‘Mining’ Solar *and* Social Potential

Exploring social innovation and the conditions that foster it in a Canadian, community-owned renewable energy project

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LUCSUS
Lund University Centre for Sustainability Studies

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As a primary driver of climate change, energy systems are often affected by the type of "self-perpetuation and lock-in" that characterize so-called 'wicked problems'. Although it has a relatively clean energy system, Canada still has provinces (e.g. Alberta, Saskatchewan) that possess carbon-intensive power grids, and provinces that have experienced minimal renewable energy development other than hydroelectric (e.g. British Columbia). This thesis conceptualized socio-technical transition as a promising strategy for driving sustainable change in Western Canada's energy system, and social innovation in the form of community-owned energy, as the niche level 'agent' of that change. I utilized the case of the *SunMine*—a community-owned solar project in Kimberley, B.C.,—to fulfill my research aim of examining the presence of core elements of social innovation in the project, and exploring the multi-level structural factors that shape these elements. Two components of the TEPSIE social innovation framework are used; the first enables me to 'test' for the presence of five core elements, the second allows me to discuss the influence of regime and niche level 'conditions' on the project. Data comes from a combination of semi-structured interviews and an analysis of various government, corporate, and municipal documents.

My results show that the SunMine exhibits, to a degree, all five elements of social innovation. Key findings reveal that the project: displayed many novel aspects, built new relationships and transformed existing ones, better utilized City assets, and created an effective cross-sectoral partnership. The exploration of structural conditions identified the importance of renewable support policies that specifically target community level projects, a problematic bias towards technological innovation in regime-level funding, and a positive relationship between social innovation and the institutionalization of sustainability-related values and goals at the municipal (niche) level. Project stakeholders can help build momentum towards socio-technical transition, and thus, an energy system with more community-owned renewable models, by engaging in active diffusion. This involves disseminating project information and forging partnerships to assist like-minded communities. However, various structural conditions may constrain this goal. Ultimately, this research contributes to a deeper understanding of what social innovation in an energy system looks like, how various levels of society influence it, and how it can contribute to a socio-technical transition in the broader energy system.

Keywords: Sustainability science, socio-technical transition, social innovation, community-owned energy, Western Canada

Word count (thesis): 13,987

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1. Introduction

1.1 Decarbonization of the Electricity Sector

As 2015 drew to a close, representatives from 195 nations gathered in Paris to devise a universal agreement to combat climate change. In the *Paris Agreement* that emerged, parties reinforced their commitment to limiting temperature rise to 2°C and pledged to "pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels" (UNFCCC, 2015). Although this more aggressive target is commendable, a firm strategy for achieving it has yet to be fully articulated. To avoid surpassing the 1.5°C warming limit, global greenhouse gas (GHG) concentrations, which are already rapidly approaching 400 ppm, must be held to below 430 ppm (Intergovernmental Panel on Climate Change [IPCC], 2014). This ambitious goal would require deep and immediate emission reductions across a wide-range of sectors from agriculture to energy (IPCC, 2014).

While rapidly decarbonizing all facets of society is imperative, accomplishing this in the electricity sector is of particular urgency. Of the 49 gigatons of global, anthropogenic GHG emissions in 2010, a quarter were produced by the electricity sector, exceeding the total of any other (IPCC, 2014). Meeting the IPCC low-stabilization targets, implying a global temperature increase of 2 °C or less, would necessitate a dramatic increase in the role of renewable technology for electricity generation, e.g., solar, wind, geothermal, small-scale hydro, biomass—from its current share of 30% to at least 80% by mid-century (IPCC, 2014). Progress is being made; however, the pace of deployment must be accelerated if we as a global community are to realize our climate goals (Renewable Energy Policy Network for the 21st Century [REN21], 2015).

Canada is ahead of the global trend, with 75% of its electricity supplied by renewable sources (International Energy Agency [IEA], 2015). The country ranks sixth globally in terms of clean energy investment and steady yearly increases indicate a strong, consistent commitment to decarbonization (Clean Energy Canada [CEC], 2015). Despite these advances, the electricity sector has much room for improvement, and must add clean generation capacity to keep pace with growing demand and contribute to Canada's overall GHG emission reduction target of "30% below 2005 levels by 2030" (CEC, 2015). This 'clean energy transition' varies greatly by province, with some requiring farther-reaching and more regionally dispersed action to build a clean electricity grid than others.

The majority of Canada's renewable energy generation comes from large-scale hydroelectric, with other technologies lagging considerably behind. Despite an abundance of both, wind and solar

account for just 1.8% and 0.1% of total generation respectively (IEA, 2016). While some large-scale wind projects have developed in Eastern Canada (particularly Ontario), most provinces do not have the support mechanisms in place to spur significant commercial investment in wind or solar. A range of additional factors, from the political to societal level, further constrain the deployment of renewables (IEA, 2016). Large, private, and centralized renewable generation facilities are not the only strategy for moving towards a decarbonized grid; community-owned energy models, underutilized and under-researched in the Canadian context, have significant potential to contribute to energy transition (REN 21, 2015).

1.2 Responding to 'Wicked Problems'

As a primary driver of climate change, energy systems are often affected by the type of "self-perpetuation and lock-in" that characterize so-called 'wicked problems' (Haxeltine et al., 2013; Loorbach, & Rotmans, 2010). Overcoming wicked problems requires solutions that account for complex interactions between the political, cultural, and economic dimensions of various levels of society, and have the capacity to contribute to systemic change (Doci, Vasileiadou, & Petersen, 2015).

The electricity sector needs a variety of solutions to set it on a more sustainable trajectory. Technological solutions are important to a clean energy transition; however, they alone cannot address the multitude of barriers to decarbonization. Resistance to the deployment of renewable generation is often deeply ingrained in "attitudes and values, strategies and policies, organizational structures and processes, delivery systems and services" throughout the existing system (Haxeltine et al., 2013). Socio-technical transitions, fostering (local) niche innovations, can develop independently of the constraining factors, and have the potential to contribute to systemic change in the sector (Geels, 2012). More specifically, social innovation, a form of niche innovation within socio-technical transition, can potentially overcome the obstacles listed above and reshape electricity sector by fusing technological advancement with the necessary changes in social structures (Doci et al., 2015).

Community-owned renewable energy projects are a type of social innovation in the energy system (Haxeltine et al., 2013; Doci et al., 2015); they have had extensive success in Germany, Denmark, and the United Kingdom, where countless communities have actively contributed to socio-technical transitions by developing and assuming complete ownership of local energy systems (REN21, 2015).

This same model is emerging in other countries, e.g. Australia, Japan, Thailand, United States, though its uptake in Canada has been limited (REN21, 2015; IEA, 2015).

1.3 Research Aim & RQs

The aim of this research is to examine the core elements of social innovation in a community-owned, renewable energy project, and explore the structural conditions that have encouraged or discouraged their presence. The *SunMine* solar project in Kimberley, British Columbia, Canada, is used for this purpose. This research contributes to a deeper understanding of what social innovation in an energy system looks like, how various levels of society influence it, and how it can contribute to a socio-technical transition in the broader energy system. Ultimately, I consider the implications this study has for enhancing social innovation locally, diffusing the SunMine model regionally, and identifying 'windows of opportunity' for the future emergence of similar projects.

The questions guiding this research, along with the steps taken to answer them, are outlined below:

- **RQ 1:** What characteristics of social innovation does the SunMine exhibit?
- **RQ 2:** How have structural conditions influenced social innovation in the SunMine?
- **RQ 3:** What are the implications of this case study for socio-technical transition in the region?

Research question 1 will be addressed by applying the first part of a social innovation framework to the case-study to 'test' for the presence of five core elements that embody such an innovation. By using the latter half of this same framework to contextualize the elements in the structural conditions that influence them, I am able to answer my second research question. Finally, to respond to research question 3, I draw on findings and conclusions from both Chapter 6 and 7.

1.4 Thesis Structure

This thesis is structured as follows. In Chapter 2, I provide the foundation for community energy, embed it in the Canadian context, and introduce the SunMine case. Chapter 3 develops the overarching conceptual framing, positioning the research in sustainability science and establishing the linkages between socio-technical transition, the multilevel perspective, and social innovation. In Chapter 5, I outline the analytical frameworks used to answer research questions 1 and 2. In Chapter 6, I present the results, concentrating on the presence of the five core elements. Chapter 7 interprets the results by exploring the structural conditions that have influenced the elements and reflects on

the frameworks used. Chapter 8 discusses the steps that SunMine project stakeholders can take to grow its social innovation potential, delves into the potential for regional diffusion of the model, and highlights emerging 'windows of opportunity' for niche level innovation. Finally, I conclude the thesis with a summary of the research process, main findings, and key contributions.

2. Case Study & Context

2.1 Community Energy

Community energy is a term used in disparate ways. Community energy projects assume different forms depending on the stakeholders involved, the intended outcomes, and the socio-political context in which they occur (Walker, & Devine-Wright, 2008). Energy projects oriented at the community level are diverse and can include "relatively small-scale renewable energy projects; projects dedicated to retrofitting energy efficiency measures; activities aimed at supporting sustainable behaviour changes...and initiatives for collective purchasing of sustainable energy" (Smith, Hargreaves, Hielscher, Martiskainen, & Seyfang, 2015, p. 6). According to Walker and Devine-Wright (2008), what distinguishes these various projects is not necessarily the technology used, but the process through which they are created and the distribution of the intended benefits across the community. The process dimension is concerned with the stakeholders engaged in project development and its ongoing operation, while the outcome dimension pertains to how widely and equitably economic, environmental and social benefits are shared (Walker, & Devine-Wright, 2008).

The outcome dimension of a project is highly dependent on ownership structure. Community energy can imply various ownership structures, including: a private business venture that returns a percentage of profits to the community, a landowner cooperative, a group scheme for renewable energy purchase, small-scale initiatives owned by a portion or all community members (Commission for Environmental Cooperation, 2010). To set a contextual bound for understanding this term, 'community-owned' energy will be used herein to describe a renewable energy model solely owned by the entirety of taxpayers in a city, as is the case with the Kimberley SunMine.

Community-owned projects typically offer a wider array of socio-economic benefits than those owned by a private entity or smaller segment of the population (Department of Energy & Climate Change, 2014). They promote community empowerment, increase energy supply resilience, educate

citizens about renewable technology and efficient energy usage, foster a strong sense of place through a commitment to local values, and spark opportunities for expanding and diversifying the local economy (Walton, 2012).

Community-Owned Energy: A Social Innovation?

The socially-oriented process and outcome dimensions of a community-owned, renewable energy project are the defining elements of the social innovation concept. I thus conceptualize community-owned energy as a 'species' of social innovation. However, because many community energy projects might fail to meet the criteria of a social innovation, either as a result of limited ownership structure, an unequal distribution of benefits, or a lack of social license, it is important to test this assumption against an analytical framework.

2.2 Community Energy in Canada

Compared to the world leaders Denmark and Germany, Canada's community energy sector is in its infancy. However, it has made progress in recent years, particularly in the country's eastern provinces (REN21, 2015). Ontario has added "292 community participation projects with [a total] capacity of 170 MW" to its electricity grid since it instituted its Feed-in-Tariff in 2009; however, this number includes any kind of participation, and does not indicate community ownership of the systems (CEC, 2015). There are a small number of renewable energy cooperatives dispersed across the rest of the country. Two of these, and a bulk purchasing group for solar panels, are located in British Columbia (Community Energy Co-Operatives, 2016). As the first "utility scale solar facility developed, owned, and operated by a Canadian municipality", the SunMine is unique, not only in the British Columbian context, but at the national level (City of Kimberley, 2014).

2.3 The SunMine Case-Study

This project references 'Western Canada' several times, an area encompassing the provinces of British Columbia, Alberta, Saskatchewan, and Manitoba. When the term 'region' is used it refers to a segment of this area, specifically British Columbia and Alberta. The SunMine is located near the border shared by the two provinces (see Figure 1), and although their renewable energy support policies differ significantly, their spatial connection and similar solar resource (though Alberta's potential is greater) establishes a level of comparability that will be relevant in Chapter 8.

Figure 1. Regional map of British Columbia and Alberta with the city of Kimberley pinpointed (City of Kimberley, 2016)

Kimberley is a city of 6,750 (B.C. Stats, 2015) nestled in the Kootenay Rockies, the southeast corner of British Columbia. The city's origins are founded in the rich lead, zinc, tin and silver deposits that led to the development of the Sullivan Mine, once the world's largest zinc mine and mainstay of the local economy from 1909 to 2001 (HelloBC, 2016). Despite this recent mine closure, Kimberley still possesses tremendous natural resources including solar radiation. The city is one of the sunniest in British Columbia, enjoying almost 300 days of sunshine per year and a solar potential greater than the vast majority of Canadian cities, and indeed even Germany, the world's solar PV leader (EcoSmart, 2016).

The SunMine project is the realization of eight years (see Figure 2 for the project timeline) of collaboration between the City of Kimberley, Teck, EcoSmart and a number of other organizations: the Government of British Columbia, Columbia Basin Trust, Southern Interior Development Initiative Trust, BC Hydro, Skyfire Energy, CONERGY and the College of the Rockies (City of Kimberley, 2016). Owned solely by the city and its taxpayers, the facility stands on reclaimed mining land; its 96 solar trackers (comprised of 42 PV panels each), providing generation capacity of just over 1 MW, supply the grid with enough clean electricity to power 200 homes yearly (City of Kimberley, 2016). The City sells the electricity it produces back to BC Hydro, the provincial utility, at a fixed rate.

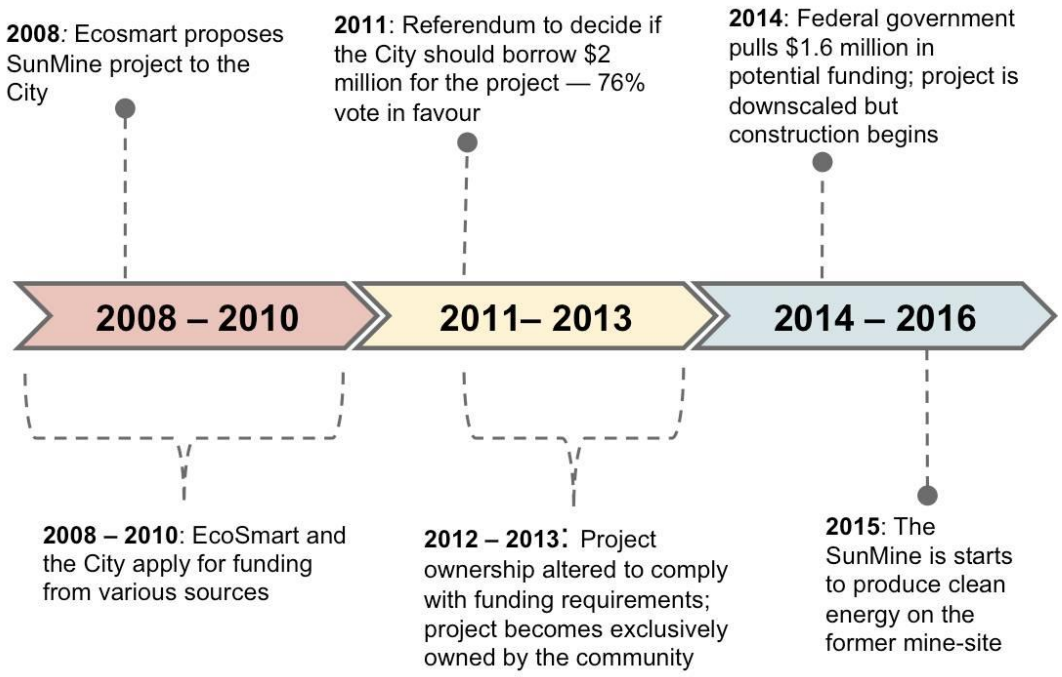

Figure 2. Timeline of the SunMine project (adapted from: City of Kimberley, 2014)

3. Conceptual Framework

3.1 Sustainability Science

Sustainability science as a research field is a "vibrant arena" where scholars from a range of academic disciplines collaborate to develop creative, yet systematic, approaches and solutions to sustainability challenges (Clark, & Dickson, 2003, p. 8060; Jerneck et al., 2010). This study is situated within two core questions that Miller et al. (2013, p. 243) identify as central to the advancement of sustainability science research:

- "How can socio-technical systems be guided along more sustainable trajectories?"
- "What are promising strategies, tactics, interventions to transition from unsustainable to sustainable states and dynamics?"

This research embeds itself within these two questions by recognizing socio-technical transition as a method for reshaping socio-technical systems, and social innovation as a potentially efficacious agent of transition.

3.2 Socio-technical Transitions & the Multilevel Perspective

Socio-technical transition is a fundamental process of change that can guide a particular subsystem of society (i.e. energy, mobility, health etc.) towards a sustainable trajectory (Geels, 2011). They are highly complex and often arduous processes "that result from the interplay of multiple developments at three analytical levels: niches, socio-technical regimes, and an exogenous socio-technical landscape" (Geels, 2012, p. 2).

The multilevel perspective (MLP) is a useful tool for examining how these levels interact through political, institutional, economic, and cultural dimensions to shape the 'rules' perpetuated by the dominant regime and its network of sub-regimes (Doci et al., 2015). Reinforced through coherent policy, institutions, market design, socio-cultural practices, science, and technological development, these rules allow the regime to maintain stability by discouraging radical innovation (Doci et al., 2015; Geels, 2002).

By simultaneously exerting pressure on the regime, the landscape and niche levels can enable transition to occur under the right conditions. The landscape can reinforce the existing regime, or by virtue of its response to major political, economic or environmental developments, destabilize it thereby opening up an opportunity for niche innovations to gain foothold (Doci et al., 2015). While the landscape plays an important role in socio-technical transition, social niches like communities or small municipalities are crucial as "they provide the seeds for systemic change" (Geels, 2011). If successful, these innovations can be scaled or diffused outwardly for use in other settings, potentially leading to integration with, or a complete transformation of, the existing regime.

Social innovation, one such example of an innovation that can emerge from a niche to influence socio-technical transition, is new way of conceptualising innovation in a theory that has traditionally focused on the role of niche technological developments as the primary agent of systemic change (Doci et al., 2015).

3.3 Social Innovation

3.3.1 A Contested Field

There are diverse interpretations and applications of social innovation, with researchers acknowledging that no standard definition exists (Caulier-Grice, Davies, & Norman, 2012; Preskill, & Beer, 2012; Pol, & Ville, 2008). A number of factors have contributed to this uncertainty including the wide-range of sectors and academic fields utilizing the term, a historical focus on practical application over theoretical grounding, and its relatively new found status as a popular and potentially influential concept (Caulier-Grice, 2012). In response to this lack of clarity, a growing body of literature has emerged, with practitioners and scholars alike working to find common ground on the characteristics of social innovation.

Innovation, from both a technical and social perspective, has long driven the development of society (Cajaiba-Santana, 2014). Its use in the modern context can be traced back to the field of economics and business where innovation was "generally motivated by profit maximization and diffused through organizations that are primarily motivated by profit maximization" (Mulgan, 2006). Social innovation represents a departure away from a model of developing new ideas that are fueled predominantly by a desire for ever increased profits and economic growth. In policymaking, academia, and in practice, the recent focus on reframing innovation can be viewed as a direct response to "growing dissatisfaction with the technological emphasis in economic innovation literature and innovation policy" (Caulier-Grice, 2012,). Social innovation aims to fill the void left by traditional forms of innovation by positioning people and communities as the primary beneficiaries of new solutions to wicked problems (Dawson, & Daniel, 2010).

3.3.2 Definition

The sheer breadth and diversity of social innovation discourses makes it challenging to find commonalities. But, a significant portion of the literature shares the theme that social innovation is socially-oriented in both its development process and outcomes (Caulier-Grice et al., 2012; Haxeltine et al., 2013; Murray, Caulier-Grice, & Mulgan, 2010; Preskill & Beer, 2012;). Other important characteristics identified include: the ability of social innovation to provide solutions where the traditional market fails (Committee for Scientific and Technological Policy, 2011); new partnerships and collaboration between sectors (Nicholls, & Murdock, 2012); and, enhanced levels participation and empowerment within society (Moulaert, Martinelli, Swyngedouw, & Gonzalez, 2005).

This thesis employs the following definition from *Defining Social Innovation: Part 1*, the document that provides part of the framework for this study. It advances the following: “social innovations are new solutions (products, services, models, markets, processes) that are both good for society and enhance society's capacity to act” (Caulier-Grice et al., 2012). The following section on analytical framing will outline the specific aspects that have the potential to make this type of innovation ‘good for society’.

4. Analytical Framework

4.1 TEPSIE

The Theoretical, Empirical and Policy Foundations for Social Innovation in Europe (TEPSIE) is a research initiative funded by the European Union via the 7th Framework Programme (European Commission, 2007). TEPSIE comprises six entities: the Danish Technological Institute, the Young Foundation (a social innovation leader), two European universities, a research institute, and a private sector consultant. From 2012 to 2015, the TEPSIE research team strived to develop a common definition of social innovation, tools for detecting and evaluating it, and strategies to encourage its growth (TEPSIE, “Summary”, 2016).

Few frameworks have been created for the purpose of defining and measuring social innovation; Dainiene and Dagiliene (2015) list just four comprehensive ones, including TEPSIE, who are recognized for their influence on the social innovation field. Their multi-year research program has made significant contributions to the European Union’s policy and future strategy on social innovation. The TEPSIE framework is therefore highly pertinent to the future direction of this field.

4.2 Core Elements

The five key elements of the TEPSIE framework are: novelty, social need, effectiveness, idea implementation, enhancement of society’s capacity to act (Caulier-Grice et al., 2012). One element, ‘idea implementation’ was substituted for ‘engages and mobilizes beneficiaries’—an element from a parallel TEPSIE framework (Bund et al., 2013). As the project has already been implemented, that characteristic was neither relevant nor interesting to this study.

1) Novelty

To qualify as a social innovation, a given product, service, or model does not have to be the first of its kind; however, it must be "new to the field, sector, region or market" (Caulier-Grice et al., 2012, p. 19).

2) Social Need

The TEPSIE framework asserts that social innovation should respond to a social need that, if left unfulfilled, "can cause serious harm or socially recognizable suffering" (Doyal & Gough, 1991). However, TEPSIE offers a caveat to this definition, saying that what is defined as a social need is highly context-specific to geography and culture (Caulier-Grice et al., 2012).

3) Effectiveness

To be effective, a social innovation "should create a measurable improvement in terms of outcomes" (Caulier-Grice et al., 2012). The nature of these outcomes differs depending on the innovation; it could involve improving the quality of a product, making a service more accessible, or enhancing the wellbeing of a population (Caulier-Grice et al., 2012).

4) Engages & Mobilizes Beneficiaries

The fourth core element of a social innovation pertains to the extent in which a project effectively engages and mobilizes those who stand to benefit from it (TEPSIE, 2014a). Depending on the project structure and stakeholders involved, this engagement can be conducted directly or through are expected to be highly positive, engagement lends legitimacy to a social innovation and often leads to better solutions (TEPSIE, 2014b)

5) Enhances Society's Capacity to Act

The final core element of the TEPSIE framework deals with social innovation's potential to 'enhance society's capacity to act'. Capacity to act is defined as being able to better meet future needs (Caulier-Grice et al., 2012) and is often characterized by improvements in a given society's "collective power resources" and "economic and social performance" (Hamalainen, & Heiskala, 2007). According to TEPSIE, "the process of social innovation enhances society's capacity to act by, amongst other things, creating new roles and relationships, developing assets and capabilities and/or better use of assets and resources" (Caulier-Grice et al., 2012, p. 20).

4.3 Structural Conditions

Secondly, the multilevel perspective is operationalized in this study through the use of the 'framework conditions' that influence social innovation, as outlined by the TEPSIE report, *Blueprint of*

Social Innovation Metrics (Bund, Hubrich, Mildenberger, & Krlev, 2013). TEPSIE breaks this overarching framework dimension into four sub-categories (see Figure 3) that interact at the various levels of the MLP, namely: political, institutional, societal-climate, and resources (Bund et al., 2013, p. 34). I use these conditions to contextualize and explain the results, and explore how certain factors have shaped the presence of socially innovative elements in the SunMine. If the net effect of these conditions spurs innovation the framework as a whole is considered 'enabling', if negative, it is 'disabling' (Bund et al., 2013).

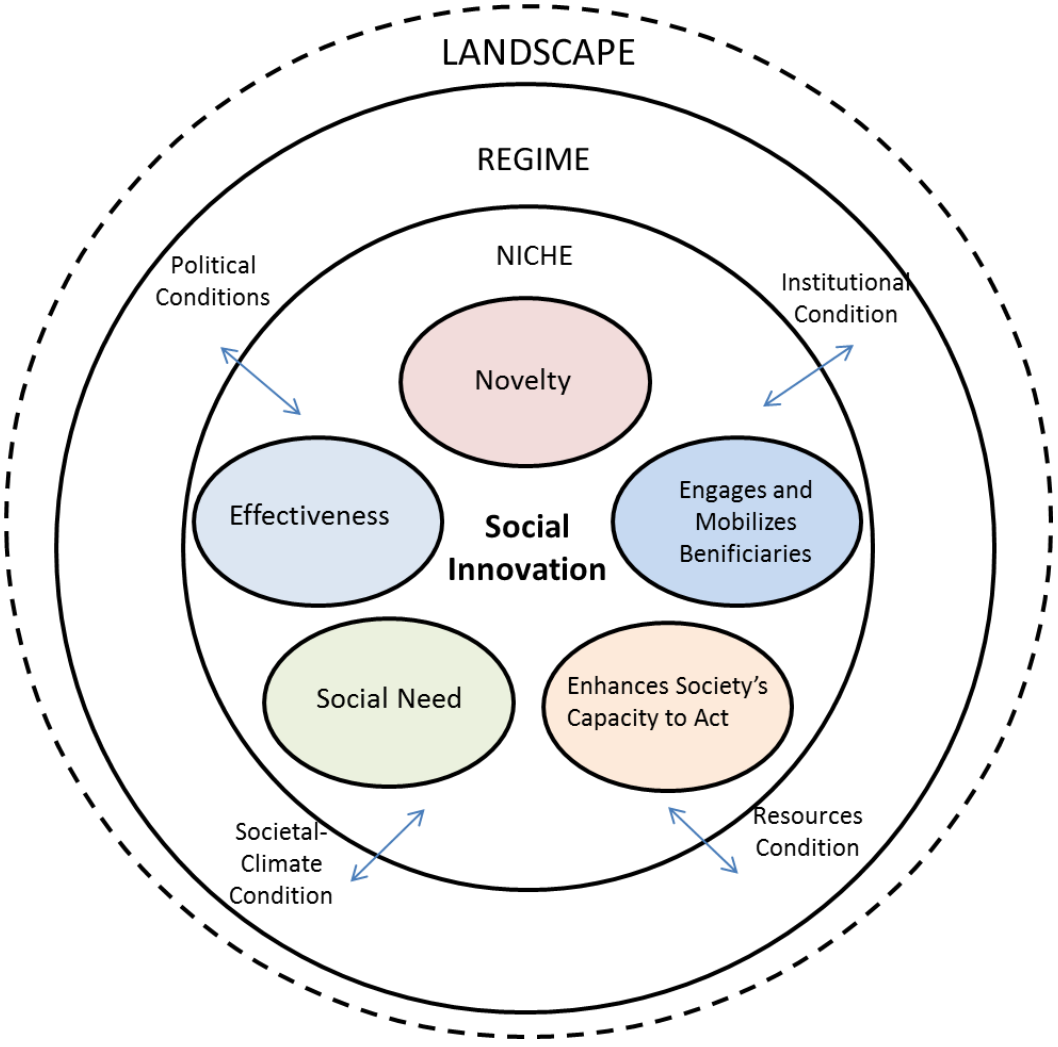

Figure 3. Illustration of the relationship between the two TEPSIE frameworks. The arrows indicate that the conditions interact between the regime and niche levels (author created)

The scope of this study did not permit an analysis of all possible interactions between the three levels capable of shaping the SunMine project. The social structural conditions framework provided parameters for my MLP approach, and I use it to explore a select range of important factors. Geels states that that the complexity of transitions can never be fully captured by a single "methodological procedure" and that all studies will "contain elements of creative interpretation" (Geels, 2011).

5. Methods

5.1 Case study research

A "case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used" (Yin, 1984, p. 22). Thus I have aimed to "retain the holistic and meaningful characteristics of real-life events" (Yin, 1984, p. 14).

5.2 Case Selection

The SunMine project presented a unique opportunity to study the complexities of an emerging, socially-oriented energy model in the region. Stake (1995) says that if we believe a certain case can help answer a research question developed early in the process, then "we may call our inquiry an instrumental case-study" (p. 3). This case allowed me to address a question I posed back from the outset of my research: why is SunMine the first project of its kind in Canada?

Due to a deep personal connection with Kimberley, I have been interested in this project for a number of years. In describing an 'intrinsic' case-study, Stake (1995) asserts that "it is not unusual for the choice of case to be no 'choice' at all" (p.3). My selection of the SunMine was certainly guided by this intrinsic passion; however, the case also fulfilled its instrumental value for answering questions formulated at the outset of the research process.

5.3 Data Collection

This thesis employs the approach of data triangulation to address the multiple research questions. Triangulation is particularly effective when a researcher wishes to "to obtain different but complementary data on the same topic" (Morse, 1991, pg. 122). In this case, qualitative data comes from a combination of semi-structured interviews, municipal documents, corporate and government reports. The core socially-innovative elements of the SunMine are explored using data collected

through semi-structured interviews; the framework conditions in the discussion section are examined using the aforementioned reports and documents.

5.4 Interview Selection Process

The goal of my interview selection process was to conduct interviews with individuals representative of the complete range of stakeholders involved throughout project development—as well as a representative actively involved in current operations. Using a chart of the project governance structure from the *SunMine Business Plan* (2014), I created a typology of desired stakeholders based on the nature of their involvement and affiliation. This included: a project 'champion' (someone involved from the outset who consistently worked to progress the cause), an important decision-maker in the City of Kimberley, an elected City official, a representative from an organization that funded and collaborated with the City, and an individual from a prominent community group or NGO.

Participant selection was realized through a parallel process of snowball sampling, where an initial key contact gives the researcher access to further contacts (Noy, 2008), and research into project structure. The contact typology I created was referred to repeatedly to ensure that the desired stakeholder range was being covered. My initial contact (a member of Kimberley's Chamber of Commerce) helped me gain access to the municipality; from there, an employee of the City of Kimberley was instrumental in recommending relevant and knowledgeable contacts.

The list of interviewees is as follows:

Table 1. Participating Interviewees and their affiliation

Interviewee	**Affiliation**	**Date of Interview(s)**
(A)	Community NGO	March 3rd, 2016
(B)	City of Kimberley Official	March 3rd, 2016
(C)	Council Member	March 16th, 2016
(D)	Former City of Kimberley Official	March 16th, 2016
(E)	Representative from key project partner	March 16th & April 1st
(F)	Representative from key project partner	March 29th

5.5 Interview Design

Using The TEPSIE framework, questions were developed to correspond with each element provided by the framework to enable me to test for their presence. A set of core questions was used for each interview to allow for patterns to form between the various responses; however, some questions were tweaked, added, or removed entirely depending on their suitability to each interviewee. Stakeholders were or currently are, involved in the project in different capacities and as a result it was impractical to use a fixed list of questions.

The six interviews, which lasted between forty-five minutes and an hour, were conducted in a semi-structured manner that allowed me to organize the discussion around predetermined topics and themes, while still giving the subjects the opportunity to discuss the project freely and elaborate when necessary (Arksey, & Knight, 1999). While I attempted to ask questions from the standpoint of a neutral observer, I ultimately agree with Diefenbach's (2008) claim that "there is no such thing like [as] a neutral, non-intervening and non-existent interviewer" (p. 880). To elicit information from an interviewee that may have been impossible to acquire through other means (e.g., personal opinions), I had to maintain an active role in the conversation (Diefenbach, 2008).

5.6 Data Analysis

Qualitative coding was used to analyze the data collected from the six interviews. A code, either created uniquely by the researcher or adapted from an existing framework, "attributes interpreted meaning to each individual datum for later purposes of pattern detection, categorization, assertion or proposition development" (Saldana, 2015, p. 4). The majority of codes used to categorize, sort, and analyze the data from this case-study are considered 'a priori' as they were directly derived from the elements and features categories outlined in the TEPSIE framework (Christensen, 2000). Some 'priori' codes were created during the iterative coding process to tag data relevant to the structural conditions examined in the discussion section. The qualitative research program Dedoose™ was used to attach appropriate codes to excerpts from each interview transcription; it made the process more efficient and allowed me to keep the data organized even when multiple codes were applied to the same excerpt.

6. Results and Analysis

6.1 Novelty

The SunMine project exhibits a number of novel aspects; the municipality-produced business plan lists seven ways in which this solar development distinguishes itself from others in Western Canada, and four that set it apart nationally (City of Kimberley, 2014). Aside from being the largest of its kind west of Ontario, it is the first solar project in Canada to receive significant backing from a mining company, the first to utilize a reclaimed mining site, and the first owned solely by a municipality (City of Kimberley, 2014).

One novel aspect discussed at length by participants was instrumental in helping the City of Kimberley acquire $1 million in project funding from B.C.'s *Innovative Clean Energy Fund*, a program designed to spur the province's clean energy sector forward (I.C.E. Fund, 2016). As a condition to secure funding, the SunMine was obliged to incorporate solar-axis tracking into its project design. These systems enable each solar panel to continually adjust its horizontal and vertical tilt in response to the sun's movement and changing or adverse weather conditions like heavy wind or snowfall. The tracking system ultimately chosen by the SunMine's contractor Conergy, was a dual-axis system manufactured by the German solar company Deger. Interviewee B commented that "it was a technology transfer objective" and noted that while the possibility of producing parts in B.C. was explored, relying on that as a strategy was deemed too risky in the short-term.

The majority of participants acknowledged the added solar generation potential offered by the dual-axis trackers—as much as 45% more than fixed panels (Deger, 2016)—but voiced concern over their relatively unproven nature and long-term durability. Four of six participants expressed uncertainty about how effectively the complex components of the tracker (which include a patented smart sensor) will perform over time, and whether the three year warranty offered by the company will be enough to ensure that the system will function as advertised. Interviewees A, B and C mentioned cost in their critique, questioning if the additional revenue earned from generation would account for potentially higher maintenance costs. Two of the stakeholders interviewed pointed to the proven track record of fixed-panel solar arrays and indicated that this, rather than assuming greater financial risk in pursuit of the provincial incentive to be 'innovative', may have been a better model for a relatively small pilot project like the SunMine. The solar developer involved throughout the project, represented by Interviewee F, stated that originally "I was proposing to use single axis trackers...we

did a lot of simulations and calculation on this and the difference in energy is only 5% between the two systems [single vs. dual axis]".

Despite shared concern over the moving parts of the dual-axis system, early results show that the system has functioned seamlessly and exhibited resiliency in the face of extreme conditions, withstanding heavy snowfall by tilting vertically, and 120 km winds by lying flat. Observing the operations of the system over a number of years is the only way to determine whether the durability of this technology is an issue. Interviewee B, speaking on behalf of the City of Kimberley, highlighted the positive effect that this technology transfer could have on regional economic development:

> "It goes back to Skyfire [a solar company involved in the project] who is using a technology they've never seen before. We're equipping them with knowledge and in the future, I think that's where a lot of the opportunity lies. It's not in creating a widget; it's combining existing things to adapt them to specific geography and applications."

According to this interviewee, the invaluable knowledge gained from working with a complex dual-axis tracking system in a challenging mountainous environment, will give regional solar companies a competitive edge in the future. This is likely an aim that the B.C. Innovative Clean Energy Fund hopes to achieve through its SunMine contribution.

The SunMine can unquestionably be labeled novel, not only for its status as the first municipally-owned solar facility in Western Canada (a novel social model), but also for its introduction of dual-axis tracking to the region (a novel functionality). However, it remains to be seen if the benefits of this innovative technology will outweigh the reliability risk.

6.2 Social Need

TEPSIE defines 'social need' as something that society cannot effectively function without (Caulier-Grice, 2012); a electricity grid is certainly such a need. Of the six participants, four were asked if a need to improve or secure Kimberley's energy supply was a primary motivation for undertaking the SunMine project—the response was a resounding no. The city, and wider East Kootenay region enjoys the tremendous hydroelectric resources provided by the Columbia river. Three run-of-river generating stations comprise the bulk of its energy supply: the Elko, Aberfeldie, and Spillimacheen, which range from 4 MW to 24 MW and are located 90, 70, and 175 km from Kimberley respectively

(BC Hydro, 2015). Electricity customers in Kimberley experienced an average of 3.29 outages in 2015 at a duration of 1 hour per outage, significantly less than the majority of East Kootenay communities. When asked whether the SunMine would add resiliency to the City's energy supply, Interviewee A responded: "You can't island the city on the grid, so if there's any kind transmission line breakdown it doesn't really make any difference to our situation" and confirming that in Kimberley, "we have good transmission connections".

Rather than citing a technical need, the four interviewees alluded to a higher social need as the rationale for pursuing this project. Although the articulation of this concept varied between participants, the responses supported the overarching theme that the SunMine presented an opportunity to strengthen the community internally by acting upon shared values, and externally by raising the profile of the City to attract lifestyle migrants. Both have the potential to translate into socio-economic benefits. Interviewee A, a representative of an NGO that works closely on local and regional environmental issues, touched upon both dimensions stating:

> "It's great to have visible solar and wind that people can look to and feel that they can make a difference...I think that putting Kimberley at the forefront of that movement is great for the city, the people of Kimberley, and to some degree encourages people interested in that sort of thing to move here."

This dual benefit was reiterated by interviewee C who stated that the project was not only "community building to increase pride amongst locals", but would also put Kimberley on the map by making it "a cool, neat place to be *and* start a business". Interviewee D spoke to this being yet another example of the community's ability to respond to changing economic circumstances.

Participant B stressed that this project presented a prime opportunity for the community to act on collective values and take important steps towards realizing the sustainability vision it has worked to create over the past decade. Multiple municipal documents, including and of particular relevance the 2011 *Integrated Community Sustainability Plan*, outline Kimberley's long-term goal of achieving sustainability across a number of sectors. The values, priorities, and strategies highlighted by these

reports, and their influence on the perceived social need for the SunMine, will be discussed in a later section.

If the strictest interpretation is applied to this component of the framework, the link between the SunMine and a pressing social need appears tenuous. However, when viewed in the context of a small community attempting to simultaneously create a stronger, more resilient economy and build upon the values held by its citizens, the project takes on a different light. A more nuanced definition of what constitutes 'social need' may be needed in future iterations of the TEPSIE framework.

6.3 Effectiveness

The stated goals of the SunMine project include: creating a platform to reach out to and attract people who share similar values to those in Kimberley, diversifying and adding resiliency to the economy, spurring more local entrepreneurship, and establishing a basis for regional solar development (City of Kimberley, 2014). Determining outcomes or benefits of an innovation necessitates that "social innovators find some way to capture and articulate the impact of their initiative", whether in quantitative or qualitative terms (Caulier-Grice et al., 2012, p. 19).

The current plan for measuring project outcomes is limited to a handful of quantitative indicators that will measure the amount of energy produced, successful implementation of the products and processes used, the number of personnel hired, promotion of the SunMine model regionally and internationally, and public outreach statistics relating to media references and website traffic. The strategy will not become more complex in the foreseeable future according to Interviewee B. As the final measurement period for the bulk of these indicators is December, 2016, it is possible that revisions or additions to the strategy could take place at this juncture, though this was not explicitly stated by the participant.

The lack of a comprehensive plan to measure the ambitious desired outcomes of the SunMine project was a divisive issue amongst some stakeholders. Interviewee C considered this a significant shortcoming of the project development process, stating:

> "The benefits being talked about weren't all direct benefits—they were spin-offs. And to me, in order

> to make those happen you couldn't just build it [the SunMine]; you had to build it and have a plan and a program to communicate those things, to set up other system to draw entrepreneurs in—to make all of that happen."

Interviewee C also noted that when the City Council met in April of 2014 to decide on moving forward with implementation, the question of how to assess the project featured prominently in the debate and elicited considerable disagreement. Without a firm plan in place to gauge the success of stated socio-economic goals, some councillors expressed concern that the business case was less certain. Interviewee D pushed back against these worries, saying "I can't remember how many times I said this isn't about money, this is about the community and about building blocks. You cannot run a City, a municipality, as a business". The meeting ultimately led to a 4-3 vote in favor of starting construction; however, the narrow margin indicated lingering concerns.

Of the participants explicitly asked if it is important to measure the outcomes of this project, all answered affirmatively. There was consensus that it is vital at the municipal level, in part due to resource constraints, to determine the actions that engender positive change. But, most interviewees placed a greater emphasis on developing the 'narrative' of the SunMine—using the project, at least in its early stage, as a public relations piece to reinforce community pride and attract external interest—than on creating a comprehensive set of quantitative indicators. However, given that the project is in its operational infancy, even had such a set of complex indicators been created it would be far too early to conduct any useful measurements.

Interest in devising a more in-depth strategy combining qualitative and quantitative data was present, to some degree, across the interviews conducted. However, barriers to achieving this were cited repeatedly. They include the limited municipal resources available for allocation to such an initiative (both from a financial and personnel standpoint), and the difficulty of teasing out causal relationships between the SunMine and socio-economic changes in the city. Touching on the second barrier, interviewee A stated that there are a number of ongoing sustainability-related initiatives in Kimberley and "it would be very difficult to separate that [the effect of the SunMine alone] from the whole package".

Aside from early statistics on energy generation and a year-one financial summary, it is difficult, if not impossible, to assess the socio-economic outcomes of the project at this stage. Determining whether the economy has become more 'diversified' or 'resilient' will depend greatly on the City's working

definition of those terms and the indicators they develop accordingly. Through surveys and face to face interactions, the City may be able to gather some initial feedback from constituents to set an early benchmark. The feedback the interviewees have received to date, while anecdotal, has been resoundingly positive.

6.4 Engages and Mobilizes Beneficiaries

How did project leaders engage and involve the beneficiaries of the SunMine which, due to the novel ownership structure, is the entire Kimberley community? All six interviewees agreed that while community engagement did occur during the development phase, it was not as extensive as it could have been. Interviewee A described engagement as "minimal"; interviewee D stated that the community was "not heavily involved", and interviewee E was of the opinion "that we probably could've done more". According to participants the engagement strategy consisted of information sessions in the early stages, a city-wide referendum in 2011, and media outreach to disseminate information via a website and physical material. The referendum to decide whether the city should borrow $2 million for the SunMine was widely cited in the interviews as a defining moment in terms of the community's involvement in the project. At 76%, the resulting vote was heavily in favor of the borrowing; interviewee B from the city of Kimberley stated, "to have 76% of people say that they think the benefits from a long-term perspective are worth it, as opposed to something more immediate like building a road tomorrow...it's pretty unique". Interviewee C from the City Council pointed out that this referendum and the public consultation(s) that led up to it may have represented the peak of engagement, as afterwards "the project morphed considerably...and there was very little public input throughout the further development and design process".

A number of reasons were proffered to explain why community engagement looked the way it did. Two interviewees mentioned that a web of legal agreements with various entities and the partnership with Teck, limited or slowed the flow of information from key project stakeholders to the public. Interviewee D, a central figure throughout much of the project, acknowledged that the community was kept informed, "but on a very, very high-level" as many of the finer details could not legally be revealed. Other participants pointed to the technical nature of an energy project as a barrier to extensive engagement. Interviewee A expressed the challenge of fostering high community involvement in a project of this type: "you have to consider if it's [the project] economically viable and technically feasible. From there, it's really a question of yes or no. I think it's difficult to get creative with this kind of thing". Interviewee B and C both echoed this general sentiment. Another limiting factor, highlighted by interviewee B, is the difficult balance that a socially-conscious

municipality must strike between sufficiently engaging the community and ensuring that the same residents feel they are getting as much value from their tax dollars as possible. While not explicitly stated, this may indicate that carrying out additional engagement could have compromised the resources required to perform due diligence on the project's technical and financial aspects. A final factor that contributed to limited community engagement during the development phase was the fear of involving more stakeholders in what was already a complex process. Interviewee D stated the following about this concern: "it was too challenging to include too many more people stirring the pot on something [a project] that had become very challenging to move forward in an expeditious and realistic way". Reiterating this view, interviewee B added that the inclusion of too many stakeholders could have led to a key partner walking away.

Community engagement since the SunMine began operations in the summer of 2015 has centered on showcasing the project through various modes of media, and site visits for interested tourists and local residents. The SunMine clearly presents an opportunity for the City to engage and educate Kimberley residents about energy efficiency and renewable technology; the tours have been the first step towards this, but there does not appear to be a detailed engagement strategy for the future at this point. Participants discussed various options for this including incorporating the SunMine into local curricula (for class-based knowledge and field visits), creating an online platform to display easily accessible real-time energy generation statistics, and potentially helping the City secure funding or partners for scaling up the project (the site has the space to install up to 200 MW of capacity).

Summing up their view on the engagement strategy and process, Interviewee E said "We did do it and I think we did it well. Did we do enough? You can always do more, but the fact that the city voted 76% in favour is telling in itself". Based on the broad TEPSIE definition, it appears that the consultation and engagement conducted by the primary SunMine stakeholders was sufficient. With that said, the interviews reflect that greater emphasis was placed on informing stakeholders and using intermediaries, rather than engaging them directly in the development process. To what extent the project will mobilize beneficiaries to become involved in project up-scaling, or similar clean energy initiatives in the future, remains to be seen.

6.5 Enhances Society's Capacity to Act

6.5.1 Creates New Roles and Relationships

SunMine is the result of a truly cross-sectoral partnership between the City of Kimberley (a public actor), Teck Resources (a private actor), and EcoSmart (a third-sector actor). The initial concept was the brainchild of EcoSmart's CEO, Michel De Spot, who proceeded to take the idea to his friend David Parker, the then Vice-President of Sustainability at Teck. From this origin in 2008, steps were taken to investigate solar potential and further develop the concept for presentation to the City. Teck's senior leadership was enthusiastic about the project from the outset; this new relationship with EcoSmart, partly borne from a personal one between De Spot and Parker, brought the idea to a point where the City of Kimberley could confidently come aboard as a partner to move the development process forward. Interviewee E elucidated that "each [partner] served a purpose and I think that three-way partnership, it really was a partnership, is at the heart of the story". The long-standing relationship between Teck and the City of Kimberley, which can be traced back to the opening of the Sullivan Mine in 1909 (HelloBC, 2016), was altered by this project. As opposed to simply maintaining the reclaimed former mine site, Teck's investment in the SunMine reflects an active approach to ensuring that they have a continuing, positive impact on what the company refers to as a 'legacy community'. Teck's contribution to the project from a financial, technical, and human resources standpoint, was an important action towards realizing the type of impactful, sustainable community investment outlined in their most recent sustainability report (Teck, 2014). Involvement in the SunMine has transformed Teck's role in Kimberley from that of a steward, to that of a long-term proponent of the City's clean energy future.

Creating these new roles and relationships was not without its challenges; five of the six participants alluded to the specific challenge of aligning the goals and interests of three very different stakeholders. As interviewee D put it "when you're working with two levels of government, a large corporation and a not for profit (NGO), things just do not move smoothly that's all there is to it". There was uncertainty surrounding the governance structure of the project throughout much of the development phase as Teck initially planned to pursue joint-ownership with the City. Interviewee B and E asserted that EcoSmart was also interested in a financial stake in the project during the early stages, though this was disputed by interviewee F. These unresolved questions lingered into 2012-2013 and strained stakeholder relations, however, any dispute over ownership was resolved when a key external funder stipulated that the City of Kimberley must be the sole proprietor of the system to

receive the money. No shortage of compromise, patience, and a willingness to accept alterations to the project vision was required from all sides to eventually make this project a reality.

The SunMine project has already precipitated an opportunity to forge a unique partnership. The City of Kimberley has approached the nearby A'qam community (of the Ktunaxa First Nation), offering them advice, information, and guidance should they wish to build a similar energy system in the future. This group is not a direct beneficiary of the SunMine project as they are independent of the city, but could still benefit from the ability of social innovation to transform and create new relationships.

6.5.2 Develops Assets and Capabilities

TEPSIE defines a "capability approach", as one where members of the community are conceptualized as "active, creative, and able to act on behalf of their aspirations", and have the agency to develop their own solutions to problems (Caulier-Grice et al., 2012, p. 23). This approach stands in contrast to solutions devised externally. Commenting on this theme, interviewee E stressed that while the involvement of both EcoSmart and Teck was integral to project success, it was the City of Kimberley that truly assumed the primary ownership role. Taking the lead on this project demonstrates the City's, and by extension the community's, desire to strengthen this type of capability approach. Speaking about the potential of the SunMine to develop capability within the community, interviewee A stated the following:

> "I think it's something that [helps] people feel more empowered to make changes on carbon emissions and on climate issues. I think that in this environment where there's a great deal of negativity and hopelessness, it really can help to see a large-scale initiative like this. *People can point to it and say we can do these things*".

Determining whether the SunMine has stimulated an increase in a capability approach will be difficult to measure and separate from other ongoing initiatives in Kimberley. However, half of the participants spoke directly about the sense of empowerment and community pride they believe the SunMine will foster—the symbol of the SunMine alone might bolster the public's perception of their capabilities.

6.5.3 Better Utilizes Assets and Resources

A hallmark of social innovation is its recognition and exploitation of unutilized resources (Caulier-Grice et al., 2012). The SunMine stands on a small portion of the former mine site, reclaimed over a period of five years through an intensive process involving capping the subsoil with till and restoring native vegetation (EcoSmart, 2016). Even though this reclamation process was completed to provincial government standards, interviewee E pointed out that potential uses for the land are limited by remaining contamination, and thus, the SunMine represents "a really novel and wonderful use of fully reclaimed land that would otherwise sit there unproductive". The SunMine also takes full advantage of former mining infrastructure like access roads and a transmission station.

7. Discussion

7.1 Results Summary & Reflection

Table 2. Summary of the key findings for each element of social innovation

Core Element	**Presence of Element**	**Key Findings**

6.1 Novelty	***Yes***	• SunMine is a highly novel project
		  ○ First Canadian renewable energy project solely owned by a municipality
		  ○ First project of its kind supported by a large mining corporation
		• Brings a novel technology to the region (dual-axis trackers)
		  ○ Source of significant uncertainty surrounding the project
		  ○ Difficult to weigh potential regional benefits of technology transfer vs. local risks

6.2 Social Need	***Yes***	• No technical need as the local power supply is sufficient and secure • Agreement that the need was of a 'higher' order than a technical one • Presented an opportunity to build on community values, and

		a pathway to fulfilling community goals and visions
6.3 Effectiveness	***Partially/To be determined***	• Project business plan states ambitious goals • Existing strategy to measure the effectiveness of the project is limited to a small handful of indicators • 'Narrative' building is currently more important than the development of comprehensive plan to evaluate socio-economic goals
6.4 Engages & Mobilizes Beneficiaries	***Partially***	• Community engagement was not extensive; the community was not heavily involved in the development phase of the project • Social licence was given through a referendum where 76% voted in favour of moving forward with SunMine • Multiple reasons given for low level of direct engagement
6.5 Enhances Society's Capacity to Act	***Yes/To be determined***	• Project reshaped the City's relationship with Teck • Solidified existing partnerships and built new one • Truly cross-sectoral process • Established potential collaboration with a nearby First Nations community • Projects confidence that Kimberley can develop solutions to its own challenges • Takes advantage of underutilized assets and resources

The results demonstrate that the SunMine exhibits, to a degree, each of the five core elements of social innovation. Three of the elements, 'effectiveness', 'engages and mobilizes beneficiaries', and 'enhances society's capacity to act' were partially present, but will require a longer temporal scale for effective assessment. The presence of the five elements is crucial as it establishes the socially-innovative nature of the SunMine project, thus positioning it as a potential agent of socio-technical transition. However, because social innovation is a fluid and evolving process rather than "an objective fact or phenomenon" (Caulier-Grice et al., 2012), it is highly context-specific and influenced by structural conditions at the niche and regime level. The subsequent sections will interpret and contextualize my results by looking at how conditions—political, institutional, societal, and resourced-based—have shaped the core elements of social innovation in the SunMine. Section 7.2.1 discusses the political factors that led to SunMine's status as a novel project in the region; 7.2.2

focuses on novelty and social need; section 7.2.3 explores the effect of societal factors on community engagement in the project; and finally, 7.2.4 ties back to the elements of effectiveness and 'enhances society's capacity to act'.

7.2 Structural Conditions Influencing Social Innovation

7.2.1 Political Condition

The deployment of renewable energy falls predominantly under the jurisdiction of Canadian provinces, enabling each province to design their electricity market and renewable support mechanisms as they deem fit (IEA, 2016). The Federal government can catalyze action at the provincial level by devising broader renewable energy policies, setting carbon-emission reduction targets, and providing direct funding to clean energy projects (IEA, 2016). However, support at the Federal level has been lacking. Clean Energy Canada, a leader in the nation's energy research and advocacy sector, asserts that "Ottawa [Federal level] remains largely indifferent to the opportunities of the clean energy revolution...the growth [of renewables] is a testament to the efforts of provincial leaders and innovative entrepreneurs" (CEC, 2015).

As a result of the autonomy afforded to provinces by default, a patchwork of electricity regimes has emerged with highly varied approaches to the deployment and diversification of renewable energy sources. Some provinces have enacted progressive legislation to actively promote renewable adoption (i.e., Quebec with its cap and trade system, Ontario with a FIT program, and B.C. with a robust carbon tax) while others have lagged behind considerably, relying on the market to dictate (i.e. Alberta, Saskatchewan) (IEA, 2016).

Regime Level: Renewable Support Policies and Novelty

Differences in energy policy across the provincial level help to explain why the SunMine is considered a novel project in the Western Canadian context. In Eastern Canada, Ontario paved the way for renewable support mechanisms with the introduction of North America's most ambitious FIT program in 2009; this legislation has been revised considerably over the years due to increases in consumer prices and other issues, but it still provides reliable support for small-scale projects with capacities up to 500kw (IEA, 2015). Since 2010, Ontario has attracted the largest amount of renewable investment in Canada, and experienced the highest growth rate of renewables as a percentage of grid capacity (CEC, 2015). The neighbouring province of Quebec has a grid supplied by 99% clean energy thanks to large-scale hydroelectric procurement, and has also diversified by adding

4GW (or 10% of total capacity) of wind power (IEA 2015). The Atlantic provinces have also taken slow but consistent steps toward a clean energy transition, using portfolio standards and FIT programs to encourage the addition of wind, tidal, biomass and run-of-river hydro (IEA 2015).

The West has a mixed track record; Manitoba and British Columbia both possess electricity grids that are over 90% renewable, while Alberta and Saskatchewan each generate roughly 75% of their power from a carbon-intensive combination of coal and natural gas (CEC, 2014). A reliance on hydroelectricity in two provinces and a lack of significant renewable support mechanisms in Alberta and Saskatchewan, have set the stage for the SunMine to become the largest solar project in the region at just over 1 MW. British Columbia does not provide any specific incentives for solar PV; however, the SunMine did benefit from supportive provincial policy. The B.C. Clean Energy Act passed in 2010, established the province's commitment to source 93% of its electricity from clean sources, and introduced a standing offer program (SOP) to help achieve this (Government of British Columbia, 2010). Through the SOP, BC Hydro (the provincial utility) purchases electricity generated by renewable projects ranging from 100 kw to 15 MW at a fixed rate, giving developers assurance with regard to economic viability. The SunMine currently earns $109 per megawatt hour of electricity it adds to the grid—a project of a similar size in Ontario would receive roughly double that (BC Hydro, 2016; Independent Electricity System Operator, 2016). However, Ontario caps their FIT program at 500 kw, forcing any larger projects to win a contract through a highly competitive large-scale procurement program. B.C.'s fixed rate prices, which do not distinguish between the type of renewable technology used, are not as incentivizing as those offered by Ontario, but may provide easier access to the electricity market for communities looking to develop mid-size projects.

7.2.2 Institutional Condition

Regime Level: Funding & Innovation Bias

The elements of novelty and social need in the SunMine were influenced by a bias at the regime level towards projects with a clear focus on either technological innovation, or innovation aimed at creating significant economic growth.

With EcoSmart taking the helm, the key stakeholders worked to secure external funding, managing to attract initial support from the Federal government via their *Western Economic Diversification* (WED) program, and the provincial government through the *Innovative Clean Energy fund* (ICE). As the name implies, WED's mandate is to promote local economic development in communities across Western Canada (Western Economic Diversification Canada [WED], 2014); with its explicitly stated

economic goals (diversification, resilience, local job creation), the SunMine appeared to be a strong candidate to receive a grant. WED requirements factored into Teck's decision to forgo an equity stake in the SunMine, as only nonprofit organizations (e.g., municipalities) were eligible. Despite the best efforts of project stakeholders, WED ultimately decided against contributing $1.6 million to the project in early 2014, causing the proposed capacity to shrink from 1.65 to 1.05 MW (City of Kimberley, 2014). None of the interviewees asked about this setback felt they were given a sufficient explanation, with interviewee B stating that WED cited "changing priorities" within their organization as a primary justification.

In 2011, the B.C. government's ICE fund awarded the SunMine $1 million towards its development. According to numerous interviewees, the use of solar trackers in the project design was an important stipulation of the agreement. As highlighted in the results, this was a contentious issue, with more than one participant stating or insinuating that this additional funding may not have been worth the high cost and long-term risk of using dual-axis trackers.

These two funding experiences reflect an ingrained institutional bias at the regime level towards a business and technologically oriented approach to innovation. WED currently awards funding to projects that promote 'innovation'; some of the activities listed in their priorities statement that make a project eligible include: "helping new technologies to the marketplace; applied research and technology development; acquisition of necessary equipment to engage in applied R&D" (WED, 2016). These are certainly valid examples of how innovation can manifest. However, this view of innovation fails to consider the indirect economic benefits that social innovation can stimulate, and the value of reorienting innovation around society. Despite the SunMine having the potential to demonstrate viability of a 'novel' technology in the market, it is possible that WED decided that its potential economic impact on the region was too marginal to warrant support. Similarly, the ICE awarded the SunMine project funding largely for a "technology transfer objective", as interviewee B elucidated. Based on the participant's responses, it seems unlikely that ICE would have been involved had it not been for the technological component. However, the creation of the Community Energy Leadership Program (CELP) in 2015, marks an evolution in ICE's approach to innovation. The CELP aims to support "vibrant and resilient communities", encourage "investments in small-scale community-owned energy generation from clean or renewable resources", and promote "partnerships with industry" (I.C.E. Fund, 2016). Through its promotion of cross-sectoral partnerships and an emphasis on niche models of energy ownership, this program is better positioned to support projects similar to the SunMine in the future.

Regime Level: Institutionalizing social innovation in a mining company

Teck's actions to institutionalize values relating to community empowerment and partnership, as well as an explicit commitment to renewable energy, set the stage for a new, transformative relationship with Kimberley.

Despite some initial skepticism from small pockets of the community regarding the company's intentions and involvement in the project (as expressed by interviewee E), the participants affirmed that Teck was instrumental in helping the City realize its vision of a socially-oriented, community-owned energy model. For a large mining corporation with operations in a number of countries to engage in a project of this size and stature, motives beyond profit maximization must be present. This was alluded to by interviewee E, who stated that the SunMine presented an opportunity for Teck to implement part of the sustainability strategy it has been building over the past decade. Although a scan of company sustainability reports from 2001-2015, shows that 'social innovation' is not explicitly mentioned, elements likely to enable it are discussed in recent documents. In 2009, the company laid the foundation for its 'sustainability leadership initiative', a diverse group of employees tasked to develop a more comprehensive sustainability plan aligned with the "escalating demands of society" and a "world that demands increasing transparency" (Teck, 2009, p. 19). This shift in ethos made Teck more receptive to a partnership with EcoSmart and the City of Kimberley.

Teck's contributions to the SunMine represent a positive step towards their aim of "strategically empowering Communities of Interest to achieve their long-term development goals" (Teck, 2009, p. 42). These investments fall outside the scope of day-to-day business activities and are designed to identify social needs within communities—as was the case with Kimberley. Teck has also set a target to procure 100 MW of renewable energy by 2030 (it has currently invested in 30.7 MW)—this will be achieved through a combination of community partnerships and investments in larger-scale, utility ventures (Teck, 2015). Viewed together, these strategic priorities and the success of the SunMine, can only serve to increase the likelihood that the organization will engage in similar projects in the future. Teck is certainly an 'energy regime actor' due to its operational scale and participation in a resource-intensive industry traditionally reliant on energy from fossil fuels. However, through its involvement in the SunMine, it has taken a definitive step towards enhancing the economic and social vibrancy of a community of interest. This is indicative of a 'reconfiguration pathway' in transition where niche innovations spark or contribute to "changes in some guiding principles, beliefs, and practices" of the regime (Verbong & Geels, 2010). An internal change was already underway within Teck; however, the SunMine now stands as a tangible example that Teck's

institutional evolution has contributed to the presence of social innovation in Kimberley. This can be built upon within the organization, and may also inspire companies within the same industry, or even across sectors, to follow suit.

Niche Level: Institutionalizing Social innovation principles in a municipality

The City of Kimberley has created an enabling environment for social innovation by embedding key sustainability goals, priorities and strategies across its guiding municipal documents. These include: the *Official Community Plan - 2005, Adapting to Climate Change in Kimberley, B.C. - 2009,* the *Integrated Community Sustainability Plan (ICSP) - 2011, and* the *City of Kimberley Corporate Strategic Plan - 2013.* As discussed in the results, the social need for a given innovation hinges on local context. For Kimberley, a small city that experienced significant contraction in its economy and population decline after the mine closure of 2001, the need to reinvigorate the community was, and still is, pressing. In the *Official Community Plan* created in 2005, the ultimate, stated socio-economic goal was to foster a "lifestyle community with a thriving, diversified, sustainable economy and healthy social environment (p. 31)—this serves as the basis for the 'higher' need alluded to by the participants. Subsequent reports have built on this foundation, echoing a need to identify strategies to strengthen the economy without compromising the city's strong commitment to environmental protection and social cohesion. The overarching document in the City's approach is the *ICSP*, as every decision made and report produced at the municipal level is harmonized with it. Of the many priorities laid out by this plan, three are especially conducive to breeding the elements of social innovation manifested in the SunMine. These are:

- Promoting "open communication, collaboration and partnership between government, private business and nonprofits help Kimberley's local economy adapt to changing trends." (City of Kimberley, 2011, p. 14)

- Taking "an integrated approach to economic development and activity that recognizes and improves the social, natural, built and communication infrastructure to support it." (City of Kimberley, 2011, p. 14)

- Meeting energy needs through "local and regional renewable energy sources with minimal physical impact on natural systems." (City of Kimberley, 2011, p.13)

Institutionalization of these goals helped to ensure that the City was poised to act when an idea that could contribute to meeting their established, critical need, was proposed. Also key to the eventual success of the SunMine were institutional efforts to establish it as a strategic priority once it began to take shape. This was done in the *ICSP*, the *Corporate Strategic Plan*, and the *Kimberley Economic Development Strategy*—an important step that helped keep the project squarely on the City agenda despite internal political changes and challenges in its relationship with Teck and EcoSmart.

7.2.3 Societal-Climate Condition

Societal attitudes and values, particularly with regard to change and development, can have profound effects on whether a social innovation develops and flourishes in a given community (Bund et al., 2013). Kimberley has been forced to adapt and embrace change over the course of its relatively short history, consistently reinventing itself while striving to preserve core values. When the community recognized in the late 1960's that mining would not be the future of the city, it began to reorient the economy around tourism by expanding the local ski resort and showcasing the myriad benefits of the alpine locale (City of Kimberley, 2014). This evolution has continued over recent decades, with the community and municipality working together to attract further tourism while also encouraging local entrepreneurship (City of Kimberley 2014). The resiliency, resourcefulness, and creativity that this transition called for has cultivated a community that is receptive to change and new ideas.

As evidenced by the *ICSP*, the community has collaborated closely to build a set of shared values and visions for the future. Caulier-Grice et al. (2012) emphasize that undergoing this process can be just as valuable as the outcomes generated—it builds a cohesiveness and sense of trust within the community, and between residents and their municipal government, that can be highly enabling for social innovation (Bund et al., 2013). This may explain why community engagement throughout the SunMine process was admittedly lacking. While direct engagement is a cornerstone of many social innovations, it can also be achieved through intermediaries who have acquired the necessary social license; by maintaining consistent community involvement in visioning and priority setting (e.g. the *ICSP* workshop sessions and public questionnaire), the City of Kimberley gained the 'license' needed to move forward without developing an extensive, project-specific strategy. That 76% of residents voted in favour of the City borrowing money for the project in the 2011 referendum is sufficient proof of aligned priorities and values.

7.2.4 Resources Condition

Two core elements examined in the results, 'effectiveness' and 'enhances society's capacity to act', are difficult to assess at this juncture. This is partly attributable to the youth of the project, however, the lack of available resources at the municipal level throughout the development phase led to the absence of a well-defined plan for long-term monitoring and evaluation of these elements. Interviewee B stated that the simple indicators (listed in 5.1.3) currently in place for measuring project effectiveness will not be expanded upon in the foreseeable future. This leaves the City with limited scope for outcome measurement to determine if the innovation is having its desired effect, and to separate potential impacts of the SunMine—whether positive or negative—from other City programmes and initiatives.

Murray et. al (2010) present a number of methods for measuring social innovation that have been adapted and transplanted from other fields. Cost-benefit analyses, stated preference methods and other standard measures of return on investment, take a highly quantitative measurement approach ill-suited to the budgetary constraints of the City of Kimberley and the evaluation of more socially-oriented goals (Murray et al., 2010). Social return on investment is an approach that assigns proxy, monetary value to social benefits that would otherwise remain qualitative; the nonprofit sector has had considerable success with this technique, but, its complexity, cost, and time commitment, would likely make it unpalatable to the municipality (Arvidson, Lyon, McKay, & Moro, 2013). Data on social innovation is needed to justify the dedication of resources at the niche level and potentially inform decision-makers at the regime level (Boelman, Kwan, Lauritzen, Millard, & Schon, 2014); however, TEPSIE acknowledges that this data can also be qualitative in nature (Caulier-Grice et al., 2012). Limited municipal resources certainly are a barrier to the measurement and socio-economic benefits are undoubtedly difficult to assign value to. However, the City should consider less costly, qualitative methods like surveys or benchmark setting; failing to do so could weaken the project's potential to contribute to regional knowledge regarding social innovation in an energy system.

7.3 Reflection on Frameworks

Social innovation as an analytical framework is especially useful for ensuring that the social aspects of innovation are considered when examining socio-technical transition. A critique frequently leveled against the multilevel perspective is its excessive focus on the influence of technology on transition

at the expense of other potential factors like “social and cultural aspects” (Doci et al., 2015). The framework used as a proxy for the MLP in this case-study addresses this major shortcoming by including the ‘societal-climate’ as a key condition enabling or disabling social innovation. Additionally, the section on institutionalizing social innovation (7.2.2) in the City of Kimberley provides insight into how these social and cultural values are formalized at the niche level.

Additionally the TEPSIE ‘conditions’ framework was able to effectively capture a guiding principle of the MLP; namely, that transition does not have a “single ‘cause’ or driver” and that interactions between the various levels “link up with, and reinforce, each other” (Geels, 2011). This ‘circular causality’ is revealed throughout the discussion section; ICE’s recent commitment to the development of community energy through its new CELP program—influenced by institutional changes, political factors, and likely, its involvement in the SunMine project—is just one example.

TEPSIE states that “it is clear that we require more and better data on social innovation”, and that more research is needed to understand the relationship between social innovation, the multiple levels of society it operates in, and systemic change (Caulier-Grice et al., 2014, p. 35, 37). By examining a case-study through TEPSIE’s analytical framework, and utilizing socio-technical transition theory and the multilevel perspective to interpret the results, I have contributed to both knowledge gaps.

8. Implications of Case-study

8.1 Growing the impact of the SunMine

An examination of the SunMine case reveals that three core elements of social innovation were only partially present, or unable to be fully evaluated at this juncture. Fulfilling the potential of these elements, which will require short-term action and the development of long-term strategies, is essential to maximizing the potential socio-economic benefits of this innovation. The SunMine stakeholders should consider pursuing and implementing the following steps: 1) engage the community for ideas regarding project evaluation; 2) identify opportunities to use this social innovation as a platform for innovation in other sectors; 3) pursue formalized connectivity with others engaged in social innovation and community-owned energy initiatives.

1. Although technical, financial, and other aspects of the project precluded extensive community engagement during the development phase, the community could now play a vital role in helping the City devise a strategy for measuring the outcomes of the SunMine. Holding workshops with the community at large could help the City better determine what is expected from the SunMine, what the timeline for delivering certain benefits should be, and potential methods for capturing value and communicating these benefits to the taxpayers. Qualitative data could come from periodic, open-ended surveys or questionnaires of new residents and businesses to determine if the SunMine played a role in their decision to move and/or start a business in the city. Establishing outcome benchmarks and reporting on them periodically to demonstrate progress, could garner greater support for future expansion of the solar facility—which sits on a brownfield site that could accommodate up to 200 MW of generation.

2. The SunMine's ability to 'enhance society's capacity to act' is crucial to spurring future social innovation in the city. The City should continue to underscore its commitment to local ideas and entrepreneurship (as the SunMine business discusses), but must also ensure that the necessary structures are in place to nurture local innovation when it presents itself. There are a number of regional programs designed to support entrepreneurs (e.g., *Kootenay Rockies Innovation Council, Community Futures East Kootenay*); however, if Kimberley expects an influx of residents in the coming years seeking to capitalize on a socially-innovative 'climate' reinforced by the SunMine project, it must plan accordingly.

3. Resource constraints at the municipal level make it even more important for the City of Kimberley to join formalized networks that can provide them with existing knowledge regarding social innovation. The City should look to join networks like the previously mentioned *B.C. Partners for Social Impact*; doing so would create a mutually beneficial relationship where experts and practitioners in the field can inform the City's efforts to determine project effectiveness, and in turn utilize the data to enhance efforts to diffuse the model regionally.

8.2 Diffusing the SunMine Model

Driving a socio-technical transition forward requires the diffusion of niche-level innovations, without this, a standalone innovation will have little influence on the existing regime. Although diffusion is rarely "linear, orderly, or easily co-ordinated" (Davies, & Simon, 2014), Dees, Anderson, and Wei-Skillern (2004) outline three methods—dissemination, affiliation, and branching—for growing a social innovation beyond the niche it develops in. Dissemination involves sharing knowledge with prospective innovators, affiliation aims to formalize the innovation via networks and partnerships, and branching is the replication of similar models by a single organization or entity (Dees et al., 2004). The SunMine is currently employing a strategy of informal dissemination, focusing on fielding calls from interested individuals and communities, sharing general information about the system, and providing tours of the site on request. A stated goal of the project is to establish the efficacy of solar in the region, but there is no explicit plan for actively encouraging or supporting similar projects in other communities (City of Kimberley, 2014). Asked whether developing such a strategy was a priority, Interviewee B said "what I do with my time professionally comes back to city priorities and how my year to year business plan fits into those. Frankly, it [active diffusion] does not". The interviewee went on to say that diffusion is a balancing act. While pursuing it could have "reputational benefits" for the city, it might also come at a relatively high cost to the City and local taxpayers. This reality of conflicting priorities and resource constraints at the niche level, helps to explain why the spread of innovation is often "complex, iterative, organic and untidy" (Davies, & Simon, 2014, p. 7).

There is still considerable potential for the SunMine model to be diffused regionally, as the second strategy, affiliation, could occur in the future to complement knowledge dissemination. Project stakeholders have left this possibility open by expressing a desire to build partnerships with other municipalities, First Nations groups, and post-secondary institutions (City of Kimberley, 2014). The City of Kimberley has already been in close contact with the nearby Aq'am First Nation community, offering them classified project information and further support should they wish to build a similar facility. Formal networks are also crucial to affiliation (Davies, & Simon 2014); research did not reveal any specifically tailored to community energy, but, joining a network like the *B.C. Partners for Social Impact*, which brings together a diverse-range of actors involved in social innovation may be a good starting point for the SunMine. The creation of specialized networks will require momentum at the niche level, and a proposed solar project in the nearby city of Nelson, could provide a catalyst for

formalized connectivity amongst community energy projects. Finally, Teck has expressed interest in branching this type of innovation to other communities they are currently operating in.

8.3 Identifying further 'Windows of Opportunity'

By delineating the structural conditions that have influenced the SunMine project in the previous chapter, I am now able to step outside my case-study to identify similar conditions that may enable or disable future social innovation in the region's energy system. This section looks at potential windows of opportunity, caused by destabilization within regime structures, for niche-level social innovations to flourish and contribute to socio-technical transition (Doci et al., 2015). The region explored here encompasses British Columbia and its neighbouring province of Alberta.

8.3.1 Political Changes in Alberta

Emerging political factors in Alberta could eventually have an enabling impact on the development of community-owned renewable projects in the region. In 2015, the Government of Alberta initiated a review of its relatively unambitious, existing climate change strategy. Provincial interest in devising a more comprehensive plan was spurred by a number of factors including: the ascension of more progressive political parties at the federal and provincial level, internal and external pressure for Canada to assert itself as a climate leader on the world stage, global push back against 'dirtier' fossil fuels like those derived from the Athabasca Oil Sands, and a steep decline in global oil prices (Government of Alberta, 2015).

The report produced by this process reflects a proactive, yet loosely defined, step in the province's approach to renewable energy support (Government of Alberta, 2015). It outlines various components of a multi-pronged plan to encourage decarbonization, including a coal-phase-out by 2030, a gradual increase of the renewable share to 30% of total electricity, and a 30 dollar per tonne carbon tax by 2018 (Government of Alberta, 2015). Alberta's Electric System Operator (AESO) has set a timeline for the development of a renewable procurement program; initial stages will begin in the latter half of this year, with the first expected project to come online in 2019 (AESO, 2016). These measures will spark a rise in large-scale commercial projects, but will do little to catalyze small, socially innovative energy models. Although no specific policy recommendations are given, the provincial climate report expresses interest in the creation of mechanisms to support "larger scale community generation" (Government of Alberta, 2016). Targeted support for this type of energy model is key, however; changing social needs in the province may be equally important to the

diffusion of community-owned energy. Low oil prices, which caused Alberta's economy to contract by nearly 3% in 2015 (CBC, 2016), could force many communities to look for new solutions to insulate themselves from further economic shock. If bolstered by a supportive policy mechanism—perhaps one similar to the B.C.'s SOP—community-owned energy would be well positioned to respond to current challenges in the province.

8.3.2 An Emerging Social Innovation Environment

Much like in Europe (e.g., European Commission), social innovation is becoming ingrained at the regime level through government programs, cross-sectoral partnerships and networks. The government of British Columbia created the *BC Social innovation Council* in 2011 to find pathways for stimulating social innovation in the province; its action plan included launching the aforementioned *BC Partners for Social Impact,* an online idea hub for social innovators, and a series of additional initiatives (Government of British Columbia, 2016) Alberta's government launched a massive, 1 billion dollar social innovation fund in 2014, and although it was cancelled later that year, the province has still seen formalization of the concept in cross-sectoral networks like *Alberta Social Innovation (ABSI).* It is difficult to ascertain the direct influence that these programs and networks will have on social innovation in the energy system; however, as Doci et al. (2015) contends, heterogeneity in social innovation in "terms of the variety of the actors, their motivations, [and] the innovations they use" is a vital to its transition potential (p. 89). Thus, the more links established between actors from various social innovation programs, networks, and individual innovations, the more enabling the overall climate of social innovation in society will be. Community-owned energy would likely benefit as a result.

9. Conclusion

Although Canada has one of the cleanest electricity grids in the world, it must accelerate and diversify its approach to renewable energy deployment if it is to meet its climate targets and achieve nation-wide decarbonization. This thesis conceptualized socio-technical transition as a promising strategy for driving sustainable change in Western Canada's energy system, and social innovation in the form of community-owned energy, as the niche level 'agent' of that change. I utilized the case of the *SunMine* in Kimberley, B.C., to fulfill my research aim of examining the presence of core elements

of social innovation in the project, and exploring the multi-level structural factors that shape these elements.

Results showed that the SunMine exhibits, to a degree, all five elements of social innovation. Key findings revealed that the project: displayed many novel aspects, built new relationships and transformed existing ones, better utilized assets, and created an effective cross-sectoral partnership. The exploration of structural conditions identified, among other things, the importance of renewable support policies that specifically target community level projects, a problematic bias towards technological innovation in regime level funding, and the positive relationship between social innovation and the institutionalization of certain sustainability values and goals at the niche level.

As the first municipally owned project in Canada, the SunMine is in a unique position to demonstrate the viability of this energy model regionally and beyond. Project stakeholders can help build momentum towards socio-technical transition by engaging in active diffusion, that is, encouraging the development of similar niche innovations by disseminating project information and forging partnerships to assist like-minded communities. However, these lofty goals must be tempered by the reality that certain structural conditions still constrain the spread of socially-innovative energy models in the region. One thing is certain, if Kimberley effectively harnesses this innovation, it will be mining the solar and social benefits for years to come.

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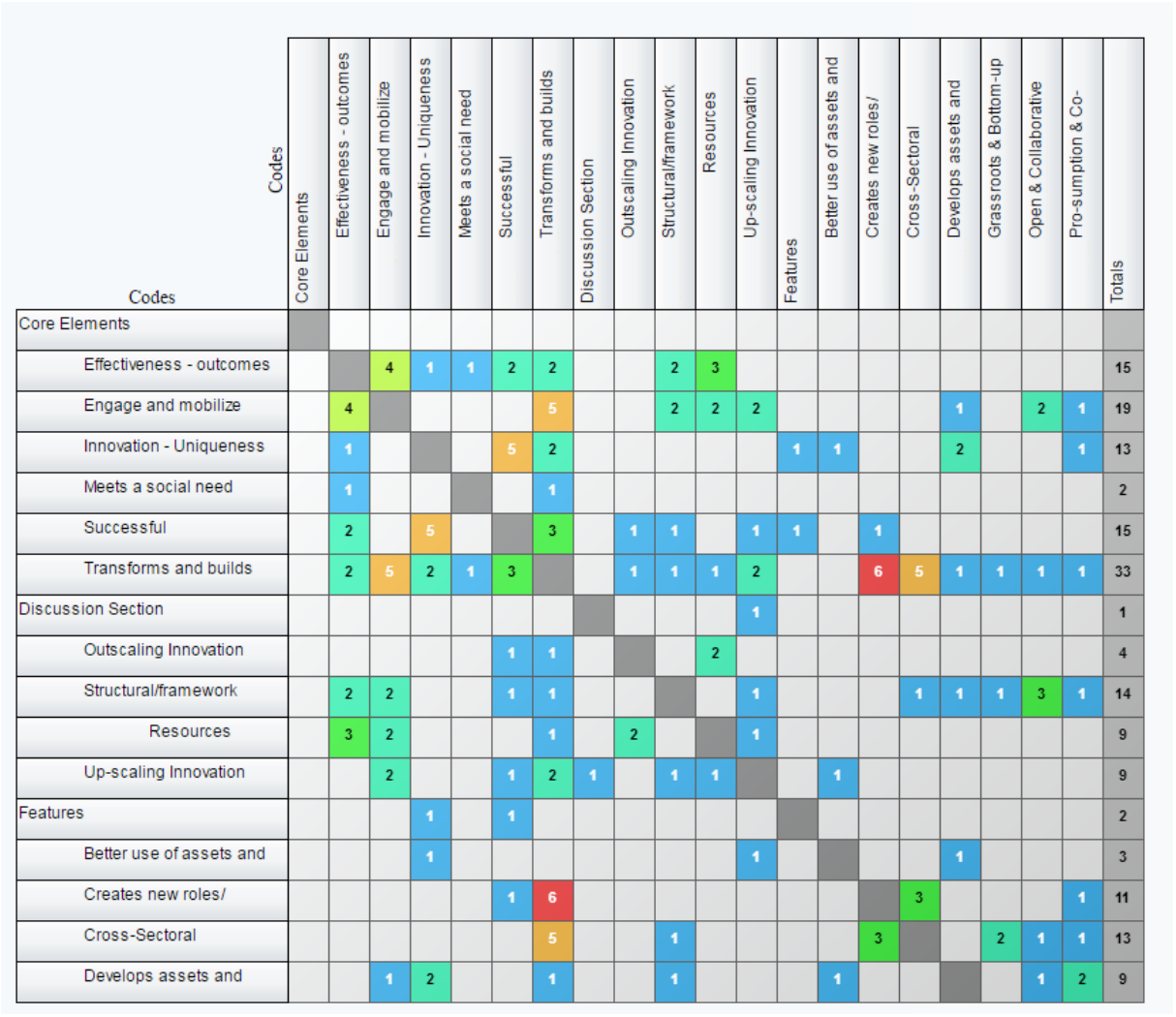
Appendices

Appendix I: Sample Interview Guide

Core Elements	Description	Corresponding Questions
1) Novelty	Social Innovations are new to the field, sector, region, market or user, or to be applied in a new way	• What makes the SunMine project unique? Structure, the region, technology etc. (not sure if this is even worth asking as the answers are in the business plan
2) Ideas to implementation	Distinction between invention and innovation (implementing and applying ideas). Fairly straightforward...	• What is the timeline like for the expansion of the SunMine, is there a plan right now to expand beyond the X MW stated in the project doc.?
3) Meets a social need	Social innovations are explicitly designed to meet a social need/demand	• Have there been repeated issues with electricity supply from BC Hydro/Fortis, was this a motivation for localizing the energy supply? (transmission problems, prolonged power outages etc.) • Was there a growing demand by citizens in Kimberley for access to clean, localized energy? ○ BC is already powered by 88% hydro
4) Effectiveness	SI's are more effective than existing solutions - create a measurable improvement in terms of outcomes. (Seems like this could be a bit difficult to interpret)	• What are the plans to measure the potential benefits of the SunMine project? • How will you measure some of the stated socioeconomic goals of the project (i.e creating a more resilient economy, "generating innovative business opportunities")? • What is the competitive advantage that the SunMine brings? ○ brand recognition, a
5) Enhances society's capacity to act	Empowers beneficiaries (community members) by creating new roles and relationships, better use of assets and resources	• What steps has this project taken to empower members of the community? • How involved was the community throughout the project development and implementation process? • Is holding a referendum unique to Kimberley? Has the governance structure of the city been altered in any way by the project?

Appendix II: Code Co-occurrence

Chart showing the overlapping application of codes in the Dedoose™ program.



Codes	Core Elements	Effectiveness - outcomes	Engage and mobilize	Innovation - Uniqueness	Meets a social need	Successful	Transforms and builds	Discussion Section	Outscaling Innovation	Structural/framework	Resources	Up-scaling Innovation	Features	Better use of assets and	Creates new roles/	Cross-Sectoral	Develops assets and	Grassroots & Bottom-up	Open & Collaborative	Pro-sumption & Co-	Totals
Core Elements																					
Effectiveness - outcomes			4	1	1	2	2			2	3										15
Engage and mobilize		4					5			2	2	2					1		2	1	19
Innovation - Uniqueness		1				5	2						1	1			2			1	13
Meets a social need		1					1														2
Successful		2		5			3		1	1		1	1		1						15
Transforms and builds		2	5	2	1	3			1	1	1	2			6	5	1	1	1	1	33
Discussion Section												1									1
Outscaling Innovation						1	1				2										4
Structural/framework		2	2			1	1					1				1	1	1	3	1	14
Resources		3	2				1		2			1									9
Up-scaling Innovation			2			1	2	1		1	1			1							9
Features				1		1															2
Better use of assets and				1								1					1				3
Creates new roles/						1	6									3				1	11
Cross-Sectoral							5			1					3			2	1	1	13
Develops assets and			1	2			1			1				1					1	2	9

Appendix III: Code Cloud

Word cloud showing the most discussed themes (codes) across the six semi-structured interviews.

Appendix IV: Pictures of the SunMine

SunMine in the winter. Panels are tilted fully forward to catch the last of the day's light (City of Kimberley, 2016).

SunMine with the Kootenay Rockies in the background (City of Kimberley, 2016).