions</li> <li>▪ Create long-term monitoring to bridge the gap between performance expectations and realities after commissioning</li> </ul>

<b>Partnership and network development</b>	<ul style="list-style-type: none"> <li>▪ Create strategic alliance partnerships with the private, public and NGO sectors to provide the necessary resources (i.e. human, technological, financial, organizational, institutional) for innovation development and diffusion beyond the campus</li> <li>▪ Develop partnerships through teaching and learning to offer students the opportunity to engage in real-world learning and contribute to advancing institutional or organizational sustainability goals</li> </ul>
<b>Integrated decision-making</b>	<ul style="list-style-type: none"> <li>▪ Align governing documents and processes to embed the notions of sustainability into decision-making at all levels and dimensions (i.e. academics and operations)</li> <li>▪ Ensure accountability and transparency between all actors to build, and/or restore, public trust in the institution and governance structure</li> <li>▪ Support internal champions, including faculty, staff and students, who push innovative sustainability ideas and initiative onto campus growth and development</li> </ul>
<b>Adaptive Management</b>	<ul style="list-style-type: none"> <li>▪ Adopt shared visions and agendas that are adaptive and reflexive to context particularities</li> <li>▪ Continuously structure and reframe plans, policies and processes to reflect the outcomes of performance assessment and research</li> <li>▪ Create living documents that adapt to, and reflect, lessons learned and best practices in the built environment</li> </ul>
<b>Systems-thinking and long-term planning</b>	<ul style="list-style-type: none"> <li>▪ Consider sustainability across various dimensions in governing plans, policies and frameworks</li> <li>▪ Develop deep and holistic linkages between systems in the development process</li> <li>▪ Include long-term vision and planning into plans, policies and processes that are inherently resilient and adaptive to changing conditions in the future</li> </ul>

**Table 5.1 Key attributes for enabling transitions to sustainability**

### 5.3 Conclusions

In conclusion, this thesis presents an attempt to apply the sustainability transitions perspective to the University of British Columbia. Reflecting on the UBC’s activities through the lens of transitions theory, the findings suggest that the institution is well on its way to foster transformative change for social innovation. An analysis of its sustainability policies, practices and processes over the past twenty years reveal that the University has created and continues to sustain the necessary conditions for this complex, long-term and multi-level systemic change – with exception of a few barriers, outlined above,

that have challenged non-conformism and innovation development or the diffusion of ideas and practices across scales, and ultimately tested the institutional commitment to sustainability. In essence, UBC has created the necessary conditions for experimentation and learning to nurture innovation at the niche level, and supported forums and networks for cohesive multi-level coordination and synchronization to accommodate, accelerate and diffuse innovative ideas and practices from the niche to the regime, where they can ultimately interact and compete with the status quo. Furthermore, its institutional commitment to sustainability is structured around strategies that integrate people, place and performance with the goal of not only improving the environmental footprint of campus activities, but also promoting the pursuit of best practice, innovation, and cross-functional collaborations and outreach. Looking forward, the key is to maintain and build momentum to upscale what is learned and developed in the niche, and to continue to embed the conditions that inculcate a culture of sustainability into the institutional fabric.

Even though the conclusions remain inevitably speculative, particularly as the transition to sustainability at UBC is in its early phases, it is plausible to conclude that the enabling conditions for transformational change for sustainability have been institutionalized to a great extent, which would imply that a change in leadership, for example, would not be able to halt innovation for sustainability. Leadership, particularly support from past presidents, has undeniably been an important factor in the institution's transition to sustainability; however, as sustainability, more generally, has increasingly become embedded into the operational and academic culture of the University over the past twenty years, a change in leadership would not be able to easily reverse this progress or underscore the knowledge, legitimacy or unprecedented outcomes from its sustainability activities. In fact, many other complex and interconnected factors, such as a shift in external and internal pressures, academic and operational structures, and visionary leadership of and engagement between faculty, staff and students, for instance, would need to work against sustainability in order to substantially alter the University's development pathway. Needless to say there will be changes in leadership activities and conditions along the way, and

establishing a culture of sustainability is an ongoing process, requiring both honest evaluations of strategies and a willingness to innovate as attitudes, technologies or structures change. UBC's holistic and reflexive approach to mainstream sustainability across all areas of campus operations and academic activity, however, has, and will continue to, keep the institution on this pathway to transition.

Despite the contributions of the University's activities to foster conditions for transformative change, there will naturally be criticism about its approach to sustainable development. Some critics may perceive the University's development agenda as unnecessary construction under the guise of innovation for sustainability, while others may perceive universities as irrelevant contexts to study as a result of their unique governance, regulatory or financial structure. Though it is important to be critical of emerging endeavours to ensure they reflect institutional priorities and are designed to inform best practice and continuous improvement for sustainability, the design and development of multiple campus projects thus far, as illustrated in this thesis, have positively contributed to sustainability overall. In fact, sustainability projects at the University, despite their different funding models, are nonetheless inherently relevant to the wider community and its shift to sustainability. For instance, by collaborating and signing a Memorandum of Understanding (MOU) with community partners, UBC is directly contributing to both institutional and communal sustainability aspirations and innovations. These coalitions are, in fact, designed to be of direct value to other universities and organizations developments independent of their funding models.

Furthermore, UBC has, in general, created a campus environment built on social networks and structures that allow the development and distribution of knowledge and ideas both on and off campus. The lessons derived from high-performance buildings, for instance, have led to improvements on how buildings are commissioned, the use of a sustainability lens has led to changes in the development process for major capital projects, and the challenges and lessons learned from innovative buildings have helped future developments overcome similar barriers. This is not to say that the process has been perfect over

the past few decades, and there will be challenges and failures along the way, but the University's development agenda, as revealed by the findings of this thesis, are now rooted in aspirations to innovate, collaborate, and inform research on sustainability, as opposed to a purely growth-centered paradigm. In fact, over the past twenty years, UBC has altered its actions to be more in-line with sustainable development, including re-envisioning its activities related to teaching and learning, research and innovation, operations and administration, and the management of the university as a whole, in pursuit of sustainability-led growth.

In regards to the conceptual framework, sustainability transitions theory has indeed been a constructive theoretical lens to analyze the sustainability endeavours at the University and answer questions of this nature. It has not only delivered a framework to better understand the patterns and dynamics that are relevant in the context of transformative change, but it has also suggested tools and conditions to lead and manage transition processes in terms of what type of resources and configurations are required at strategic, tactical and operational levels to create the necessary space for innovative thinkers and entrepreneurs, and to link actors across scales and disciplines in order to form a broader and stronger network for exercising transformative change.

Furthermore, the open-ended and participative approach of transitions theory, which rejects a positivist top-down definition of sustainability and instead emphasizes envisioning processes, innovation development, and social learning and feedback processes, is, in fact, a fruitful approach to co-develop the concept of transformative sustainability more generally. This perspective on transitions, in essence, eliminates the tension between the desire to create transformative change and the desire to achieve specific goals (at which point further change is not wanted) as it provides direction without defining end-states, and therefore, does not necessarily prescribe rigid goals. That being said, it is possible to have transformative change and to remain in a particular sustainable development path, if said pathway aligns with the definitions, goals and values of a desirable development pathway constructed through continual

experimentation, reflexive learning and adaptation processes. In other words, instead of placing the importance solely on the end-state, the focus of transformative change is on the process of continuous change, learning, and adaptation. In fact, this conceptualization deeply parallels the procedural approach to sustainability, which views sustainability as an emergent property of discussions about desired futures informed by an understanding of the ecological, social and economic consequences of different courses of action (Robinson and Cole, 2014; Robinson, 2004; Robinson and Tansey, 2006). By defining sustainability as a participatory and open-ended process, the University has been able to enable, foster, support and facilitate sustainability endeavours both on and off campus.

Despite the contributions of the theoretical framework in explaining sustainability transitions and new frameworks for stimulating transitions, there is room for further research and for broadening the existing field with a more explicit conceptualization of the role of power with respect to sustainability transitions, especially as it can play an impact in enabling lock-in and path-dependency in the system (Smith et al., 2005). At UBC, for instance, this issue of power is particularly relevant as it relates to its bureaucratic structure of decision-making and its Board of Governors' wide-ranging governing authority to ultimately endorse or reject a new sustainable development pathway. So far, a conceptualization of power has been lacking in the transitions literature as it generally does not explicitly define or mention power (Avelino and Rotmans, 2009; Shove and Walker, 2007). In fact, the most power-laden conceptualization in the literature concerns the multi-level interaction between niches, regimes and landscapes, where the landscape and regime are generally conceived as the constellations with the most power. This simplistic conception of power, however, does not address the influence of power in the construction, circulation and implementation of visions and decisions about future pathways for sustainability. It therefore necessitates further exploration and elaboration in the transitions literature in order to better understand how power is exercised during long-term processes of systemic change.

Since the transition to sustainability at UBC is in its early phases, it also remains uncertain

whether the sustainability endeavors at the University will ultimately result in system transitions and whether these long-term processes can be governed fully and deliberately. To validate the findings, different kinds of future research designs and theoretical multiplicity are necessary, such as studies that investigate the success or failure of niche coalitions and their strategies. For instance, in how far do these innovation and coalition strategies substantially affect the regime in the long-term? Comparative studies at other universities could also shed light on the different and complementary approaches to governing sustainability transitions, as the UBC model outlined in this thesis will not necessarily suit a generic application to other universities. The creation and maintenance of a campus environment built on social networks and structures that allows the development and sharing of knowledge and ideas, is, nevertheless, critical to the long-term effectiveness of any campus strategy and in establishing sustainability as a lasting value. While long-term effects and persistence of such changes remain to be seen and further explored, I can testify to the excitement and enthusiasm that changes at this level have catalyzed.

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## Appendix

### Appendix A List of interviewees

<b>Interviewee</b>	<b>Position and Affiliation at the University of British Columbia</b>
Carole Jolly	Director, Community Development, Campus and Community Planning
Charlene Ponto	Coordinator, Sustainability Policy Implementation, Campus and Community Planning
Chris Fay	Manager, Policy Planning, Campus and Community Planning
David Woodson	Managing Director, Energy and Water Services, Energy and Water Services
Dean Gregory	Landscape Architect, Campus and Community Planning
Doug Doyle	Associate Director, Infrastructure and Services Planning, Campus and Community Planning
Freda Pagani	Former Director, Campus Sustainability Office (1998-2006)
Geoff Atkins	Former Leader of Sustainability and AVP, Land and Building Services (1996-2010)
Jennifer Sanguinetti	Director, Infrastructure Development
Joe Stott	Director, Planning (Development Services), Campus and Community Planning
John Madden	Director, Sustainability and Engineering, Campus and Community Planning
John Metras	Managing Director, Infrastructure Development
Orion Henderson	Director, Energy Planning and Innovation, Energy and Water Services
Penny Martyn	Manager, Green Building, Campus and Community Planning