A QUADRUPLE HELIX APPROACH TO THE REGIONAL INNOVATION SYSTEM IN CORNER BROOK AND SURROUNDING AREA: CASE STUDY OF A LOCAL INNOVATION PROJECT APPLYING WASTE HEAT FROM CORNER BROOK PULP & PAPER LIMITED FOR GREENHOUSE OPERATIONS

by

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Abstract

The Regional Innovation System (RIS) model provides important insights into the innovation performance of regions by investigating the interaction of organizations with each other and their environment in these regions. There is a lack of literature on RIS in resource-dependent rural and peripheral regions. This thesis contributes to our understanding of RIS in resource-based regions by investigating the interaction between the quadruple helix of government, post-secondary institutions, the private sector, and community organizations to investigate the current state of RIS in Corner Brook and its surrounding area in Newfoundland and Labrador (NL). To achieve this, this study uses context analysis and a case study approach. The thesis reveals a number of challenges and opportunities to further develop RIS in the region. The findings suggest that there is a lack of interaction among key quadruple helix actors of RIS in Corner Brook and its surrounding area, especially between the private sector and other actors of the quadruple helix. On the other hand, strong knowledge infrastructure, the presence of enough support organizations, rich natural resources, quality transportation infrastructure, and close-knit ties within the small community offer good prospects for the future of RIS in the region. Findings from the case study indicate that, although establishing cross-sectoral partnerships with the quadruple helix actors can be challenging and time-consuming, the application of this approach to develop innovation-based projects could offer tremendous benefits to the region. Based on the findings, recommendations are provided for each category of actors involved in the quadruple helix approach to encourage innovations in Corner Brook and the surrounding area.

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List of Abbreviations and Symbols

AAFC – Agriculture and Agri-Food Canada

ACOA – Atlantic Canada Opportunities Agency

AINL – Advancing Innovation in Newfoundland and Labrador

BDC – Business Development Bank of Canada

BIA – Business Innovation Agenda

BR&E – Business Retention and Expansion Report

CBC – Conference Board of Canada

CBDBA – Corner Brook Downtown Business Association

CBDC Humber – Humber Community Business Development Corporation

CBPPL – Corner Brook Pulp and Paper Ltd.

CCCF – Climate Change Challenge Fund

CNA – College of the North Atlantic

CRI – Centre for Research and Innovation

EE – Entrepreneurial Ecosystem

FFA – Department of Fisheries, Forestry and Agriculture

GCBBT – Greater Corner Brook Board of Trade

GC-MUN – Grenfell Campus, Memorial University of Newfoundland

GC-REB – Grenfell Campus Research Ethics Board

GFL – Growing For Life Ltd.

GSDC – Greater Sudbury Development Corporation

HEI – Higher Education Institutes

ICT – Information and Communications Technology

IET – Department of Industry, Energy and Technology

IP – Intellectual Property

IPGS – Department of Immigration, Population Growth and Skills

ISC – Indigenous Services Canada

ISL – Department of Immigration, Skills and Labour

MNL – Municipalities Newfoundland and Labrador

MOU – Memorandum of Understanding

MUN – Memorial University of Newfoundland

NDA – Non-Disclosure Agreement

NIS – National Innovation System

NL – Newfoundland and Labrador

NLOWE – Newfoundland and Labrador Organization of Women Entrepreneurs

NLSA – Newfoundland and Labrador Statistics Agency

NLWIC – Newfoundland and Labrador Workforce Innovation Centre

NRC – National Research Council

NRC-IRAP – National Research Council of Canada Industrial Research Assistance Program

OECD – Organisation for Economic Co-operation and Development

PMA – Professional Municipal Administrators

QFN – Qalipu First Nation

QDC – Qalipu Development Corporation

R&D – Research and Development

RIS – Regional Innovation System

RIS3 – Research and Innovation Strategies for Smart Specialization

RPA – Research Participation Agreement

SMEs – Small and Medium-Sized Enterprises

SSHRC – Social Sciences and Humanities Research Council of Canada

TCAR – Department of Tourism, Culture, Arts and Recreation

TCII – Department of Tourism, Culture, Industry and Innovation

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Chapter 1. Introduction

1.1 Context

Innovation started to germinate as a term linked with science and industry in the 19th century following the breakthrough of the Industrial Revolution (Green, 2013). However, the term was often interpreted as invention, particularly technical invention, until 1939, when Austrian economist Joseph Schumpeter differentiated these two concepts (Green, 2013). According to Schumpeter (1939), while the invention was an act of intellectual creativity "without importance to economic analysis" (p. 85), innovation was an economic decision for firms whether to apply or adopt invention. Schumpeter studied innovation as a source of economic change (Schumpeter, 1928; 1942; 1947) and business cycles (Schumpeter, 1934; 1939).

Since the late 1980s, the topic of learning and innovation has captured the attention of an increasing number of researchers and policymakers (Organisation for Economic Co-operation and Development or OECD, 1997). With this increasing attention, innovation is regarded as a primary factor of competition in the modern economy, economic development, and social prosperity (Doloreux, 2002). Innovation activities are seen as key for businesses to maintain or boost competitive advantage and facilitate future growth (OECD & Eurostat, 2005). Innovation has great importance for regions or nations for the same reasons it is relevant for businesses. Successful business innovations increase the regional business base and play an important role in shaping the competitive advantage of the region. Developing an innovation-based national or regional economy is considered the most effective means to develop and secure competitiveness and indeed economic growth (Schierenbeck, 2010).

The importance of innovation in fostering productivity and, consequently, economic growth has been recognized by various levels of governments widely. Since innovation is

recognized as a primary means for a sustained high standard of living, it is increasingly located at the top of the policy agendas of governments (OECD, 2011). For example, the Department of Finance Canada (2017) acknowledged in *Canada's Innovation and Skills Plan* that innovation brings opportunities "to rethink everything from how we manage the demands of our daily lives, to how we build our cities and grow our economy" (p. 1). The UK government (Department of Trade and Industry, 2003; as cited in Schierenbeck, 2010) called innovation "the most important influence on productivity growth alongside changes in skills and capital intensity" (p. 8) and put it as one of the five productivity drivers in their framework analysis. Similarly, the Government of Newfoundland and Labrador recognized innovation as "a key factor in the province's future prosperity" in *Newfoundland and Labrador's Business Innovation Agenda: The Way Forward on Business Innovation* (Department of Tourism, Culture, Industry and Innovation, 2017, p. 3)

An increasing number of reports indicate that Canada's performance in the area of innovation is decreasing. *Newfoundland and Labrador's Business Innovation Agenda: The Way Forward on Business Innovation* emphasizes that the innovation performance of Canada has dropped over the last decade (Department of Tourism, Culture, Industry and Innovation, 2017). The report entitled "How Canada Performs: Innovation," released by the Conference Board of Canada (CBC) in 2018, positioned Canada twelfth among sixteen countries (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Japan, Netherlands, Norway, Sweden, Switzerland, United Kingdom, United States) deemed 'high income' countries by the World Bank and most likely to have achieved and sustained a high standard of living. This represents a drop from ninth place in 2015 on innovation performance based on the 11 innovation indicators: public research and development (R&D), researchers, connectivity, scientific articles, entrepreneurial ambition, venture capital investment, business enterprise R&D, information and

communications technology (ICT) investment, patents, enterprise entry rate, and labour productivity. According to the report, the reason for the decline is that Canada has lost its innovation competitiveness to much-improved international peers. The findings indicate that the most substantial decrease over the years was on the venture capital investment indicator. A report released by the Council of Canadian Academies (2009) entitled *Innovation and Business Strategy: Why Canada Falls Short* also links the weak innovation performance of Canada to the relatively small number of firms adopting innovation-based strategies.

With its resource-based economy, dispersed population, rugged nature of the landscape, and remoteness, the province of NL is among the poorest performing provinces in Canada on innovation. CBC (2018) ranked NL 22nd overall among 26 comparator jurisdictions (including Canadian provinces and 16 above-mentioned countries) based on innovation indicators. The province performed worse than the poorest-performing country (among 16 countries) on the following indicators: researchers, business research and development (R&D) spending, and patents. Another study, "Achieving Sustainable Prosperity: Benchmarking the Competitiveness of Newfoundland and Labrador," conducted by Palladini (2015), compared NL's performance to nine jurisdictions (Norway, United Kingdom, Texas, North Dakota, Alberta, Saskatchewan, Quebec, Nova Scotia, New Brunswick) based on: innovation, investment, human capital, and the business and policy environment. These jurisdictions were selected due to their similarities in economic structure, business environment, and export market with NL. The study emphasized that NL performs poorly on all innovation indicators. The province scored in the bottom half on 21 out of 32 measurement indicators. The poor innovation performance by NL urges the province to take a more holistic and broader approach to innovation to strengthen its economic competitiveness.

NL has many rural areas, with 60 percent of NL residents living in rural and peripheral regions (Walsh & Winsor, 2019). Walsh & Winsor (2019) state that the economies of many regions of the province have traditionally been based on mainly a single industry, primarily linked to natural resource extraction. Which resources their economic history has been based upon often depends on whether the region was located close to the ocean or in the interior part of the province. The economy of Corner Brook and surrounding area, which is located on the west coast of the island of Newfoundland adjacent to both coastal/ocean and inland/terrestrial resources, has depended on the resource-based industries of both fishing and forestry from its beginnings. Many regions of NL, including Corner Brook and surrounding area, currently struggle with challenges such as a lack of skilled labour, high outmigration, and low immigration after declines in resource-based industries (Walsh & Winsor, 2019). These challenges both call for innovation to help address them and cause potential difficulties in pursuing innovation, a topic which this thesis addresses.

1.2 Justification of the Study

A substantial amount of literature has investigated the relationship between geography and innovation. Regions (defined and discussed further in Chapter 2) have been recognized as primary spaces of national and supra-national innovation performance (Cooke, 2001; Doloreux & Parto, 2004; Asheim & Coenen, 2005; Doloreux & Porto Gomez, 2017; Ponsiglione, Quinto, & Zollo, 2018). Territorial innovation models (TIMs) suggest that agglomerations, and in particular regional clusters, stimulate collective learning and innovation. Regions are identified as important places for innovation, where close inter-firm communication, socio-cultural structures, and institutional environments emerge that can facilitate (or hinder) innovation processes (Asheim & Isaksen, 2002). Asheim & Isaksen (2002) further describe regions as "important bases of economic

coordination at the meso-level" (p. 82). Examining the regional level of innovation systems in Norway (Sunnmøre and Jæren regions), they observe that the regional level was important for technological development and competitiveness of firms. In these regions, the firms had to keep developing competitive products with local farmers and fishermen as demanding customers. Shared rules and close relationships in regions facilitate interaction, mutual understanding and collective learning (Camagni & Capello, 2013; Lorenzen, 1998). Additionally, proximity and contacts have a significant influence on non-codified and tacit knowledge exchange (Boschma, 2005).

Similar to other TIMs, regional innovation systems (RIS's) emphasize interaction and knowledge transfer among the actors of the system (Asheim et al., 2011; Tödtling and Trippl, 2011). The quadruple helix concept helps to further understand the differences among the various types of actors involved in RIS, knowledge links and interactive learning, and institutional and social context within the region (Carayannis & Campbell, 2009). This concept of innovation is structured around the interactive relationships between four stakeholders (university, industry, government, society). More specifically, this approach of encompassing government agencies that deliver policy and programs, firms that are seeking research and development initiatives, education and research institutions, and community and support organizations is increasingly being used to support innovations in regions (Carter & Vodden, 2017) (for more on the quadruple helix approach see Section 2.6). Cooke (2016) states that innovation at the regional level primarily emerges through collective learning and synergies among these actors. Similarly, according to Dougherty (2017), regional innovation processes are path-dependent and based on collective learning and social interactions. Thus, in order to foster innovations in a region, the sharing of ideas, new technologies, and best practices should be enhanced (Schierenbeck, 2010).

RIS is applied to analyze and come to a better understanding of the important aspects of the functioning of regional clusters (Asheim & Isaksen, 2002). Ponsiglione, Quinto, & Zollo (2018) state that considering the relationship between innovation and competitiveness, analysis of innovation processes and performance should be emphasized at the regional level. RIS is used as a tool in policymaking to build systems of innovation in support of regional business competitiveness (Cooke, 1998). Research on RIS can help guide policymakers to develop policies and programs in support of innovation. It can also serve the policy mission to create and improve the regional knowledge base and interactions among various private and public institutions (Doloreux & Porto Gomez, 2017). This links RIS research to the development and implementation of policy tools, in addition to its potential to fill existing knowledge gaps.

1.3 Knowledge Gap

Despite growing attention in recent years, there remains a lack of literature on innovation in peripheral, resource-based regions. This challenges us to have a detailed look into the innovation environment in these regions, a central knowledge gap that this study seeks to fill. Urban bias in economic geography and innovation literature has been acknowledged by several scholars. Eder (2018) states, for example, that until recently, innovation literature focused on successful core regions. On the other hand, it was implicitly assumed that no innovation occurs in peripheral regions. Similarly, according to Shearmur (2012), studies on the geography of innovation has tended to investigate core regions and clusters. Atterton (2016) states that innovation potential of rural and peripheral regions has not been fully emphasized. Eder & Trippl (2019) discuss that the conceptual work on innovation in peripheral regions is scant. Tuitjer & Küpper (2020) acknowledge that knowledge and networking in rural innovation remain under researched. Eder (2018) suggests that more innovation research on peripheries should be conducted to have a better

understanding of peripheral setting across regions and countries. He also discusses that recently an increasing number of researchers are expressing their discontent with the geographic bias toward successful core regions providing empirical evidence that innovation occurs in peripheral regions as well (Petrov, 2011; Shearmur, 2011; Isaksen & Karlsen, 2016; Shearmur, 2017). The current study attempts to challenge this geographic bias by analyzing innovation processes in Corner Brook and surrounding area through the periphery lens.

In addition, limited studies have been conducted on RIS in NL and, more specifically, Corner Brook and surrounding area, using the quadruple helix approach. One of the early reports on business development in Corner Brook, entitled *The Business Retention and Expansion Report* (BR&E), was prepared by Burden (2008) for the Greater Corner Brook Board of Trade (GCBBT), studied only the business community of Corner Brook and opportunities for them. Lam and a team of individuals from government, university, community, and business (2013) used Social Network Analysis to map connections and networks within the local innovation system in the city of Corner Brook and investigate local and global knowledge flows within the networks. This study highlighted the potential in Corner Brook to enhance innovation within the private sector and community. Another study, *Mapping Knowledge Seeking in the St. John's and Corner Brook Entrepreneurial Ecosystems* by Winsor & Carter (2018), maps the entrepreneurial ecosystem in the cities of St. John's and Corner Brook, based on the knowledge-seeking behaviour of the entrepreneurs. However, further research is needed to explore existing potential can be used to convert the region into an innovation centre.

Previous studies conducted in NL have recognized the need for further insight on how to develop innovations in rural and peripheral regions of the province, similar to the gap identified in the innovation literature more broadly. For example, Carter and Vodden (2017) emphasize the lack

of innovation literature on rural resource-based regions of the province. *Advancing Innovation in Newfoundland and Labrador Knowledge Synthesis* (2013) indicated a lack of evaluation for innovation in NL more broadly, while Greenwood et al. (2011) cite that "municipalities, Regional Economic Development Boards, and other local organizations are crying out for a greater role in fostering the conditions to drive the economy" (p. 53). Most RIS studies show that there is no one-size-fits-all policy to be applied to any region (Asheim, Boschma, & Cooke, 2011; Doloreux & Porto Gomez, 2017). Thus, support for innovation in the Corner Brook and area region requires region-specific know. Building on the previous studies conducted in Corner Brook, new research is needed to learn more about the role of certain actors and sectoral and cross-sectoral interactions among them that support innovation in Corner Brook and surrounding area. Thus, this study investigates what role various local stakeholders have taken and might take in the future to support the growth in innovation in the Corner Brook and surrounding area.

1.4 Research Objective and Questions

The objective of this study is to investigate the current state of the RIS in Corner Brook, Newfoundland and Labrador (NL), Canada, using the quadruple helix approach. More specifically, this research will answer the following questions:

1. What are the region-specific barriers and opportunities for innovation in Corner Brook and surrounding area?

2. Who are the key quadruple helix actors, and what role(s) do they play in the RIS of Corner Brook and surrounding area?

3. How do quadruple helix actors serve the development of RIS in Corner Brook and surrounding area?

4. How do quadruple helix actors interact in the RIS of Corner Brook and surrounding area?

The study seeks to answer these research questions by using a context analysis and case study approach (to be further discussed in Chapter 3). The case study of this research emerged through my internship with Corner Brook Pulp and Paper Ltd. (CBPPL). This internship allowed me to bring a component of lived experience into this research. A qualitative method was utilized for both the case study and context analysis. Qualitative data was collected through interviews, participant observation, and publicly available government documents, reports, media, and previous research (to be further described in Chapter 3).

1.5 Importance of the Thesis and Anticipated Outcomes

Tödtling & Trippl (2005) acknowledge that the prerequisites to create innovations in regions can be enhanced by the influence of policies in place. On the other hand, Doloreux & Porto Gomez (2017) state that policymakers who hope to start or upgrade strategic plans in support of regional innovative environments can find only limited help from the available RIS literature. According to Doloreux et al. (2012), the theoretical frameworks of RIS are often adapted to metropolitan regions with the purpose of creating regional competitive advantage. Yet RIS should be adapted to the specific barriers and advantages of each region (Cooke et al. 2004; Asheim & Coenen 2005; Tödtling & Trippl 2005). The primary reason is that regions are different. McCann & Ortega-Argilés (2013) argue that some regions "are systematically more disposed towards innovation than others" (p. 193) due to their industrial context (Iammarino & McCann, 2006), presence of knowledge-generating institutions (Morgan, 1997), agglomeration externalities (Acs, 2002; Van Oort, 2004), and environment for entrepreneurship and innovation (Sternberg, 2011;

Ortega-Argilés and Moreno, 2009; Cozza, Ortega-Argilés, Piva, & Baptista, 2012). Thus, policies need to be adjusted to the specificities of the region (Doloreux & Porto Gomez, 2017).

As discussed above, there is limited literature on RIS in NL and, more specifically, Corner Brook and surrounding area. Considering this, the current study is designed to expand empirical research on RIS and innovation in Corner Brook and surrounding area, NL. More specifically, understanding the challenges to innovation, the key quadruple helix actors, their roles, and interactions is an important part of the RIS discussion in Corner Brook and surrounding area, and findings from this research will help to inform policy and practice in the region and in NL. Based on the barriers identified, recommendations will be presented for each category of actors within the quadruple helix to encourage the development of sustainable innovations in Corner Brook and surrounding area (see Chapter 6). This thesis will also identify critical areas for future research in the RIS based on the research findings and contribute to the existing body of knowledge on innovation in peripheral, resource-dependent regions.

1.6 Overview of Thesis

The thesis is organized into six chapters and is structured as follows. This introductory chapter (Chapter 1) has provided context and justification for the research project.

Chapter 2 introduces the concepts of innovation and region. Following this, the chapter offers a review of literature on the RIS and its key elements (e.g. research and development, the interaction of actors, and knowledge creation). In the following sections, the chapter discusses the quadruple helix approach and innovation in rural resource-based regions. Finally, the chapter provides an overview of recent studies on innovation, business development, and entrepreneurship in NL, with an emphasis on Corner Brook and its surrounding area.

Chapter 3 provides an overview of the research design and methods used in the study, including data collection and data analysis methods, as well as ethical considerations of the study. The chapter discusses why Corner Brook was selected as the study region and how the case study of the Corner Brook Pulp and Paper Ltd. (CBPPL) Greenhouse Project, an innovative project investigated in this thesis, relates to the subject of the study.

Chapter 4 discusses the research findings, mainly derived from expert interviews, on the RIS of Corner Brook, which is the context for this study. The context analysis provides insights into the roles of the quadruple helix actors and the current state of RIS in Corner Brook and surrounding area. The findings were used to provide recommendations for the actors in Chapter 6. The discussion section in this chapter will directly address the research questions based on relevant research findings.

Chapter 5 discusses the findings acquired from the investigation of the case study of the CBPPL Greenhouse Project. The case study contributes to the understanding of the roles of the quadruple helix actors, interaction among them, and barriers to innovation with a specific illustrative example.

Chapter 6 recaps the critical issues identified in the RIS of Corner Brook and offers recommendations to government agencies, post-secondary institutions, firms, and community organizations to consider in order to develop RIS and foster sustainable innovations in the region. It also describes the limitations of the study and recommends areas for future research based on the results.

Chapter 2. Literature Review

2.1 Introduction

This chapter starts by presenting a review of the literature related to a broad range of concepts and key elements of RIS that have guided this research and the analysis, methodology, and findings chapters that follow. The literature review starts with discussing the definition of innovation and the process of innovation, and the concept of region. The following sections provide an overview of RIS as well as its shortcomings and key components, and the quadruple helix approach. The literature review also highlights a range of differences that rural and peripheral regions face in pursuing innovation as compared to urban areas and discusses the importance of innovation in these regions. Following these sections, the chapter summarizes recent studies on the theme of innovation, entrepreneurship, and business development specific to NL, the western region of Newfoundland, and Corner Brook to provide a picture of the local innovation landscape. While the literature review is primarily based on innovation-related peer-reviewed articles and published books, it is complemented by including sources from the grey literature. By bringing together a set of articles, books, and government reports, the literature review intends to exemplify and develop the RIS approach and enhance our understanding of the complexities of regional innovation within a rural, resource economy setting.

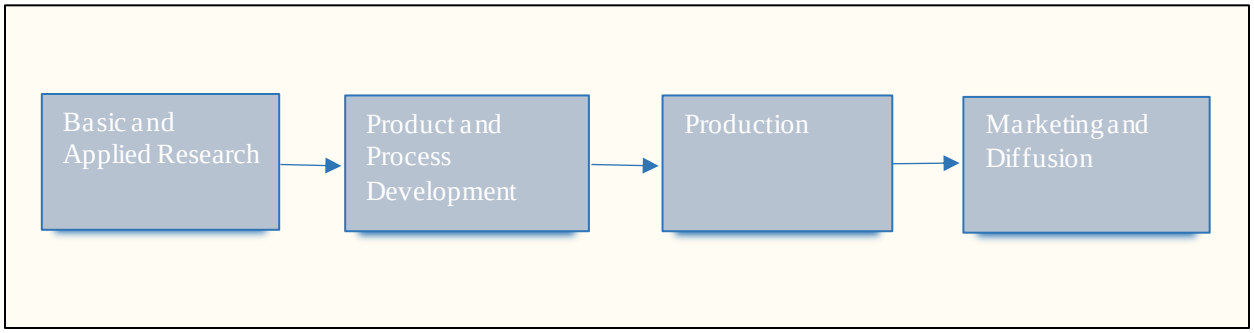
2.2 The Definition of Innovation and Process of Innovation

Organizational innovation has been much discussed in the literature. An early definition suggested by Thompson (1965) states that "innovation is the generation, acceptance, and implementation of new ideas, processes, products, or services" (p. 2). Associating innovation with a degree of change and newness, Damanpour (1996) categorizes four types of innovation: product or service innovation, process innovation, administrative innovation, and program innovation.

More specifically, Damanpour (1996, p. 694) states that "innovation is broadly defined to encompass a range of types, including new product or service, new process technology, new organization structure or administrative systems, or new plans or program pertaining to organization members." Similarly, the OECD & Eurostat (2005) defines innovation as "the development of a new marketing strategy, substantially improved product or process, a new organizational strategy in industry, workplace or external relations practices" (p. 46).

Firm level innovation is a complex process by which "firms master and get into practice product designs and manufacturing processes that are new to them" (Nelson & Rosenberg, 1993, p. 4). Similarly, according to Dosi (1988), innovation comprises "the search for, and discovery, experimentation, development, imitation and adoption of new products, new production processes and new organizational set-ups" (p. 222). Within this perspective, innovation is a linear process, which begins with new scientific research and continues sequentially through invention, development, and production activities, until ending with the marketing and sale of products, processes, and services, and after-sale adoption (Malecki, 1997). The linear model of innovation was popular from the 1950s to the mid-1970s and centred on R&D and marketing (Doloreux, 2002). Asheim, Isaksen, & Trippl (2020) state that R&D input into production activities was the most important factor of the linear model. The purpose of this model was to improve the exploration capacity of firms, regions, and nations; it did not consider the diffusion and adoption of new technologies (Figure 1).

Figure 1. *The linear model of industrial innovation*

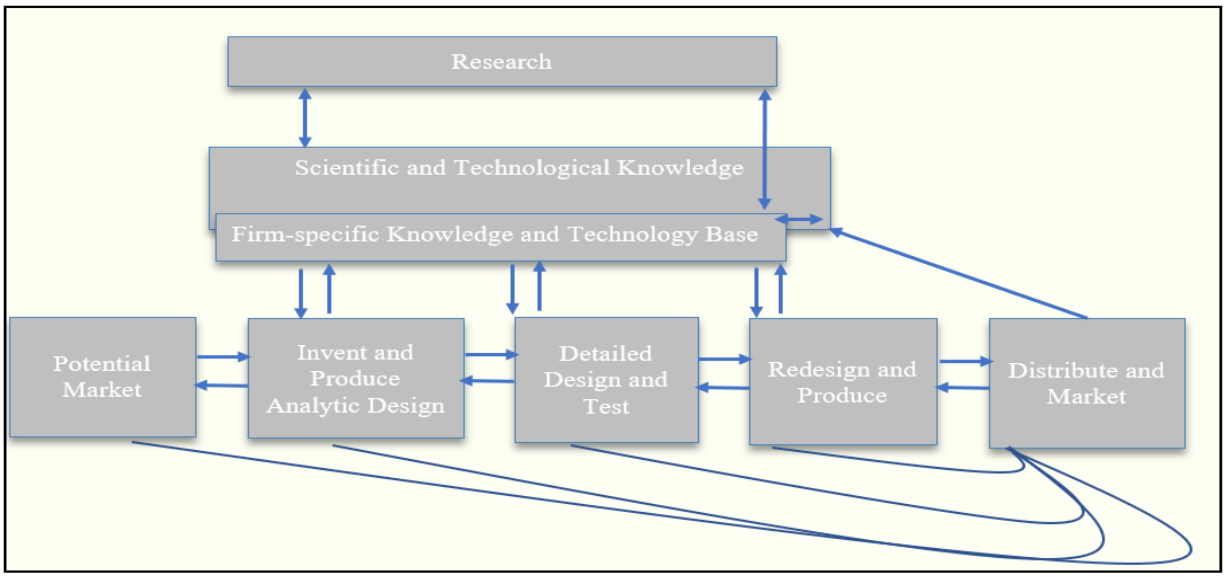


Source: Adapted from Doloreux (2002)

However, innovation has increasingly been considered an interactive learning process rather than a linear process (Kline and Rosenberg, 1986; Smith, 1994; Lundvall and Borras, 1997). Innovation, defined as "conversion of new knowledge into economic and social benefits" by the European Commission (2002, p. 22), is now understood as being a result of complex long-term interactions among actors within an innovation system (Schierenbeck, 2010). In other words, innovation, which was presented as a linear process for a long time, is now recognized as an interactive process. There is now an implicit sociological and structural view in which "learning is mainly an interactive activity and, thus, a socially integrated process that cannot be understood without its institutional and structural significance being taken into account" (Lundvall, 1992a, p. 1). The interactive innovation model was opposite to the linear model in several aspects (Doloreux, 2002). For example, the linear model of innovation was over-simplified. It focused only on the transfer of technologies from the research realm to industry (European Commission, 2002) and devoted resources mainly to R&D, neglecting the diversity of activities that form the innovation process. Instead, the new model of innovation centred on interaction processes and involved the synthesis of various types of knowledge rather than only scientific knowledge that emerged from the R&D (Figure 2). Further, within the frame of the interactive model, innovation is understood as the "conversion of new knowledge into economic and social benefits," which occurs through

interactions between players in an innovation system (European Commission, 2002, p. 22). Ultimately, the interactive model's emphasis on practice adds emphasis on not only the creation but also the use and adoption of new products or processes.

Figure 2. *The interactive model of industrial innovation*



Source: Adapted from Doloreux (2002), Kline and Rosenberg (1986), Malecki (1997), Fischer (2001)

2.3 The Concept of Region

There are different interpretations and conceptualizations around the term 'region' in the literature. Referring to Harvie (1994), Cooke & Memedovic (2003) suggest that "there is no general understanding of how to define a region" (p. 3). The term region is used to describe supranational, national, and subnational geographical areas (Schierenbeck, 2010). It is also often used for supralocal territorial areas, bigger than urban areas (Schätzl, 2001; Schierenbeck, 2010) and smaller than the state (Cooke, 1997; Schierenbeck, 2010). Blotevogel (2000, p. 496) describes the ambiguity of the definition of the region as a "multi-dimensional semantic field" with "fuzzy edges" and "multi-dimensional meaning" (Schierenbeck, 2010). According to Jovanovic (1997),

"the definition of a region depends on the problem which one encounters. A region is both a geographical phenomenon with its distinctions from others; it also has political, governmental and administrative features; and it is an ethnic and social concept with its human and cultural characteristics" (p. 301). Similarly, in a study by Collins (1994), a region is described as a geographical area according to at least one specific feature it has (i.e., geographical, functional, social, or cultural reasons). Scott & Storper (2003) interpret the term region as "any area of a subnational extent that is functionally organized around some internal central pole [most advanced forms of economic development and innovation]" (p. 580). According to Schierenbeck (2010), regions can also be defined based on "their institutional environments in the framework of evolutionary economics" (p. 43). Boschma (2004) explains the definition of the region as "(at whatever spatial level) a meaningful and relevant entity that affects the behaviour and performance of local organizations" (p. 1005).

Cooke (1998), with reference to the concept of RIS, states that: "conceptually, regions are often defined in terms of shared normative interests (cultural areas), economic specificity (mono-industrial economies), and administrative homogeneity (governance areas)" (p. 15). The role of place-based approaches in development has been widely discussed in the regional planning literature (Vodden, Gibson, & Daniels, 2014). According to Vodden, Gibson, & Daniels (2014), in terms of development theory and practice, a place has a significant role in establishing a unique environment to stimulate development by bringing together various factors, such as culture, resources, human capacity, identity, and relationships. Specific conditions or contextual elements of the geographical area directly influence the development of this area. They suggest that regional identity, cultural norms, and other informal factors of the region play a significant role in shaping the system's activities and functions, which, in turn, influence regional development. As discussed

in Section 1.2 of this study, regions are recognized as primary places of national and supra-national innovation performance.

Considering aspects of a region's possessed prerequisites and innovation problems, Tödtling & Trippl (2005) classified regions as either peripheral, old industrial, and fragmented metropolitan. According to these authors, metropolitan regions possess superior conditions for innovation, such as a skilled labour force, a dense concentration of knowledge infrastructure, quality knowledge-based services and transportation infrastructure. The institutional thickness in these regions provides exceptional networking opportunities for firms with other actors and offers local and global knowledge flow. Thus, Tödtling & Trippl suggest that these regions have a highly competitive advantage over other regions and are often considered innovation centres. Rural regions face worse prerequisites for innovation and knowledge sourcing. These regions usually are characterized by institutional thinness, being weaker in terms of knowledge infrastructure, and having less R&D concentration and innovation capacity. Old industrial regions are also considered problematic in terms of innovation development since they are "addicted" to process-oriented innovation in their mature industry sectors. Thus, entrepreneurship or product-based innovation do not progress rapidly in these regions. However, it might also be possible to see regions in a mixed form. For example, peripheral regions might also be an old industrial region, which is true of the context for this study.

As in the broader literature, there is not a general agreement on how to define the regions in NL, the context where this study occurs. The concept of '*region*' is used to name the various boundaries in the province, such as health regions, education regions, service areas of regional development associations, regional economic development boards sports teams, destination marketing organizations, Rural Secretariat regions, etc. These boundaries often emerge as a

consequence of the grassroots, provincial, and federal initiatives, and each of them has a unique history and purpose (Vodden, Gibson, & Daniels, 2014). For the purposes of this research project, the concept of the region will refer to Corner Brook and the surrounding area. Corner Brook is located on the west coast of Newfoundland, at the mouth of the Bay of Islands. The regional delineation of Corner Brook and surrounding area was used by the Government of NL to implement RIS pilot projects related to forestry and agriculture in 2017 (further discussed in Chapter 4). Activities or functions of the innovation system discussed in the current study, including competence building, networking, financing of innovation, etc., are within this "local area region" – as named by Community Accounts.

2.4 An Overview of Regional Innovation System

The significance of innovation networks often emerges as a crucial element within the context of regional or territorial models of innovation. Territorial models of innovation, which are categorized as innovative milieu, clusters, regional innovation systems, and industrial districts, often emphasize the role of networks, knowledge exchange, and social interactions on economic development (Lam et al., 2013; Hall & Walsh, 2013). For the purpose of this study, it is worth emphasizing the RIS model, which is one key form of territorial models of innovation.

The RIS approach was originally derived from the National Innovation System (NIS) approach. The NIS approach was designed by Freeman (1984) to demonstrate the economic performance of nations (Asheim, Smith, & Oughton, 2011). This idea of the NIS approach was then applied to the regional context (Cooke 1998; Cooke et al., 2000; Acs, 2000). Although the term RIS was used for the first time by Cooke (1992), it became popular via the book by Braczyk, Cooke, & Heidenreich (1998). As cited in Schierenbeck (2010), when Cooke (1998) described the RIS approach, he referred back to the studies on NIS by Lundvall (1992a) and Nelson (1993).

Considering the definition and basic elements of the RIS approach, similarities to the NIS approach are evident. However, according to Schierenbeck (2010), RIS is a narrower approach compared to NIS (Lundvall, 1992a) not only because of spatial dimensions but also its objective to be more operational (Cooke, Gomez Uranga, and Etxebarria, 1997). For example, Nelson and Rosenberg's (1993) description of the NIS approach does not assume that its system is "consciously designed, or even that the set of institutions involved work together smoothly and coherently" (pp. 4-5). On the other hand, when explaining the RIS approach, Cooke (1998) suggested it is adapted and aims to "provide an operational guide to the construction and governance" of the system (Schierenbeck, 2010, p. 94).

There are several definitions of RIS in the literature. However, focusing on region, social process of innovation, learning and interactions between the actors of the system as "a dynamic and evolutionary approach to the learning economy" (Lam et al., 2013, p. 7) are common features. For example, Cooke et al. (1998) suggest that a RIS is a system "in which firms and other organisations are systemically engaged in interactive learning through an institutional milieu characterised by embeddedness" (p. 1581). According to Lundvall et al. (2009), the RIS model "is a focusing device aiming at analysing and understanding processes of innovation (rather than allocation) where agents interact and learn (rather than engage in rational choice)" (p. 7). Doloreux (2002) suggests that a RIS "consists of a set of interacting private and public firms, institutions and other organisations function according to organisational and institutional arrangements and relationships conducive to the generation, use and dissemination of knowledge" (p. 33).

According to Cooke, Gomez Uranga, and Etxebarria (1997), a RIS consists of three basic components: region, innovation, and system. The RIS concept refers to the region as "an economic space (i.e., geography matters in an industrial organization), as relational space (i.e., institutions

matter), as well as a location to drive innovation (i.e., proximity in a wider sense matters for learning and innovation)" (Schierenbeck, 2010, p. 96). Innovation is seen as "the result of social interaction between economic actors in an open system, which interacts with its environment" (Cooke & Memedovic, 2003, p. 5). Thirdly, this concept regards the system aspect of the RIS as reflecting that "the discrete elements of RIS work in concert with one another, creating self-perpetuating cycles of innovation and economic growth" (Spigel & Harisson, 2018, p. 154). It is clear that the RIS approach primarily builds upon the relationships between the individual conceptualizations of a region, innovation, and a system (Schierenbeck, 2010).

Tödtling & Trippl (2005) suggest that the RIS approach can be used to investigate the innovation process in regions as a systematic analytical approach. Trippl et al. (2019) acknowledge that the RIS approach can be used to learn the reasons behind regions' economic successes or failures and to evaluate the design and implementation of regional economic development policies. In a policy context, there are successful applications of the RIS approach as a framework for the development and implementation of regional-based policies. For example, the Swedish government agency VINNOVA's regionally targeted innovation policy focused on the growth and competitiveness perspectives. The aim of VINNOVA is to increase Sweden's international innovation competitiveness by building strong research and innovation milieus in regions with national and international linkages (Asheim et al., 2020). A recent regional innovation concept – Research and Innovation Strategies for Smart Specialization or RIS3, having first emerged in 2013 (Lopes, Ferreira, Farinha, 2018) – is increasingly playing an essential role in European regional innovation and its development policies (Capello, 2014). The RIS3 concept strives to identify knowledge in selective research and innovation domains, along with regions' priority areas, which are an advantage and can be developed into a competitive advantage for these regions (Foray,

2014). The European Commission emphasized in its EU 2020 strategy that each RIS should be built on the specific knowledge of the region (Hoglund and Linton, 2018). In other words, the RIS3 concept is adapted from the original RIS approach and can be considered as an evolution of RIS (Lopes, Ferreira, Farinha, 2018) in a way that it primarily concentrates on the economic revenues generated through R&D (Tiits et al., 2015).

Asheim et al. (2020) emphasize that the RIS model has been and will continue to be an effective instrument to increase regions' innovativeness and competitiveness. As discussed in Chapter 1, in the current study, the RIS model has been chosen to serve the policy/recommendation mission to create and improve the regional knowledge base and interactions among various private and public institutions in this case in Corner Brook and surrounding area. Similar to the views mentioned above by Tödtling & Trippl (2005) and Trippl et al. (2019), the RIS model will be applied in this study to explore the enablers and obstacles to the development of innovations in the Corner Brook region.

2.5 Key Elements of a Regional Innovation System

The RIS approach is characterized by its various interrelated elements. Thus, its system approach recognizes the role of these elements in ensuring innovation prosperity in the region. In other words, the success of RIS depends on how well its elements perform within the system. Synthesizing multiple studies (further discussed in the next subsections), this thesis discusses knowledge, actor interactions, and R&D as the key elements of RIS. Focusing on these elements in the analysis of the findings allows the study to investigate the current state of the RIS in Corner Brook and surrounding area. The next sections introduce these elements, which will be used in the findings chapters of this study to analyze the current state of RIS in Corner Brook.

2.5.1 Knowledge Creation

When discussing the nature of innovation, it is important to consider the role of knowledge creation and absorption in generating innovations. Archibugi and Michie (1995) emphasize that "knowledge production and use are at the heart of value-added activities" that ultimately decide the success of individuals, businesses, regions and nations (p. 1). Knowledge is generally recognized as a strategically valuable resource and a source of competitive advantage in economic geography (Conner and Prahalad, 1996; Grant, 1996; Kogut and Zander, 1992; Szulanski et al., 2016). Doloreux (2002) claims that firms generate more revenue and stay competitive only if they manage to create and absorb knowledge and convert it into commercial achievements, such as innovation. Thus, the success of not only firms but also economies as a whole depends on their performance in gathering and assimilating knowledge. According to Muller et al. (2008) innovation capacity of regions is determined by their ability to: create, absorb, and diffuse knowledge; seek knowledge creation and utilization; and coordinate the resources and efforts aimed at knowledge generation and utilization.

Doloreux (2002) defines knowledge as "the accumulation of different kinds of learning" that "emerges on the basis of the perceived market situation strongly influenced by the success or failures of today's practice, routines and path-dependency" (p. 20). On the other hand, Maskell and Malmberg (1999) argue that although new rounds of knowledge creation take place based on the perceived market situation, they are significantly impacted by the successes and failures of former rounds. Doloreux (2002) adds that knowledge can be created through intentional and unintentional processes. For example, unintentional knowledge can emerge as a result of performed activities in a firm (Prahalad and Hamel, 1990). Internal practices within the firm (i.e., learning from experience, trials, errors) make firms more knowledgeable of their products,

production processes, and market demands over time. Knowledge can also be generated intentionally in firms via R&D activities as a resource-consuming effort (Maskell and Malmberg, 1999).

According to OECD (1997), knowledge emerges in two forms: codified or tacit. Codified knowledge, also known as explicit knowledge, is easily transmitted and amenable to the printed page (Dutta and Weiss, 1997). Through the codification process, knowledge is put into symbolic form (Marcotte and Niosi, 2010). Thus, codified knowledge can be shared formally and systematically as data, specifications, manuals, and drawings (Handoko et al., 2016). The codification process accelerates knowledge transfer by reducing transaction costs (Zander and Kogut, 1995). On the other hand, tacit knowledge might be insights, intuitions, skills, and experiences (Becerra-Fernandez et al., 2004). It is embodied in individuals as "personal beliefs, attitudes, values, and experiences" (Handoko et al., 2016, p. 5276) and in firms as "internal procedures, routines and the gradual building of a firm-specific culture" (Maskell and Malmberg, 1999, p. 171). Since tacit knowledge is deeply embedded, it is difficult to formalize and share it. Because of the difficulty of articulating tacit knowledge in the form of writing, it is usually received through personal experience or observations (Handoko et al., 2016). Providing the original description of tacit knowledge, Polanyi (1966) claimed that much knowledge is in a tacit form within an individual, group, or organization. According to Maskell and Malmberg (1999), the more easily codified knowledge can be identified and shared, the more important tacit knowledge becomes to maintain or increase the competitiveness of firms and relatively regions and nations. For example, if all production and market information were readable in all countries, the market competition between firms would decline (Nelson and Winter, 1977; Loasby, 1990).

According to Doloreux (2002), knowledge creation and innovation occur when organizations are open to external influences since they cannot forecast which specific influence will lead to knowledge creation. In other words, organizational innovation and networks evolve when firms and other actors share certain knowledge assets in production, marketing, distribution, etc., with each other. The next section discusses the importance of active interactions of actors in RIS to acquire knowledge.

2.5.2 Interaction of Actors

The literature on RIS strongly emphasizes that the functioning of RIS is based on the interaction between actors of the system. A key argument of the innovation systems approach is that the effectiveness of interaction between actors determines the rate of technological change and innovation (Freeman, 1988). Asheim et al. (2011) state that systematic interaction of organizations shapes the innovation and economic performance of regions (and nations). The performance of RIS is strongly affected by the level and quality of interaction between the system's actors (Fritsch and Slavtchev, 2011). Similarly, Lam et al. (2013) suggest that the interaction of economic actors and opportunities for collaboration are among the major factors in the development of innovations at the regional level. They suggest that the systematic interaction of actors facilitates knowledge flows between them and therefore is important for stimulating innovations. The process of interaction between actors leads to the emergence of a regional system of knowledge creation, and this knowledge-creating system maintains its role as a key factor in the knowledge-based economy (Maskell and Malmberg, 1999). More specifically, Asheim & Isaksen (2002) suggest that the transition from an industrial to a knowledge-based economy requires strong inter-firm innovation collaborations.

According to Asheim & Isaksen (2002), in a RIS, the interaction basically occurs between two major types of actors:

- The first group of actors are the firms of the region. They engage in value creation through innovation and building sustainable competitive advantage (Ferretti & Parmentola, 2015). Doloreux (2002) states that firms are significant players in an innovation creating system for generating and diffusing knowledge. They should be seen as learning organizations having specific values, expectations, and competence and being established in technology, production, and market. Firms must be considered as users (demanding and providing ideas for product development) and producers (developing and commercializing knowledge) (Lundvall, 1992b), and as collaborators and competitors (Autio, 1998).
- The second group consists of institutional infrastructure, including finance institutions, research and higher education institutes, technology transfer organizations, vocational training centres, business associations, etc. Doloreux (2002) divides this group into two major agents. The first type is non-firm, public organizations. They actively engage in knowledge creation and dissemination and skills production. This includes universities, higher education institutes, public research organizations (i.e., research institutes, governmental laboratories). These actors belong to the public sector and consist of training (educational and training organizations that produce skilled labour) and research components (universities and research organizations that create and diffuse knowledge). The second type is support organizations. These organizations might be private, public, or both. Community organizations are also often considered support organizations. Support organizations might assist with technology transfer between 'science producers' and 'technology users' (i.e., technical centres, technology transfer units at universities, business

incubators, Chambers of Commerce) and help firms with available financing opportunities (i.e., bank and venture capital), or with specialist support (i.e., consultants).

Doloreux (2002) acknowledges that interactions with firms, especially between firms and their networks of customers and suppliers, frame the functioning of a RIS. He refers to the argument by Archibugi and Michie (1997) that the tendency of firms to interact within the innovation system facilitates knowledge flow and, indeed, generates innovations. According to Ferretti & Parmentola (2015), the interactions between universities and firms are the most fruitful in developing innovations. University-firm relationships have a major influence on the creation and diffusion of innovation. Both actors benefit from these interactions mutually but in a different form. Silicon Valley is a popular example of these relations, where the universities increased their capacities to promote and finance entrepreneurial initiatives and built a strong relational network to foster innovations (Ferretti & Parmentola, 2015). They also argue that the relationship between university and local environment ("network forms, which involve both profit and non-profit organisations, and link the firm to the local system," [p. 18]) is less interesting in terms of generating innovation than the relationship between university and firms. According to them, although relations with universities within the local context transfer spin-off processes from university to the free market and indeed impact innovation generation processes, these interactions occur in a unidirectional form, in which university is the lead of the process. On the other side, all actors involved in the regional innovation system are still affected by the systemic effect that their interactions generate (Ferretti & Parmentola, 2015).

Innovation systems of regions can be much different from each other due to the varying nature of the actors themselves and their systematic interactions discussed in this section. One of the objectives of this study is to analyze the interactions between quadruple helix actors in the

innovation system of the Corner Brook region and therefore test the above-mentioned claim of the impact of social interactions (or lack of interactions) on generating innovations.

2.5.3 Research & Development

As discussed in Section 2.2, innovation was centred on R&D until the mid-1970s, which was considered the most important factor of the linear model of innovation. With the emergence of the interactive innovation model, the major focus switched from R&D to interaction processes. However, R&D is still recognized as crucial to foster innovation initiatives. It is a primary means of intentional knowledge creation in firms (as described in Section 2.5.1). The literature on innovation emphasizes the relationship between greater R&D efforts and better innovation performance in firms and industries (Lööf and Heshmati, 2006; Mairesse and Mohen, 2010; Crespi and Pianta, 2007). According to Becker & Dietz (2004), R&D is an important firm-specific determinant of innovation behaviour. Likewise, Lerner and Wulf (2007) describe corporate R&D as the major measurement of innovation and technological development in firms. Bushee (1998) suggests that investments in R&D determine a firm's long-run value. R&D expenditures bring concrete long-term benefits to firms (Kothari et al., 2002).

Scandura (2016) acknowledges that obtaining external knowledge is important for firms' R&D innovation activities. Firms cannot rely solely on their internal processes and resources dedicated to R&D to generate innovation successfully. They instead should seek knowledge that exists outside of their boundaries. The study by Tether (2002) shows that firms looking for radical innovation were more likely to engage in R&D collaborations than other firms. Studies on R&D cooperation suggest that firms engage in R&D interactions with other actors of the system to utilize external resources for their benefit (Caloghirou et al., 2003; Hite and Hesterly, 2001; Scott, 1996), and to share costs and risks among partners (Sakakibara, 1997; Beath et al., 1998). Involvement in

R&D cooperation has been found to benefit a number of indicators of firms' innovation performance, including sales of innovative products (Klomp and Van Leeuwen, 2001; Lööf and Heshmati, 2002; Criscuolo and Haskel, 2003) and patenting (Vanhaverbeke et al., 2002). Firms establishing consistent R&D collaborations with universities, consultants, and suppliers are more likely to generate radical innovations (Kaufmann and Tödtling, 2001).

Un, Cuervo-Cazurra, & Asakawa (2010) categorize R&D collaborations into four types: firms and universities; firms and suppliers; firms and customers; firms and competitors. Each type of collaboration has different purposes and indeed provides different types of knowledge and benefits to firms (Ahuja, 2000; Baum, Calabrese, and Silverman, 2000). For example, R&D collaboration with competitors and suppliers helps firms to achieve an increase in employee productivity, whereas with universities, it facilitates the growth of sales of new products. Thus, collaborations with universities are often chosen by R&D-intensive firms with a strong focus on technological and product development (Belderbos, Carree, and Lokshin, 2004). According to Fritsch and Lukas (2001), manufacturing firms that are seeking process innovation collaborate with suppliers, while firms interested in product innovations are more eager to collaborate with their customers. According to Un, Cuervo-Cazurra, Asakawa (2010), firm-university R&D collaborations are the most effective for product innovation since universities have a broader knowledge base than other collaborators. On the other hand, R&D collaborations with competitors have the least influence on product innovation for firms because there is only limited knowledge to be obtained from competitors, and this knowledge is usually difficult to access. Therefore, R&D collaborations between firms and suppliers provide limited but more accessible knowledge for firms than competitors and customers. Finally, firms can acquire broad knowledge from R&D collaboration with customers, but this type of knowledge is less accessible for firms. Thus, for

firms, R&D collaborations with customers have less impact on product innovation than collaborations with universities and suppliers, but more than with competitors. Although these four types of R&D collaborations differ in terms of their influence capacity on product innovation, all these collaborations offer a broader knowledge base for firms to innovate.

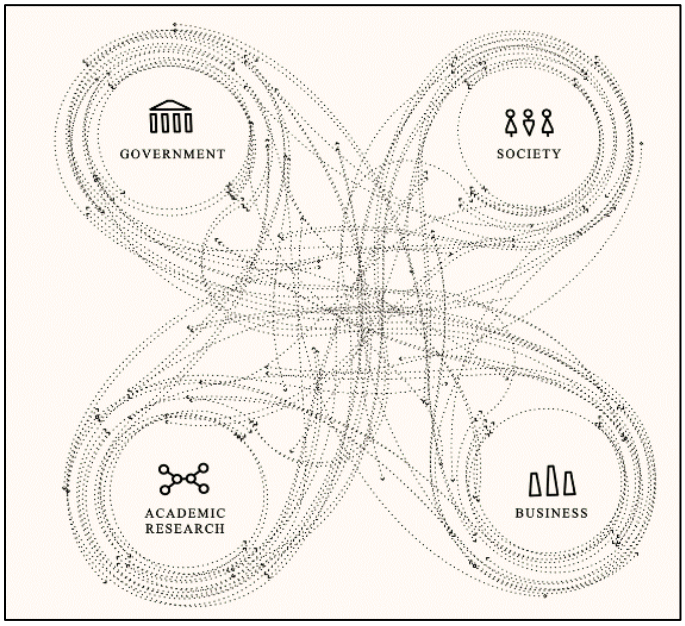
R&D activities and innovation strategies differ for rural and core regions, which means regional context matters in R&D. Analysing manufacturing data from 11 European regions (Alsace, Baden, Barcelona, Gironde, Hannover-Brunswick-Göttingen, Saxony, Slovenia, south Holland, south Wales, Stockholm, Vienna) Koschatzky & Sternberg (2000), for example, found that significant differences in R&D productivity between peripheral and central regions, even if the size of regions and industry effects were taken into account. There was significantly higher productivity of R&D activities in the central regions compared to the peripheral regions. The study suggested that agglomeration economies influence R&D activities, and the regional environment make a difference for R&D and innovation. In another study by Koschatzky (1998), analyses of several German regions indicate that R&D behaviours of firms in peripheral regions differ from their counterparts in intermediate or central regions. The peripheral regions were more interested in process innovation, whereas the central focus of firms in core regions was product innovation in terms of R&D activities. Considering that the Corner Brook region is located on the periphery, the current study hopes to find out where the region is on the R&D spectrum and how effective firms' R&D collaborations are, especially with the post-secondary institutions of the region.

2.6 The Quadruple Helix Approach

The triple helix has emerged as a key concept in the RIS framework (Asheim et al., 2011). The triple helix approach aims to foster relations between universities, the private sector, and public institutions within a region (Etzkowitz & Leydesdorff, 2000; Rodríguez-Pose, 2013).

Etzkowitz and Leydesdorff (1995) introduced the triple helix approach of university-industry-government interactions to describe structural developments in knowledge-based economies. However, civil society is also actively engaged in triple helix constellations at the regional level, forming a quadruple helix approach. The quadruple helix concept was developed by Carayannis and Campbell (2009) in response to a discussion, initiated by Leydesdorff and Etzkowitz (2003), of including 'society' or 'public' as a fourth helix into the triple-helix framework theory (p. 30) (see Figure 3). The quadruple helix approach might be seen as the redevelopment of the triple helix framework that reflects on academic, government, and industry players and acknowledges the included role of civil society within a knowledge economy (Leydesdorff, 2012).

Figure 3. *The quadruple helix model*



Source: Fraunhofer CeRRI (2018)

However, since the quadruple helix concept has not been well established in the literature yet, there are still discussions around the question of what the fourth helix of innovation helix framework should be (Carayannis and Rakhmatullin, 2014; Hoglund and Linton, 2018; Nordberg

2015). For instance, the fourth helix was conceptualized as media, culture, and civil society by Carayannis and Campbell (2014a), claiming that the fourth helix is human-centred and in favour of arts, artistic science, and art-based innovation (Carayannis and Campbell 2014b). According to them, innovation policy must be communicated with the public and civil society via the media. Ivanova (2014) also speaks about cultural aspects, albeit from an infrastructure-focused machine approach, arguing that the quadruple helix approach concerns not only the user but also the mass media, television, radio, internet, and other potential forms of mass communication infrastructure. Kriz, Bankins, and Molloy (2018) consider an end-user view of the fourth helix, involving public representatives, for instance, embedded in a community's creative and cultural fabric. Nordberg (2015) notes that the quadruple helix model of innovation should engage the whole society, including small and medium-sized enterprises (SMEs). McAdam et al. (2016) describe the innovation users as the fourth partner in the quadruple helix model from a stakeholder perspective, emphasizing interactions that occur between internal and external stakeholders. According to Carayannis and Rakhmatullin (2014), the objective of the quadruple helix approach is to reinforce and connect "eco-systemic value creators" (p. 221), who are innovation users but can also be innovation co-creators, such as entrepreneurs, artists, inventors, etc. They state that value creators, including entrepreneurs, in civil society can complement and support like-minded individuals in the government, university, and industry. Colapinto and Porlezza (2012) address financing organizations as the fourth helix.

In the RIS literature, the quadruple helix approach is considered essential to foster sustainable innovations and regional economic growth (e.g. Carayannis and Campbell 2009; Yawson 2009; Foray et al. 2012; Carayannis and Rakhmatullin 2014; Ivanova 2014; Miller et al. 2018). It is often used to describe the actors involved in the RIS model. In concrete terms, applying

a quadruple helix approach to the RIS model means a broader stakeholder involvement. Inclusion of the civil society and non-governmental actors and agencies expands the RIS framework from triple helix to a quadruple helix arrangement (Asheim et al., 2020). Therefore, the quadruple helix approach encourages citizen participation and innovation (Carayannis & Campbell, 2009). The inclusion of civil society in the RIS model is believed to reinforce democracy in developing strategies and policies for regional research and innovations (Carayannis and Campbell 2009; Cavallini et al. 2016; Deakin et al. 2018). The expansion of the triple helix approach to engage users and civil society is highlighted as crucial for the development of RIS (Kriz, Bankins, and Molloy 2018). Through the quadruple helix approach, enhancements and changes are made to the RIS model to accommodate the needs for wider stakeholder participation, greater agency presence, and an expanding role of the public sector in strengthening the demand side of innovation policies. Kolehmainen et al. (2016) state that often in peripheral regions, lack or absence of a university or other knowledge-intensive institution, scattered and less developed (in terms of innovation) business community, and/or a weak public sector makes it challenging to enhance innovativeness. In such regions, social and community groups may play a crucial role in fostering innovations, where the basic elements of the triple helix framework are present. Hence, the quadruple helix framework is important in peripheral regions for the RIS model. Being cognizant of the importance of community inclusion in the RIS model in peripheral regions, this study will explore the role of community and organizations representing the community as the fourth helix in the innovation system of the Corner Brook region.

2.7 Innovation in Rural, Resource-Dependent Regions

The literature on innovation identifies a number of significant differences between large, core regions and rural and peripheral regions. While large city-regions have the capability to allow

dense agglomeration of people, firms, and organizations with a global network (Wolfe, 2009), limited education and economic opportunities, geographic isolation, transportation and infrastructure constraints challenge rural and peripheral regions to attract and retain talents, skills, and institutions. Indeed, lack of access to capital and support organizations creates difficulties for entrepreneurs in rural and peripheral regions (Hall and Donald, 2009). Tödtling and Trippl (2005) describe institutional thinness as the primary characteristic of rural regions. Similarly, Wolfe & Gertler (2004) argue that rural regions often lack agglomeration economies. According to Doloreux (2003), innovations in rural regions occur incrementally. Therefore, due to limited support and promotion, innovations in these regions often fail to serve external markets and primarily supply to local and regional markets (Hall and Donald, 2009). Additionally, Oughton, Landabase, & Morgan (2012) argue that despite having a significant need to invest in innovation in peripheral regions, these regions have a low capacity to absorb funds to foster innovations.

Carter & Vodden (2017) acknowledge that economic structures in rural regions are often based on resource extraction, tourism, and services. Tödtling and Trippl (2005) explain that many rural areas are older industrial regions, which rested on their established industries. Despite all the above-mentioned challenges, innovations are taking place in rural regions, undoubtedly. "They often involve generating new ideas, products and processes or enhancing and altering existing innovations in traditional sectors like mining and forestry" (Hall and Donald, 2009, p. 6). Economic geography and rural studies emphasize the importance of connection to global networks and knowledge streams as major factors for the innovativeness of rural firms (Rodríguez-Pose & Fitjar, 2013; Grillitsch & Nilsson, 2015; Dubois, 2016; Martin et al., 2018). Margarian, Lilje, & Lankau (2017) state that the most innovative firms in peripheral regions are the ones with strong external connections. According to Müller & Korsgaard (2018), firms located in peripheral regions

can compensate for the lack of local assets through external linkages. On the other hand, peripheral regions might offer place-based advantages that firms can deploy, such as a loyal workforce (Küpper & Margarian, 2012; Eder, 2019), financial and cost incentives from regional and federal governments (Müller, 2016; Eder & Trippl, 2019), short distance to specific natural resources (Davies, Michie, & Vironen, 2012), and close-knit local networks (Ring, Peredo, & Chrisman, 2010). Although a lack of literature on innovation in rural and peripheral regions challenges us to have a detailed look into innovative activities in these regions, several studies have emphasized their potential. For example, the study by Doloreux and Dionne (2008) found that the small size of La Pocatière, a rural region in Quebec, facilitated trust and interaction among public institutions and firms. Similarly, the study by Copus et al. (2011) suggests that networks in rural regions can compensate for the absence of agglomeration economies and facilitate knowledge transfer. Nordberg (2015) states that "if peripheral regions get connected, both inwards and outwards, they might stay competitive and have a role to play in larger innovation networks" (p. 353). Another study by Polèse et al. (2002) provides important insights into innovation potential in resource-based sectors (i.e., new mining techniques, new techniques to cut wood products) in Quebec and Atlantic Canada.

The Corner Brook region has a history of resource dependency with forestry. The regional economy also includes fisheries, mining, tourism, and agriculture. These resource-based industries have been dominating the economy in most of the region's communities. The Corner Brook region retains its peripheral status due to low population densities, resource dependency, and the absence of a metropolitan area. By focusing on the Corner Brook region, this study will help to expand empirical research on innovation in peripheral and resource-based regions.

2.8 Innovation in Newfoundland and Labrador

There is a general agreement in the literature on the weak innovation performance of NL as in many peripheral regions in the broader literature. As discussed by Hall and Walsh (2013), under its Innovation Strategy (2006), the Government of NL had implemented a number of measures to enhance innovations, including:

> "a new commercialization program and a new innovation enhancement fund focused on: supporting the development of strategic clusters; creating an innovation awards program; forming a Federal-Provincial Innovation Team; supporting youth innovation; establishing an innovation scholarship fund; enhancing graduate employment opportunities; informing the business community on R&D incentives; establishing an Advisory Council on Innovation." (p. 23)

However, the Innovation Strategy applied by the Government of NL did not use a place-based tailor-made development approach and, therefore, failed to bring key innovation system actors together to foster innovations (Hall and Walsh, 2013). Additionally, the region has seen the establishment of the Business Innovation Agenda entitled *Newfoundland and Labrador's Business Innovation Agenda: The Way Forward on Business Innovation* (2018) and implementation of RIS3 pilot projects in various regions, including Corner Brook and surrounding area, to increase regional innovation competitiveness (to be further discussed in Section 4.5.1) by the Government of NL. However, compared to the national and international levels, innovation growth remains weak in NL. The studied regions in the province are characterized by significant limitations on innovation. For example, Hall & Walsh (2013) identify several barriers to innovation in NL, such as infrastructure constraints, isolated regions, lack of knowledge generation, talent attraction and retention, and resistance to knowledge sharing and collaboration. Walsh and Winsor (2019) found low tolerance for change, risk, and failure among entrepreneurs, government, and funding sources; weak support system and lack of mentorship; and low connectivity, lack of networking and

information sharing among entrepreneurial peers in NL. Many regions in the province are considered rural and old-industrial, lacking innovative industrial and learning systems.

The literature also suggests some opportunities that can be leveraged for fostering innovation in NL. For example, despite having limited key economic sectors, people from the province indicated a strong commitment to place (Greenwood, Pike, & Kearley, 2011). People who study and work away, bring a diversity of knowledge and contacts to the province from which innovative ideas and opportunities emerge (Greenwood, Pike, & Kearley, 2011). The literature emphasizes the importance of strong institutional infrastructure, networking and knowledge flows within and across sectors in these regions and strongly recommends applying a quadruple helix innovation strategy in NL (Hall & Walsh, 2013; Hall, Walsh, Vodden, & Greenwood, 2014). Hall & Walsh (2013) indicated the need for industry associations, firms, community organizations, all levels of government, and post-secondary institutions to generate new ideas for future directions to develop innovations in NL. Based on the recommendations from industry, academia, government, and community stakeholders on how to expand the capacity of innovative businesses, the Department of Tourism, Culture, Industry and Innovation (TCII) (known as the Department of Industry, Energy and Technology at the time of this writing) – Government of NL (2017) identified needs around five key areas for the province: business and innovation skills; market opportunities; access to financial capital; access to talent; and innovation culture. On the other hand, Greenwood, Pike, & Kearley (2011) emphasized that the regions of NL have the potential to foster innovations by building on their existing strengths and addressing weaknesses.

Similarly, the studies conducted in western NL indicate that the region tackles several issues. For example, Hall & White (2013) acknowledged the shortcomings of the labour market, youth-out migration, tight social networks, and lack of willingness to collaborate, which limit the

growth of innovation in western NL. The report also stated that despite enough creative ideas, the province was not innovative in an economic sense. Vodden, Tucker, Gibson, & Holley (2011) emphasized the importance of and the need for stronger regional leadership in Newfoundland's Great Northern Peninsula to seek ideas and support from outside the sub-regions. The study called for more collaboration and communication among organizations in the region and encouraged them to seek support outside sub-regions. Discussing the applicability of RISs in the Great Northern Peninsula of NL, Carter & Vodden (2017) found a lack of leadership at the municipal level due to limited resources and from the entrepreneurs. This urged leadership from federal and provincial governments, support organizations, and post-secondary institutions. According to the article, lacking a robust private sector and a strong system of local government are the weakest elements of the quadruple helix within the Great Northern Peninsula.

There were also studies conducted on innovation and the entrepreneurial ecosystem in Corner Brook. According to Greenwood, Pike, & Kearley (2011), in order to grow the local economy and mitigate risks for its resource-based economy, Corner Brook (home to several post-secondary institutions) should focus on developing a knowledge-based economy. Burden (2008) emphasizes the need for firms in this city to invest in innovation and technology, and Wolfe (2009) articulates the concern that isolated social networks in Corner Brook impede the development of innovations. Lam et al. (2013) strongly emphasize the need for an enhanced range of external and peripheral connections in Corner Brook to strengthen networks for innovation activities. Likewise, Winsor & Carter (2018), analyzing the knowledge-seeking activity of actors in Corner Brook, recommend that all entrepreneurial ecosystem actors in the region enhance their ecosystem and expand knowledge seeking to outside the local area. Considering these recommendations, each quadruple helix actor has an important role in dealing with the above-noted problems and

supporting innovations in Corner Brook. This calls for the coalition of these actors to act more collaboratively within the RIS, which is the primary focus of this study. Hence, adding to the previous studies conducted in NL, this research will cast light on the RIS in Corner Brook and surrounding area using the quadruple helix approach in order to make research results comparable across other regions of the province. This is important to understanding whether the RIS in Corner Brook and surrounding area has similar challenges and advantages to other regions in NL. Also, compared to the previous studies, this research will put more emphasis on the role of the key quadruple helix actors in the RIS of Corner Brook and surrounding area and sectoral and cross-sectoral interactions among these actors. Further, there have been significant developments in the region since the initial studies and even the most recent work by Windsor & Carter (2018).

2.9 Conclusion

This chapter offered a review of the literature in four parts. The first part of the chapter introduced the concepts of innovation and region. It was argued, based on this literature, that innovation is an interactive process, which emerges through interactions between actors of the system. The second part described the conceptual underpinnings of the study – RIS and the quadruple helix approach. It discussed the major interrelated elements that determine the effectiveness of RIS and shed light on the importance of engaging society in RIS. The third part discussed that rural resource-based regions often have different limitations and opportunities to foster innovations than core regions. The final part of the chapter reviewed the literature on innovation and business development in NL. It was clear from the literature review that innovation should be advanced in the province. All of the previously studied regions demonstrated significant barriers to innovation development, including Corner Brook and area. Despite this, a limited

number of studies have investigated innovation strategies and policies in the province. The next chapter explains how the thesis attempts to contribute to the current literature.

Chapter 3. Research Methodology

This chapter describes the methodological approach applied in the current study. Specifically, the chapter discusses the research design and overall project methodology, including a rationale for the selection of the Corner Brook region as a study region and demographic information of its community, the description and selection of the case study, summary of the analytical framework, data collection methods and procedures. The final sections discuss data analysis techniques and ethical considerations of the study.

3.1 Research Design

3.1.1 Selection of the Study Region

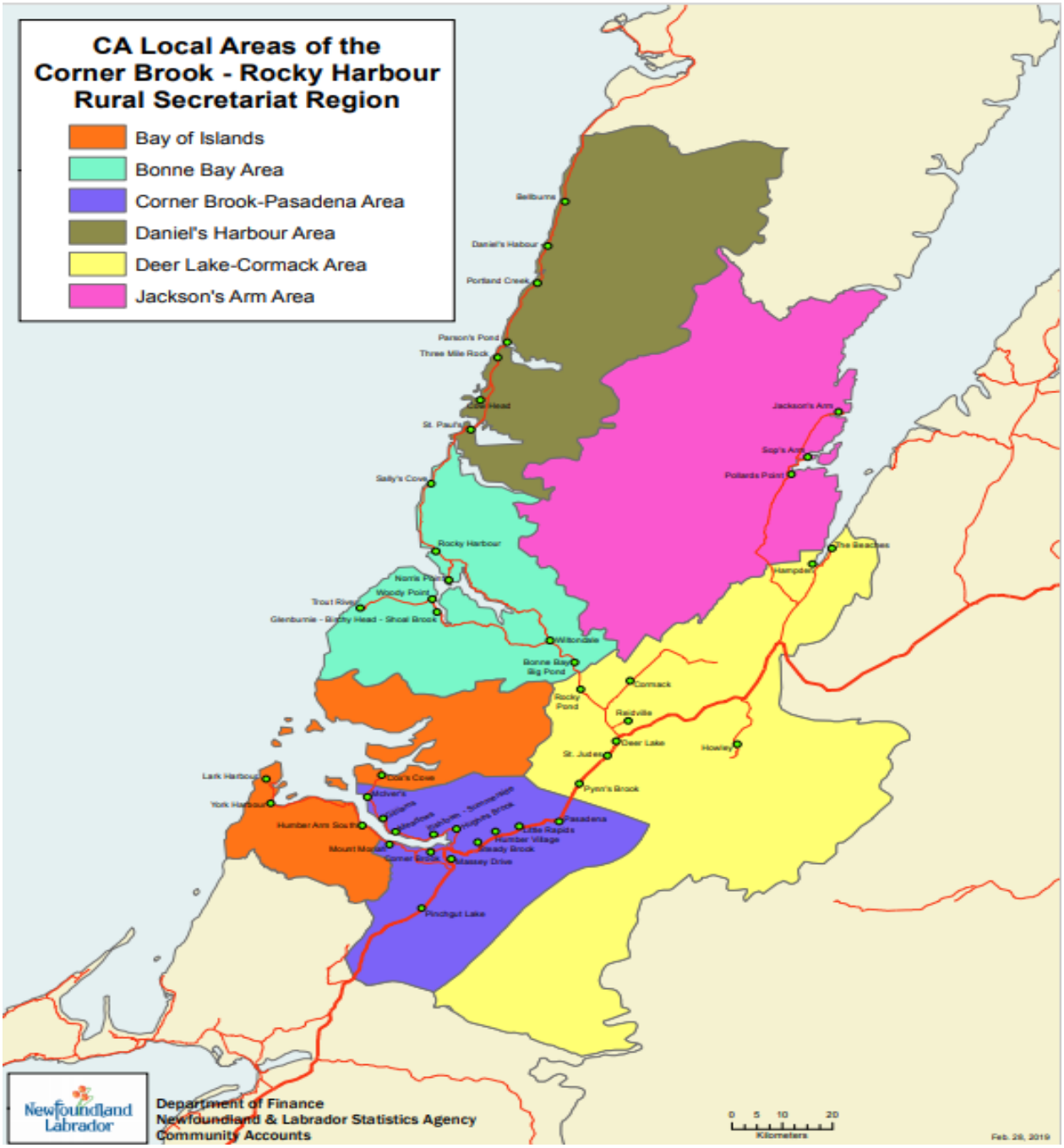
The Corner Brook city-region has many features that mainly belong to larger regions (e.g. strong institutional presence, transportation infrastructure, etc.) (further discussed in Chapter 4). The land area of Corner Brook census agglomeration (CA) is 1140.20 square kilometres (Statistics Canada, 2019). Compared to other regions at a national and international level, the city and its surrounding area are small and peripheral. This region is mostly made up of traditional resource-based industries and lacks highly intensive technology-based firms and initiatives favouring innovation, knowledge and technology transfer (as discussed in Chapter 2). As discussed in Chapter 2, few studies on innovation and entrepreneurship have been conducted in Corner Brook. The previous work provided a basis for further study and raised questions about the reasons behind poor innovation performance despite apparently sufficient regional capacity. Hence, Corner Brook and its surrounding area were selected as a study region based on the assumption that the study could investigate the current state of the RIS, understand the reasons behind poor innovation performance despite sufficient regional capacity, and provide recommendations for this region based on the analysis. Therefore, having had an internship experience with CBPPL/Grenfell

Campus, Memorial University of Newfoundland (GC-MUN) collaboration (and, more specifically, the CBPPL Greenhouse Project) was important for the author to obtain necessary insights from the quadruple helix of government, university, the private sector, and community actors and understand RIS challenges and opportunities in Corner Brook through a case study (to be further discussed in Section 3.1.4). Thus, data obtained through this internship experience was used to analyze the case study. This exposure was an additional appealing factor for the author to study the RIS of Corner Brook.

3.1.2 Statistical Profile of the Study Region

Community Accounts, which is an information system of the Newfoundland and Labrador Statistics Agency (NLSA), provides comprehensive community, regional and provincial data. Under the local area regions, Community Accounts provides statistical data about the community of Corner Brook and the surrounding area. This region includes the municipality of Corner Brook, the municipality of Massey Drive, the municipality of Steady Brook, the municipality of Irishtown-Summerside, the municipality of Hughes Brook, the municipality of Gillams, the municipality of Meadows, the municipality of McIver's and the Local Service District of Little Rapids, and also Humber Village and Pinchgut Lake (see the Corner Brook-Pasadena Area in Figure 4).

Figure 4. *Corner Brook and surrounding area*



Source: Department of Finance, NLSA, Community Accounts

According to the data provided by Community Accounts (2019), in 2016, the Census population for Corner Brook and its surrounding area was 26,095, which is 2 % higher than in 2011 (up from 25,595). In 2016, the median age in the region was 47, compared to 46 in NL

(Community Accounts, 2019) and to 41.2 – national median (Statistics Canada, 2017a). In 2017, gross personal income per capita in the Corner Brook and the surrounding area was $36,200, compared to $37,100 in the province; after-tax personal income per capita was $22,500 (for the province, the average was $22,800) (Community Accounts, 2019). National median after-tax income was $30,866 in 2015 (Statistics Canada, 2017a). In 2016, the employment rate among people 15 years of age or higher in the Corner Brook region was 50.6 % compared to the 49.5 % provincial average (Community Accounts, 2019) and 60.2 % national average (Statistics Canada, 2017a). In the same year, the unemployment rate for the region was 13 % (15.6 % in NL) (Community Accounts, 2019) and 7.7 % in Canada (Statistics Canada, 2017a). Main occupation types for females in the Corner Brook region were: health; business, finance, and administration; education, law, and social, community and government services; and sales and service – while for males, key occupations were: trades, transport and equipment operators; sales and service; and management (Community Accounts, 2019).

Education and skills are considered important indicators for innovation processes (as discussed in Chapter 2). The region had slightly higher rates than the provincial average for the education category. In 2016, for example, 11.3% of residents 25 to 64 years of age in the Corner Brook region did not have a high school diploma, compared to 15.7% provincial average (Community Accounts, 2019). In this region, 20.6% of the people aged between 25 and 64 had a Bachelor's Degree Diploma or higher education level in 2016 (compared to 18.3% for the whole province) (Community Accounts, 2019).

The statistics provided by Community Accounts show that the Corner Brook region is roughly equal to or even exceeding provincial averages in many indicators that are important for regional development. Employment rate, education and skills are the areas of apparent strength

compared to the provincial level. However, the data from Statistics Canada (2017a) shows that the region's median age is higher compared to the national median, and the employment rate is behind the national average.

3.1.3 A Qualitative, Case-Study Approach

A case-study research design has been adopted for this thesis in order to answer the research questions and, therefore, to obtain an in-depth understanding of Corner Brook's RIS. A case study, as defined by Yin (2009), allows a researcher to investigate a phenomenon in a particular context and provides knowledge that can be used in other study areas in various ways. Creswell (2014) describes a case-study approach as valuable for an in-depth analysis of a subject area. Most studies on RIS in NL (discussed in Section 2.8) and, in general, economic geography and rural studies (Eder, 2018) have been based on case studies. This study is consistent with the literature in using a qualitative case-study approach to pursue an in-depth understanding of the current state of RIS in Corner Brook. As Yin (1994) stated, "how" questions in the research prompt the application of case studies. He also added that "what" questions are the rationale for exploratory research design. The current study asks: how do quadruple helix actors serve the development of RIS in Corner Brook and surrounding area?; how do quadruple helix actors interact in the Corner Brook RIS; what role(s) do quadruple helix actors play in the Corner Brook RIS; and what are the region-specific barriers and opportunities for innovation in the Corner Brook and surrounding area. Hence, consistent with Yin (1994), this research uses an exploratory case study approach to seek answers to these questions.

This exploratory research examines the Corner Brook region as the broader context of the specific case study – CBPPL Greenhouse Project. More specifically, the study explores the RIS within the Corner Brook region, and a case study of the CBPPL Greenhouse Project allows for

further understanding of this context. Both the analysis of the overall context and the case study utilize a qualitative approach. In qualitative research, participants' perceptions on a given subject might be biased, and the validity of these perceptions is often tested by the extent of similar observations (Silverman, 2005). In this research, the case study application, which used the author's observations in addition to interviews for the qualitative data collection, helps compare the data from the case study to the broader context, coupled with findings from other related studies.

3.1.4 Description and Selection of the Case Study – CBPPL Greenhouse Project

The case study, which provides additional insight for this thesis, has evolved as a part of the Centre for Research and Innovation (CRI) initiative. The CRI is a collaborative effort of the College of the North Atlantic (CNA), GC-MUN, and CBPPL (these actors will be further described in Chapter 4). The CRI seeks to foster local and regional economic growth through innovation, research, and training and aims to serve as the hub for RIS in Corner Brook. There are three related components of the CRI project: 1) development of the Innovation Centre building in Corner Brook; 2) research on the use of waste byproducts of CBPPL and new product development; and 3) training opportunities for CBPPL employees (Centre for Research and Innovation, 2021). CRI's operations include several research projects, and one of them aims to study the feasibility of using waste heat and additional energy from CBPPL to operate a greenhouse in the City of Corner Brook (Centre for Research and Innovation, 2021). This research project builds on previous feasibility studies for Corner Brook District Energy [1] related to the use of thermal energy at CBPPL (FVB. Energy Inc., 2008; FVB Energy Inc., 2010). Within the larger

[1] Corner Brook District Energy system would use excess thermal energy at CBPPL to provide heating to several buildings in the city (FVB. Energy Inc., 2008).

partnership context of the CRI, the project led to discussions around planning the construction of a larger greenhouse facility near CBPPL with the additional private sector and Indigenous partner organizations. This innovation project is in the development phase currently and is a case study for this thesis. The aim of this larger greenhouse project is twofold. First, it aims to provide space for partners to implement technical and scientific research initiatives related to the application of sustainable industry practices and clean technology opportunities in greenhouse production. Secondly, it has a clear commercial goal to produce year-round high-value local fresh vegetables for the community and surrounding region by using waste energy and steam produced by CBPPL.

The geographical landscape, cold climate, and remoteness of the island of Newfoundland, coupled with limited food production, make it dependent on the mainland and other countries for food. While imports meet the need for food on the island to a degree, they come with extra costs and reduced produce quality due to long-distance transportation. Since there is no land access to Newfoundland from the mainland and other countries, food is imported only through air and ferry. Thus, any additional issues related to the ferry system, labour (disputes), or weather conditions further reduce access significantly to fresh and healthy food (Quinlan, 2012). In case of realization, the CBPPL Greenhouse Project can provide year-round access to fresh and healthy food in the province.

Despite remaining as an important employer and industry in the Corner Brook region, decreasing demand for newspaper production has negatively affected CBPPL's economic conditions (Centre for Research and Innovation, 2021), like other pulp mills worldwide (Business Partner Magazine, 2021). The project, which is central to the case studied in this thesis, takes into consideration the declining pulp and paper industry, food security concerns in the island of

Newfoundland, and environmental impacts of CBPPL's industrial operations (i.e., hot water discharge into the Bay of Islands, released steam into the atmosphere). As noted above, the project is part of a larger collaboration and intends to use an innovative approach to tackle these issues, which have critical importance to the region. There is potential to use waste energy and steam produced by CBPPL to heat a greenhouse. The application of the waste heat (i.e. steam, hot water) to the greenhouse can also reduce the province's carbon footprint and effluent of CBPPL to deliver positive environmental impacts, generate social benefits (i.e., year-round access to fresh and healthy food) and economic benefits (i.e., new revenue streams for business partners, employment opportunities for the community, reduced waste removal costs for CBPPL) for Corner Brook and the wider western Newfoundland region.

This project is a collaborative effort of partners with representation from the private sector, academy, and community. The role of the government actors is also important to the development of the project. Being a part of the research component of the CRI project, the greenhouse project received funding from various government agencies to build a greenhouse facility for agricultural research purposes (Centre of Research and Innovation, 2021). Additionally, staff from federal and provincial government agencies have been involved in the project's development phase, participating in partner meetings, providing recommendations to apply for available funding programs, and assisting with writing a proposal. This innovative greenhouse project involves the cooperation of actors from the private sector, government, university, and community, in which all actors play a pivotal role. Additional information about the specific roles of each actor in the project will be provided in Chapter 5.

The greenhouse project is also a means for continued communication and collaboration among government, university, the private sector, and community organizations in pursuit of the

development of sustainable and innovative practices. One of the key objectives of the project is to establish a collaborative partnership model. Involving quadruple helix of government, university, the private sector, and community actors in the development phase, this innovative greenhouse project is an excellent case allowing for a detailed look into RIS in the Corner Brook region. More specifically, this case study provides a sample of RIS challenges and opportunities in the Corner Brook region, including community support, networking among quadruple helix actors, and the availability of government financial support programs (as described further in Chapter 5).

3.1.5 Analytical Framework

This study evaluates the roles of key actors and interactions between them in the innovation system of the Corner Brook region by using context and case study analysis and provides recommendations based on this analysis. In doing so, the study adopted the RIS approach. As discussed in Chapter 2, Tödtling & Trippl (2005) suggest the RIS approach as a systematic analytical approach to explore the innovation process in regions. According to Trippl et al. (2019), the RIS approach can be used to understand the reasons behind regions' economic performance and to evaluate regional economic development policies. Similarly, López-Rubio, Roig-Tierno, & Mas-Tur (2020) justify RIS as a "popular way of explaining a region's development and competitiveness based on innovation activities and processes" (p. 1). The RIS model, applied in this study, assists in understanding the environment for innovation in the Corner Brook and area region. The analysis of this study focused on four research questions, as discussed in Chapter 1.

3.2 Data Collection Procedures

Data collection for this research occurred within two different components: research on the context and research on the specific case. Both components employed qualitative data collection methods. The primary method of data collection for the first component of the project was semi-

structured expert interviews. The purpose of the first component was to explore the roles of quadruple helix actors and their interaction within RIS in Corner Brook and surrounding area. The second component of data collection occurred through the case study. For the case study, qualitative data were collected primarily through engaged participant observation. In addition, data from structured interviews conducted with local retailers, wholesalers, and restaurants during my internships (further discussed in Section 3.2.3 and Chapter 5) with CBPPL Greenhouse Project were used in the case study. This data was used to investigate community willingness to support a local innovation initiative and to buy from a local greenhouse facility. Engaged participant observation (being involved in the development of the CBPPL Greenhouse Project and collecting data, which will be further discussed in Section 3.2.2) contributed to the understanding of the current ground of the feasibility of innovation projects, including challenges and opportunities in the region. Secondary data were collected in both components of data collection. In the first component, secondary data helped to explore the innovation context in the Corner Brook region. In the second component, secondary data collected through media, government documents, reports, and previous research projects were used to learn more about the community support and available funding opportunities for the CBPPL Greenhouse Project. The following sections will provide further information about how data was collected through each method.

3.2.1 Semi-Structured Interviews

Semi-structured expert interviews were the primary data collection method to explore the roles and interaction of quadruple helix actors within RIS of Corner Brook, as well as region-specific advantages and challenges to foster innovations. Participants expressed their expectations from the RIS and provided recommendations to improve it. This component of the study recruited participants with a wide range of expertise and a diversity of opinions. In order to have a detailed

look into the roles of quadruple helix actors of the RIS in Corner Brook and their sectoral and cross-sectoral interactions, semi-structured interviews were undertaken with participants from four categories: government (federal, provincial, and municipal), post-secondary institutions (CNA and MUN), community groups/non-profit organizations (i.e., NGOs that focus on sustainable innovations), and the private sector (local firms). The selected participants had specific knowledge and expertise of the innovation system of the Corner Brook region. Although the participants did not have to reside in Corner Brook, they had to demonstrate the expertise of the Corner Brook region's innovation system. In total, 21 semi-structured interviews were conducted consisting of:

- 4 with government representatives as follows: 2 with municipal government, 1 with the provincial government, and 1 with the federal government;
- 6 with post-secondary institution officials: 2 with CNA and 4 with MUN;
- 7 with community organizations;
- 4 with the private sector.

These interviews involved a range of open-ended questions based on the themes emerging from the questions of the thesis. Participants from each actor group of the quadruple helix were asked a number of different questions. Although most of the questions asked were open-ended in nature, a small number of structured questions were also used. Due to social distancing guidelines as part of emergency measures related to the situation of COVID-19 in NL during the data collection period, the interviews were conducted primarily via online meetings using online platforms such as Webex, Zoom, Microsoft Teams or via telephone, based on the preference and availability of the participants. Each interview was approximately 50-60 minutes in length. A list

of guiding questions for these interviews can be found in Appendix A. After obtaining consent from participants, the interviews were recorded digitally using a recording device.

3.2.2 Engaged Participant Observation

Engaged participant observation was used in this research to observe and gain more insights into the feasibility of developing innovation initiatives and the RIS in Corner Brook. Robey and Wallace (2018) define engaged participant observation as a research method, which integrates research and practice roles for an engaged researcher to get insights from qualitative field research. The opportunity to become an engaged participant observer came from two internships, which focused on the feasibility of operating a greenhouse using waste heat from CBPPL. I had an opportunity to work for CBPPL – assisting with the development of the greenhouse project through two internships provided by the Mitacs Accelerate Program. This greenhouse project was a part of a larger collaborative research project between CBPPL and GC-MUN (to be further discussed in Chapter 5). Starting the first internship in December 2019, I was involved in project development from the start. Having the second internship, which started in January 2021, allowed me to continue to be involved and stay up to date on the current status. As noted above, the aim of the first internship was to conduct a feasibility study of a research greenhouse facility to use by-products from CBPPL. The second internship, however, involved additional private sector and Indigenous partner organizations and focused on the planning of the development of a larger greenhouse facility near CBPPL, which could serve both research and commercial purposes.

This opportunity allowed me to be in regular contact with key project stakeholders and to better understand the roles and expectations of each project partner. As an active participant in this project, I collected data through document review and some of the project meetings, project-related

tasks, emails, consultations, observations, etc. Through the project development phase, I kept notes of interactions among project partners. These observations were used to add more context to the analysis of the study findings. It is important to note that some of the project meetings were confidential and, therefore, the information obtained during these meetings is not shared through this study. Because some of the project data contained confidential and proprietary information, in order to be able to be an active participant observant and maintain the confidential information in strict confidence, I signed a Non-Disclosure Agreement (NDA) between MUN and the project partner from the private sector. That is, MUN entered into a Research Participation Agreement (RPA) with CBPPL as to the respective rights and obligations of its researchers to the CRI project. This allowed me to use some of the information I received during two internships to analyze the case described in Chapter 5.

While participant observation is "an appropriate research method for engaged practitioner" (Robey and Wallace, 2018, p. 1), it is possible that the observations in the case study of this thesis are affected by the relations between me and the project partners. For example, I am a student of GC-MUN, which is one of the partners of the CBPPL Greenhouse Project. Also, I was paid through a Mitacs internship which included a financial contribution from CBPPL (another major partner of the project). Thus, the observations and ultimately the project findings might be biased toward partners. To address this, I aimed to be an objective observer and kept notes through the project development, making every effort to ensure bias does not influence the observations and findings of the case study. Triangulation with additional data sources beyond observation (e.g. interviews, documentation) also assists with minimizing bias.

3.2.3 Structured Interviews

The study also used the findings from structured interviews conducted for the CBPPL Greenhouse Project during my internship. As a part of my internship work, six structured interviews were conducted with representatives from local retailers, wholesalers, and restaurants to explore local customer perspectives and the market potential of locally grown vegetables. The findings used from these interviews for the current study contributed to the understanding of whether local production has an advantage over imported products in the perception of consumers and the extent to which community would support a local initiative. This in turn provides insight into the support of community, as a quadruple helix actor, for this specific innovation. Structured questions were asked to the interview participants so that responses could easily be classified into predetermined themes (to be further discussed in Section 3.3). A list of these questions can be found in Appendix B.

The target population for the structured interviews were local business owners/managers interested in purchasing local greenhouse vegetables. More specifically, in order to explore customer perspectives in the region, six structured interviews were conducted with the representatives of retailers, wholesalers, and restaurants as follows:

- 2 interviews with restaurant owners;
- 3 interviews with wholesaler representatives;
- 1 interview with a retailer representative.

The interviews lasted approximately 20 minutes. All of the structured interviews were conducted via telephone. With the consent of the participants, the interviews were recorded digitally to ensure that the data were accurately documented.

3.2.4 Sampling Techniques

Two sampling techniques were used in this study to recruit participants. The sampling technique used for the structured interviews was purposive sampling. Purposive sampling was also the primary sampling technique used for semi-structured interviews. According to Onwuebguzie and Collins (2007), purposive sampling selects participants with knowledge of a particular subject. Using purposive sampling for structured interviews, participants were selected from the available lists of local wholesalers, retailers, and restaurants (as discussed in the previous section). Expert sampling was used for the semi-structured interviews. Kumar (2014) describes expert sampling as one form of purposive sampling. In this form, selected participants should demonstrate expertise in the field of the subject. Applying this technique, participants were initially selected from publicly available lists of experts in the field of interest.

The second sampling technique used in this study was snowball sampling. According to Christensen (2012), in this technique, participants recommend other potential participants to researchers using their networks. In this study, snowball sampling was used as a secondary sampling technique for the semi-structured interviews. After information was collected from a preliminary group of participants, they were asked to identify other people who might be able to contribute to the objectives of the research. After additional individuals were suggested by the interview participants, their background was investigated by me to identify the ones meeting the study's selection criteria of participants. The individuals, met the 'expert' criteria for the semi-structured interviews (as discussed in the Section 3.2.1), were contacted to be invited to participate in this research. This process continued until adequate data were collected for the purpose of the study.

3.2.5 Recruitment of Participants

The interviews for this research were conducted from July 2020 until November 2020. Before the interviews were conducted, the participants were sent a copy of the recruitment letter (recruitment letters for both semi-structured and structured interviews can be found in Appendix C) via email to inform them about the research objectives, how the study results would be reported, expectations from them, and an invitation to be a participant in the study. After confirmation of participation, the date and time of the interview and means to conduct it was decided, and the participants were provided with the interview questionnaire in order to give them an idea of the range of topics. Then, the informed consent form (Appendix D) was sent to each participant indicating the objectives of the research in more detail, participants' role in this study, measures taken to protect the confidentiality, and their right to withdraw from the study.

3.2.6 Secondary Data Sources

In addition to the primary data, secondary data were collected and used throughout and in preparation for this study. Secondary data were collected primarily from publicly available government documents, reports, media, and previous research conducted in the study area. This also included economic development reports, government statistics based on a range of innovation indicators, and government innovation agendas. Secondary data were primarily collected to gain understanding and develop knowledge of the key actors of RIS and their roles and to investigate innovation funding programs and other opportunities offered by various actors in the Corner Brook region.

Secondary data also provided a basis for the primary data collection to be able to further explore the role of various actors, ways that the likelihood of innovation success might be enhanced in Corner Brook, etc. For example, the latest government projects and documents on innovation

development in NL were reviewed before conducting interviews with the representatives from the federal and provincial governments in order to have a better understanding of government perspectives on the subject and to ask emerging questions from these sources during the interviews.

3.3 Data Analysis Technique: Content Analysis

Data collected via interviews, participant observation, and secondary sources were then analyzed to address the research questions. The data analysis method of this research was qualitative content analysis with the assistance of NVivo software. According to Hsieh and Shannon (2005), qualitative content analysis is "a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns" (p. 1278). Qualitative content analysis is used to prepare, organize, and report qualitative research findings (Elo, Kanste, Polkki, Utrianen, & Kyngas, 2014).

Content analysis was applied by coding transcripts of participants' responses and the researcher's notes using NVivo software to categorize and examine emerging patterns. NVivo software allowed me to identify themes that represent answers to the research questions and analyze similarities and differences in responses related to these themes, including insights from interview participants regarding possible solutions to encourage sustainable innovations in the Corner Brook region. Additional to predetermined themes (e.g. interaction, the role of actors, opportunities for innovation, the current state of RIS) based on the research framework, new themes (e.g. the history of economic development in Corner Brook, recommendations for the RIS actors, impact of high school education on innovation development) also emerged based on the participants' responses to the interview questions.

3.4 Ethical Considerations

Because the data collection phase of this research project involved human participants, it was subject to the principles of the Tri-Council Statement: Ethical Conduct of Research Involving Humans. The Grenfell Campus Research Ethics Board (GC-REB) reviewed the research proposal, including the internships aspect, and approved it to be in compliance with Memorial University's ethics policy. No greater physical, psychological, social, and financial risks to participants were identified. Additionally, as described in section 3.2.2, because some of the greenhouse project data contained confidential information, to be able to become an engaged participant observer, confidentiality obligations were set for me. An NDA between MUN and the private sector partner was signed by me. To facilitate the CRI project, an RPA was used by MUN and CBPPL. This agreement covered matters related to intellectual property, publication, confidentiality, liability, etc. Therefore, confidential information has been maintained by me, and any project IP has not been published through this research. Also, to protect the confidentiality of the additional partners of the project, their names were indicated as the private sector and Indigenous organizations throughout the study.

Due to the COVID-19 situation and regulations in place, the interviews could be conducted only using online means, as discussed in Section 3.2.1. To facilitate the consent process, mostly oral consent was obtained from the participants. However, I also obtained written consent when it was possible to do so. Before conducting the interview, I reviewed the informed consent form with the participant together to make sure everything was clear for the participant. After reviewing the consent form together, I obtained oral consent and then signed that everything was gone over, and the participant agreed to the terms and conditions of the data collection.

Both the recruitment letter and consent form, sent to the participants, explicitly indicated that participation was voluntary. All research participants were given the option to discontinue their participation in the study or remove their data from the project up to the analysis of the collected data. Participants were informed of their right to withdraw from the project via a letter of consent or verbally by me during the interview.

Only I interacted directly with the selected participants and had access to the raw data (e.g. recordings, interview notes). Raw data collected from the participants were kept in a secure Dropbox account. Interviews were recorded digitally using a recording device. After uploading the recording to the Dropbox account for further analysis of the raw data, the recordings were deleted from the recorder.

Names of the participants or any identifying information have not been published in any way in this research. Only the general titles of the participants have been indicated, such as "one university scientist indicated ...". The results of the analysis of the raw data removed any identifying information and protected confidentiality.

Chapter 4. Findings: Context Analysis

4.1 Introduction to Findings

In this chapter, I will present the study findings of the context analysis. The findings are largely drawn from the results of the qualitative analysis of the 21 semi-structured interviews conducted with experts from various levels of the government, post-secondary institutions, the private sector, and community organizations, supplemented by secondary document review. The chapter is structured to correspond with the research questions asked in this study. Following this introduction (4.1), section 4.2 gives a background of challenges and opportunities for innovation in the Corner Brook and surrounding area (research question #1). Section 4.3 identifies the key quadruple helix actors and describes their roles in the RIS of Corner Brook and surrounding area (question #2), followed by an evaluation of the roles of each of these actors in the RIS in Section 4.4 (question #3). Section 4.5 evaluates the interaction of these actors in the RIS (question #4). Finally, Section 4.6 discusses the overall findings from the chapter.

4.2 What are the Region-Specific Barriers and Opportunities for Innovation in the Corner Brook Region?

When asked about the current state of innovations, overall, interview participants were optimistic, indicating growing awareness and appetite for innovation in the region. There are also many sectors in the region, such as tourism, that are still fairly new to innovation and individuals involved in these sectors are starting to explore and try different approaches.

One of the concerns that emerged in the interviews regarding innovation was the region's demographics. A frequent comment in interviews was that the average age and limited scale of the population make it unlikely for large-scale innovations to occur. For example, 22.8 % of the total population of Corner Brook is at least 65 years old, which is higher than the provincial (19.4% in

NL) and federal rates (16.9% in Canada) (Statistics Canada, 2017b). Respondents explained that there are many business owners in the region who are reaching the latter part of their careers. Further, a significant number of students leave the province as soon as they finish their education. Losing young talent and the workforce of the region impedes the development of innovations and advancements within businesses. Since these business owners cannot find anyone to take over their businesses, succession planning is a real challenge in the region.

Participants indicated that immigration is extremely important to Corner Brook to restore its younger demographics. Immigrants can also play a vital role in building a culturally rich and diverse community. However, some respondents indicated that the local community is not particularly welcoming toward immigrants. Participants highlighted that it is possible for newcomers to face unkindness or even hostility. There are social barriers for immigrants in the region. It was mentioned that there is a lack of social opportunities for them to integrate into the community. Often newcomers stay isolated from the local community. Two participants acknowledged the example that there is no mosque in Corner Brook, which makes the region a less attractive place for Muslim immigrants. "We need to make our community as inviting and open as we can if we want to grow culturally and economically. I think we have to be more aggressive in that regard," suggested a government respondent.

Another concern is that the innovation is limited to only certain sectors in the region, such as forestry, agriculture, fishery, while many sectors remain inactive in innovation. For example, it was noted that the less innovative tourism industry service sector impedes rapid development and expansion of this industry, despite the huge potential for tourism in the province. Respondents suggested that the areas where innovation occurs more in the region are usually resource-dependent and traditionally have been the primary source of income of the region. It was explained

that since these sectors have been developed by larger private sector actors through the many years, they have a better culture of innovation compared to other sectors. Because innovations primarily occur around the traditional resource-based sectors, sometimes, they are not perceived as innovation among the local people.

Three participants had a similar view on why the region currently lacks a culture of innovation, explaining that the region's culture is related to the history of economic development in Corner Brook. As they described it, Corner Brook's development can be attributed to the establishment of the pulp and paper mill. When the mill was constructed in Corner Brook in the early 1920s (Kruger Publication Papers, 2021), according to respondents, it was one of the largest and most technologically advanced mills in the world and remained so until the early 1980s. In this period, the region had a technologically advanced forestry industry. The construction of the mill transformed Corner Brook from a small sawmill center into the leading industrial city in the province. The population growth of Corner Brook was directly related to the development of the forestry industry in the region, and a significant proportion of this population worked for the pulp and paper mill. Being the primary source for employment, Corner Brook's economy was heavily based on the forestry sector. During this time, people working for the pulp and paper mill had full-time, year-round, well-paid jobs. There was an assumption that if you had a good job in Corner Brook, it meant you were working at the mill.

However, concentrating too much on the forestry industry and other resource-based sectors such as fisheries, the region ignored the development of other sectors. An interview participant from academia described this as follows: "When you had a large mill in the town paying a big salary, it crowded out smaller, innovative firms." As an impact of "pulp and paper mill syndrome," they added, the norm in the region was to get a job from the mill, not to start businesses, and this

kept other sectors from developing. When there was a collapse in the fishing sector in the province, and technological advancements started to reduce the usage of paper by the late 1980s and early 1990s, the region's resource-based economy lost its competitiveness. Due to its fishing and forestry dependence through the years and a lacking culture of innovation, Corner Brook did not have the capacity to keep pace with other places around the world, especially those with more research and development emanating from their universities and technologically advanced sectors.

What respondents described as "the lack of innovation culture" in the region was also linked by some interview participants to the role of educational institutions in innovation knowledge creation. It was described by one of the representatives of the private sector as follows:

> I think one of the key impediments is from the kindergarten all the way up to the high school level [of] education. By the time our children leave high school and go into post-secondary institutions, they really are not exposed very well to concepts like self-reliance, innovation or entrepreneurism, or working for yourself. In fact, our system teaches the other way. You need to get a good high school education as a foundation so that you can go to work for someone else and extract a reasonable living.

Currently, most of the employment in the region comes from government-funded institutions (i.e., post-secondary institutions, Western Health) and services, or from retail services (to be further discussed throughout this chapter). Participants noted that although the community has some innovative activities in the region, these tend to be government-driven activities. Also, entrepreneurs are more focused on their own small-scale business projects, not on the greater good of the community as a whole. While the Corner Brook region has started recently to create a culture of innovation, and there are optimistic efforts around innovation by various actors, the historic lack of innovation means there is a long way for the region to go.

Interview participants also cited a number of place-based assets or advantages for the Corner Brook region. The presence of the University (i.e., GC-MUN) and College of North

Atlantic campus in Corner Brook was emphasized as the major advantage of the region. Participants noted that compared to many regions in NL, Corner Brook has a stronger post-secondary institutional presence and knowledge infrastructure.

The region is also rich in natural resources, which continues to create a potential for the development of natural resource-based industries. While fishing and forestry are more established resource-based industries of the region, tourism is newly evolving. The region still has a long way to go in expanding tourism services and developing its infrastructure and service standards. Agriculture is also perceived as a priority sector of the region, with huge potential to support economic growth. Some respondents see the value of developing agritourism, mentioning the region's potential and increasing opportunities in this industry in recent years.

Another advantage of the region is its transportation infrastructure. The Port of Corner Brook is accessible year-round and well-positioned for shipping (Port of Corner Brook, 2020). Deer Lake Airport is only about 50 kilometres from Corner Brook. Located on the Trans Canada Highway Route 1, the city has good transportation links (Transportation and Infrastructure, 2020).

Also, one respondent suggested that living in a small sized community has its advantages, elaborating that it does not take much time or effort to reach out and connect with each other in Corner Brook. The small size of the region might be helpful for various stakeholders to build networks. Some of these opportunities and barriers for innovation are supported by the findings of other studies conducted in NL (further discussed in Section 6.1). It was suggested by the respondents that to grow the economy of the region, it is important to recognize these regional advantages and build upon them.

4.3 Who are the Key Quadruple Helix Actors, and What Role(s) Do They Play in the RIS of Corner Brook and Surrounding Area?

Each actor of the quadruple helix has an influence on the innovation system of the Corner Brook region. Although various actors have different levels of influence, each of them plays an essential role in innovation by contributing to the system's development from diverse aspects. Interview participants generally acknowledged the importance of all types of quadruple helix actors. They indicated a sufficient number of players from each category of actor (government, academia, private sector, community) in the region to develop innovations. Furthermore, the participants expressed that there is an abundance of actors in the region, such as support organizations, financial institutions, and educational institutions, to "feed" entrepreneurs. There are many entities that can provide support and mentoring to businesses to develop innovations.

This section of the study introduces these key actors of RIS from government, post-secondary institutions, private sector, and community in the Corner Brook and area functional region.

4.3.1 Government Agencies

There are representatives from three levels of government supporting innovations within Corner Brook: the federal government, the provincial government, and the municipal government. There is also Qalipu First Nation (QFN) – a Mi'kmaq band government that was established in 2011 as an Indigenous Band under the Indian Act representing members across 67 Newfoundland Mi'kmaq communities in nine Electoral Wards (Qalipu First Nation, n.d.). Government agencies play the role of support organizations in the region (Lam et al., 2013). The study by Lam et al. (2013) revealed that none of the government organizations/agencies focus on generating creativity

in the region but rather provide means to support creativity and individual innovations, such as funding opportunities, accessibility of space, human resources, and promotional opportunities.

Interview participants mentioned four major federal government players in the RIS of Corner Brook and surrounding area: the Atlantic Canada Opportunities Agency (ACOA), the National Research Council (NRC), the Business Development Bank of Canada (BDC), and Indigenous Services Canada (ISC). ACOA assists businesses in the four Atlantic provinces by providing resources and information. ACOA offers business advice and guidance, business information services, and financial support for businesses to be more competitive, innovative, and productive (ACOA, 2020). Key programs ACOA delivers for businesses are the Atlantic Innovation Fund, Regional Economic Growth through Innovation, Business Development Program, Women Entrepreneurship Strategy, and Innovative Community Funds (see Table 1). NRC Canada is another major federal government agency, which supports innovation efforts with strategic and collaborative research centers, scientific and technical advisory services, licensing opportunities, and business grants and financing (NRC, 2020). The NRC Industrial Research Assistance Program (NRC IRAP) helps small- and medium-sized businesses to drive growth through innovation and technology by providing advice, connections, and funding (NRC, 2020). A third federal player indicated was BDC. BDC offers financing advisory services and venture capital to entrepreneurs in Canada (BDC, 2020). Finally, ISC helps the economic development of Indigenous communities by investing in community readiness, entrepreneurs and businesses, land management, and strategic partnerships through the lands and economic development programs (ISC, 2020). A list of major federal agencies and programs available to support innovation in the Corner Brook region is outlined in Table 1.

Table 1. *Some of the key programs provided by the federal government*

Agency	Program	Description
FEDERAL PROGRAMS		
ACOA	Atlantic Innovation Fund	Encourages research and development by supporting partnerships between firms, post-secondary institutions, and other research institutions.
	Regional Economic Growth through Innovation	Offers funding for businesses to grow and adopt innovative technologies.
	Business Development Program	Provides funding for businesses to develop innovative ideas and clean technology projects.
	Women Entrepreneurship Strategy	Assists women to accelerate the growth of their businesses through access to financing, talent, networks, and expertise.
	Innovative Community Funds	Supports strategic projects to strengthen the economies of Atlantic Canada's communities by providing tools needed to identify opportunities for their sustainable economic growth.
NRC	Industrial Research Assistance Program	Helps small and medium-sized businesses to drive growth through innovation and technology by providing advice, connections, and funding.
BDC		Provides financing advisory services and venture capital to entrepreneurs.
ISC	Lands and Economic Development	Supports economic development of Indigenous communities by investing in community readiness, entrepreneurs and businesses, land management, and strategic partnerships.
	• Aboriginal Entrepreneurship	Provides capital to Indigenous entrepreneurs and business owners in Canada.
	• Community Opportunity Readiness	Addresses the financial needs of Indigenous communities to become equipped to participate in an economic opportunity.
	• Lands and Economic Development Services Program	Offers different types of funding programs to develop economic development services in First Nations and Inuit communities.

	• Strategic Partnerships Initiative	Promotes partnerships between federal and non-federal groups in key economic areas to support opportunities that are not eligible for other federal funding.

Sources: Adapted from ACOA, 2020; NRC, 2020; BDC, 2020; ISC, 2020

The provincial government of NL also plays a key role in the development of the RIS in Corner Brook by offering necessary services, programs, and resources for institutions and individuals. The provincial government offers significant financial support and services to the private sector. NL's government also supports the community and post-secondary institutions by providing financial assistance through various departments and programs. Interview participants emphasized the key role of the provincial government in the employment of the region's citizens, indicating that primary employment institutions of the region (i.e., post-secondary institutions, Western Health, some of the major community organizations, etc.) are funded or run by the provincial government. Four departments of the provincial government were mentioned as active players in the innovation system of the region:

- The Tourism, Culture, Arts and Recreation (TCAR) department is responsible for developing the tourism industry and contemporary arts, preserving the historical and cultural heritage of the province, and supporting provincial recreation and sport (TCAR, 2020).
- The Department of Industry, Energy and Technology (IET) supports innovation, economic development, and diversification in NL by investing in the private sector and businesses, as well as the mining, energy, and technology industries (IET, 2021). The Department of IET coordinated and facilitated five RIS3 pilot projects in 2017, each project in a different region of the province. The aim of these pilot projects was to foster regional cooperation and build networks to enhance regional innovations in well-

defined sectors in each region. The pilot project related to forestry and agriculture was implemented in Corner Brook and the surrounding area (IET, 2020).

- The Department of Fisheries, Forestry and Agriculture (FFA) supports the growth of the fishing, aquaculture, forestry, and agriculture industries to provide sustainable economic benefit and ecological integrity to NL (FFA, 2021).
- The Department of Immigration, Population Growth and Skills (IPGS) (previously known as Immigration, Skills and Labour) is responsible for ensuring that the province has the required talent and skills for economic growth. The department provides programs, services, and supports to create a favourable climate for economic growth, competitiveness, and prosperity in the province (IPGS, 2021).

A list of major programs offered by these departments to support innovation in the Corner Brook region is outlined in Table 2.

Table 2. *Some of the key programs provided by the provincial government*

Agency	Program	Description
PROVINCIAL PROGRAMS		
TCAR	Tourism Market Readiness Subsidy Program	Assists stakeholders in the tourism industry to increase the quality and market readiness of their products and services.
	Publishers Assistance Program	Aims to stimulate economic activity in NL by supporting publishers with the potential for increasing employment and business strength, expanding market capacity, and building on NL's literary sector.
IET	Business Development Support Program	Supports the development and growth of small- and medium-sized enterprises providing a non-repayable contribution in a maximum amount of $100,000 per year.

	Business Investment Program	Provides term loans and equity investments to SMEs operating in strategic growth sectors and businesses to increase their exportation capabilities and encourage production for external markets.
	The Economic Development and Growth Enterprise Program (EDGE)	Offers incentives to new businesses to support economic diversification and job creation in rural areas.
	The Investment Attraction Fund	Provides financial assistance to foreign large-size businesses to operate in NL with the aim of attracting investors to the province.
	Research and Development • For Commercial Applicants • For Non-Commercial Applicants	Supports research and development projects for commercial and non-commercial purposes Provides normally 50% of the research and development costs of businesses supporting them to realize the commercial potential of innovative products, processes, or services. Provides normally up to 50% of the costs of the research and innovation projects to the academic institutions to generate long-term economic benefits for NL. The program invests in highly qualified personnel (HQP), research, innovative programming, and infrastructure in priority areas with the aim of strengthening research and development capacity in the province.
	Regional Development Fund • Regional Development Program • Community Capacity Building	Provides non-repayable contributions to the organizations working on the projects to support economic development, innovation, and capacity building in the province. Contributes non-repayable funding (normally to a maximum contribution of 25 percent of total eligible costs) to the organizations to develop and implement economic initiatives focusing on regional and sectoral development, diversification, innovation, and key emerging sectors. Four key themes for the program are infrastructure, capacity building, marketing, and research. Provides training support in the form of a non-repayable contribution (normally to a maximum of $5,000 for regional organizations and $10,000 for provincial organizations per year) to non-profit organizations working on economic and business development. Key themes for the training sessions are strategy and planning, relationship building,

		organizational skills and management, and co-operative development.
	Economic Development and Growth Enterprise Program (EDGE)	Provides incentives to the new or existing businesses with the EDGE status to diversify the economy and stimulate new private-sector job creation in the rural areas of the province.
	Fisheries Loan Guarantee Program	Provides a government guarantee on loans for the private fish harvesting industries to construct or purchase marine vessels, and/or to purchase new engines and fishing equipment for the improvement, to rebuild or change existing vessels.
FFA	Secondary Forestry Processing Innovation Fund	Provides financial assistance to forest industry producers and processors in NL to encourage innovation utilizing locally grown wood in production or secondary processing operations.
IPGS	Immigration – Provincial Nominee Program	An economic immigration program that aims to make it easier for skilled immigrants and their families to live and work in NL.
	Canada – Newfoundland and Labrador Job Grant	Provides financial assistance to businesses and organizations towards training of their existing or future employees.

Sources: Adapted from TCAR, 2020; IET, 2021; FFA 2021, IPGS, 2021

Compared to the federal and provincial governments, municipalities in NL, including municipalities in the Corner Brook region (as identified in the Section 2.3), provide smaller programs to support local initiatives. Respondents explained that the municipalities do not provide direct financial assistance to the private industries, businesses, or start-ups but rather contribute to new businesses in the form of tax incentives. The municipal government in Corner Brook also offer minimal counselling services to organizations to help with planning and development, construction, funding proposals, etc. The staff at the municipal government in Corner Brook also deal with city/town planning, development of infrastructure and creating conducive conditions for innovations to occur. They promote and support innovations in the region by aiming to provide access to quality services, clean and contaminant-free water, good infrastructure, waste/recycling collection, etc. In 2017, The City of Corner Brook released *Initiatives to Benefit City Businesses* to implement several economic development initiatives in the city as part of the *Corporate*

Priorities Plan. These initiatives were planned to support regional economic growth through the beautification of the city, tax reduction programs, economic development seminar, etc. (City of Corner Brook, 2017).

As a Mi'kmaq band government, QFN supports Indigenous businesses and community in the region. The central administrative office of QFN is located in Corner Brook. QFN offers employment, education and training, tourism development, and community economic development services to the Indigenous community through various programs and online portals (Qalipu First Nation, n.d.). Some of these programs are listed in Table 3. Business and industry development initiatives of QFN are managed by Qalipu Development Corporation (QDC). The QDC is an independent, arm-length business entity responsible for the economic and corporate development of the QFN Band.

Table 3. *Programs offered by Qalipu First Nation*

Agency	Program	Description
QALIPU FIRST NATION PROGRAMS		
QFN	Post-Secondary Student Support Program (PSSP)	Offers financial assistance to eligible students who are enrolled in post-secondary programs.
	Indigenous Skills and Employment Training Program (ISETP)	Provides job training services to assist Indigenous people in improving their skills and becoming employed.
	Graduate Incentive Program	Offers financial assistance to graduates to find employment.
	Self-Employment Assistance Program (SEAP)	Offers financial assistance to Indigenous people who want to establish their own business.
	Wage Subsidy Program	Aims to increase the employment of Indigenous people by providing employers with an incentive to hire Indigenous employees.

Source: Adapted from Qalipu First Nation (n.d.)

4.3.2 Post-Secondary Institutions

Interviewees emphasized that post-secondary institutions have a positive social and economic impact on the development of the region through their mandates and activities. When asked about these institutions, participants named GC-MUN and the Corner Brook Campus of CNA as key actors of the RIS. Core innovation activities of the post-secondary institutions include: 1) graduating students of their programs with the necessary knowledge and skills relevant for the industry to meet a human resource requirement of the region; 2) generating knowledge and intellectual property (IP) by their students or faculty through research programs in industry or research organizations; 3) disseminating research outcomes for knowledge transfer; and 4) providing technology transfer. A fifth way mentioned that post-secondary institutions create innovation in the region is by facilitating entrepreneurship and collaboration. For example, the IP generated through research programs of the post-secondary institutions directly leads to the creation of entrepreneurship or new business opportunities in the region, or it is often applied by a firm already operating in the respective field through collaboration with the post-secondary institution. Both GC-MUN and CNA house the Navigate Program at their campuses to promote entrepreneurship among students and staff and to expose them to innovative ideas. Recently the program expanded its services on both campuses by opening a Makerspace at GC-MUN and an Incubator at CNA, where people can convert their ideas into an actual prototype by using digital fabrication tools and small-scale electronics (Crocker, 2018). A sixth contribution noted was that these educational institutions are the primary means of attracting international students to the region. As well as creating a multicultural environment, these individuals bring a constant stream of ideas and innovation to the community and play a crucial role in satisfying labour demand, especially considering the aging population of Corner Brook.

In the early 1970s, Memorial University approved the establishment of a new campus in Corner Brook. This campus was officially opened in 1975, serving 400 students and named West Coast Regional College. It was renamed Sir Wilfred Grenfell College in 1979, and since then, the campus has been known as Grenfell Campus (Memorial University of Newfoundland, n.d.). Currently, Grenfell Campus is the leading producer of the region's knowledge base through basic research, taking significant steps in the last decade to increase its research capacity, especially around agricultural, forestry, and environmental studies. Recently adding new faculty positions, academic programs, the building of environmental and agricultural labs and increasing entrepreneurship support, the campus is highly competitive to meet the research needs of the region (Government of NL, 2019). Grenfell Campus also has increased the number of applied research projects in recent years undertaken by faculty, staff, and students, along with partners, expanding its network with the industrial firms in the region. The campus's Boreal Ecosystem Research Facility, with its three interconnected analytical research laboratories, provides high-level analytical analysis with a particular focus on soils, plants, air, and water (Government of NL, 2019). Additional to four master's degrees in arts, fine arts, and science, GC-MUN offers a PhD program in Transdisciplinary Sustainability and another in Boreal Ecosystems and Agricultural Sciences (Grenfell Campus, n.d.). Furthermore, the undergraduate programs of GC-MUN are specialized in arts, business, fine arts, nursing, resource management, and science, preparing students for successful future careers.

The Corner Brook Campus of CNA is the major contributing post-secondary institution to workforce development and training in the region. Unlike Grenfell Campus, the primary research focus of CNA is applied research for local and regional companies to provide practical skills to its students and prepare them for the job market. The campus houses the Office of Applied Research

and Innovation to support local firms and community organizations. It plays a significant role in supporting local industry, community organizations, and government agencies interested in applied research collaborations to solve their practical problems (The Office of Applied Research & Innovation, 2020). Applying technology and knowledge transfer to industry and community groups, the campus supports and contributes to the innovation required for the economic and social development of the region via the Office of Applied Research (The Office of Applied Research & Innovation, 2020). The campus also administers The Newfoundland and Labrador Workforce Innovation Centre (NLWIC). NLWIC provides access for the local people to employment services, skills development institutions, and business and community organizations (NLWIC, 2020). The Centre works towards encouraging innovation in workforce development through research, testing, and collaboration to positively impact employability, entrepreneurship, and workforce in NL (NLWIC, 2020). NLWIC also provides funding, resources, and training to support individuals and institutions to apply their innovative ideas to real-world solutions (NLWIC, 2020).

4.3.3 Private Sector

Although other actors of the quadruple helix have enormous importance to the innovation system of the region, the private sector is a principal component of the RIS. During the interviews, participants acknowledged that the existence of industrial companies and businesses in the region boosts regional competitiveness by creating wealth and employability, contributing to the development of new products, and transferring the knowledge of production to post-secondary institutions. They explained that although large-size industrial firms in Corner Brook (which are based on the extraction and processing of natural resources) have less influence on the employment and competitiveness of the region compared to a few decades ago, they still play a significant role

in its economic development. On the other hand, interview participants highlighted that the region lacks a technologically advanced, broadly based private sector.

When asked about the key local players of the private sector, all interview respondents cited CBPPL as the major actor. It was indicated by the participants that CBPPL had increased its innovation efforts in recent years with the aim to diversify its production and protect its place as a major player in the region (as discussed further in Chapter 5). Another key private sector player of the region frequently cited by the respondents was Barry Group Inc. Specializing in processing seafood products, the company ships its products to 40 countries over the world. In order to stay competitive in the international market, the company has invested a significant amount of money in technology advancement in recent years (Barry Group Inc., n.d.). Other large-size local innovative firms and companies cited during interviews were Growing For Life Ltd. (GFL) (specialized in greenhouse vegetable production), Hew & Draw Hotel, and Colemans (specialized in retail operations).

SMEs with entrepreneurial initiatives play an important role in the development of innovations in the region. Although innovation is often associated with technology-intensive large companies, SMEs were also recognized by participants as significant facilitators of innovations. Participants indicated that there are a sufficient number of SMEs in Corner Brook, taking into consideration the size of the city. Innovative SMEs cited by the participants were primarily representative of the restaurant and foodservice industry. Some of the innovative local SMEs mentioned include Sorrento, Cycle Solutions, Newfound Sushi, Juniper BBQ Scraper, Brewed Awakening, and Crooked Feeder Gastropub.

4.3.4 Community Organizations

The involvement of civil society and its institutional support partners in quadruple helix arrangements is important to favour citizen participation in the development of regional innovation policies by strengthening the demand side and stimulating innovations (as discussed in Chapter 2). For example, cultural factors of the local community (which will be further investigated for the Corner Brook region in this study), such as respecting entrepreneurship as a worthy occupation; openness to learning, changes, contrarian thinking and collaboration; tolerance of failure; and risk-taking are the crucial elements of innovation-driven entrepreneurship (Isenberg, 2010). Community is also a major force in shaping the needs of the local market, which directly influences the spheres of local innovations. As institutional support partners of civil society, community organizations in Corner Brook are key actors of the RIS.

Community organizations in the region are primarily either funded by government agencies (directly or through various government funding programs) or via recurring donations, membership fees, corporate sponsorships, etc., to be able to serve the community. Three major aspects were acknowledged by the interview participants to describe the significance of the role of the organizations in economic development and representing community in the Corner Brook region.

Firstly, these organizations provide necessary resources, programs, and services, such as funding, training, mentorship, networking, information, etc., to help businesses throughout the business lifecycle. These community organizations play the role of support organizations for the businesses in the region. Their goal is to contribute to the economic growth of the region by encouraging business development. Humber Community Business Development Corporation (CBDC Humber), Futurpreneur Canada, Navigate (connected with post-secondary institutions),

Newfoundland and Labrador Organization of Women Entrepreneurs (NLOWE), and NLWIC were cited by the respondents as the primary community organizations providing resources, programs, and services for businesses. Among these organizations, Navigate and NLOWE support entrepreneurs through technical assistance (business counselling, help and advice, training, mentoring, etc.). Futurpreneur Canada, NLWIC, and CBDC Humber provide financial assistance (in the form of loans, loan guarantees, equity financing, or providing money) in addition to technical assistance.

Secondly, some of these organizations play the role of advocacy groups between the government and community and build a relationship between those two. According to community organization respondents, when it comes to an understanding of the needs of rural communities, community organizations typically have a better sense of it compared to government agencies since these organizations are at the ground level. These types of community organizations deliver the voice of the community to government policymakers and agencies. On the other hand, they keep the community informed about the opportunities, announcements, programs provided by government agencies. These organizations are usually directly funded by government agencies and have a close connection with the government. GCBBT, CBDC Humber, and NLWIC were cited by the participants as the primary examples of these types of community organizations in the region.

Thirdly, some community organizations provide social space to bring together like-minded individuals to generate new interest, excitement, and ideas through entrepreneurial conversations or to connect local entrepreneurs with each other and promote collaboration among them. These social events are often in the form of coffee break gatherings, startup weekends, networking breakfasts, innovation drinks, etc. or specific project gatherings. During various social events,

businesses also have a chance to offer their events, deals, promotions, and services, to discuss funding opportunities, to meet business experts, to form teams around innovative ideas to solve the existing problems, etc. These events are an important facilitator of emerging innovative business ideas in the region. For example, one of the interview respondents mentioned that the idea to establish Saucy Newfoundland Co., which is a craft sauce company in Corner Brook, was initiated during one of the startup weekends. Participants named Navigate, Western NL Entrepreneurs, and NLWIC as the main community organizations organizing social events for the local businesses or startups to come together.

4.4 How Do Quadruple Helix Actors Serve the Development of RIS in Corner Brook and Surrounding Area?

This section of the thesis provides an overview of the participants' responses about the functioning of key actors from each category of the quadruple helix approach in the RIS of Corner Brook and surrounding area. The data provided in this section helps to understand major issues regarding the functioning of these actors in the RIS of Corner Brook and surrounding area and provide recommendations for them (in Chapter 6) to further develop the RIS in the region.

4.4.1 Government Agencies

The interview participants were positive about the role of federal and provincial government agencies in providing funding for the organizations and institutions in the region to develop projects or expand their capacities. The majority of the respondents emphasized that there are sufficient funding programs offered by both the federal government and the provincial government, which also make the region a favourable place to launch a business. However, the main concerns mentioned were around the accessibility of these financial assistance programs. There were complaints by the participants about the complexity of the application process to get

financial assistance, especially from the provincial government programs. Some indicated that the information provided for the applications might be confusing, requiring additional help for clarification. It was also mentioned that there are too many criteria and expectations for startups to access the funding, such as effectively forecasting the balance sheet into the future, which might be challenging for them. Although there was a general acceptance by the respondents that every criterion to access the financial support exists for a reason, they stated that the application process for some programs, takes longer time and preparation than it necessarily should. These responses from participants reinforce findings by Hall, Walsh, Vodden, & Greenwood (2014), who also cited the complex paperwork associated with government funding. Their research found that in some cases businesses hired consultants for assistance to apply for funding.

Some interviewees pointed out that the provincial government tends to provide financial contributions to projects if they target the priority areas for the government. This was described by one of the community organizations' leaders as follows:

> I think that no matter what you bring to them, and no matter how good you can present it to them, they still have their own agenda to deal with. That is a problem. I think there are plenty of financial assistance programs available, but the government needs to be more open to considering different ideas.

Similarly, one of the local farmers said that "the government provides financial sources for individual farmers. But I do believe that they look at their own priorities within their own departments and target funding towards those priorities."

Another major challenge expressed by the interviewees regarding financial contributions was that even if the project receives government support, they are often asked to make changes to the project to fit it into the provided budget. Three participants described their experiences of how they had to redesign their project, reducing its scope by eliminating some of the major activities

or processes within the initially proposed project to fit into the offered budget. There was also concern among the participants that the money does not always go to the right applicant. Some participants expressed that they have an impression that the same institutions keep applying for financial contributions. One participant claimed that sometimes the provincial government picks champions and tries to move them forward, providing an example of how one of them went bankrupt after receiving a lot of government funding in the City of St. John's.

Often, interview participants emphasized that the provincial government lacks long-term planning, which impedes large-scale impacts of the initiatives, mentioning that it takes many years to change and develop the RIS. Yet it was pointed out that the initiatives are usually planned and funded for a short period of time (2-3 years). "The departments of the provincial government are often on a four-year election schedule, which makes them incapable of longer-term planning," said one of the respondents. It was also added that the provincial government agencies are not eager to measure the impacts of their policies, which is a crucial step to understand previous deficits and adjust policies and programs.

When participants from the private sector and community organizations in Corner Brook were asked if they experienced any policy impediment by the government agencies, none of the participants indicated a strict policy impediment. Instead, a few of them stated that some policies are not up to date, and they do not adjust to the needs of the local communities since they are often adapted from a bigger jurisdiction.

Several respondents emphasized that the provincial government Department of Immigration, Skills and Labour (ISL) lacks effective strategic planning. Generally, it was thought that the department could do a better job of developing appropriate strategies by investigating the key issues around immigration and engaging in planning. Therefore, it was mentioned that the

immigration policies and regulations in the province need to be more favourable to attract and retain talent. There were examples cited by various participants where the immigration process has been an unnecessary obstacle for talented people to be able to stay and work in the province. For example, one participant explained that there is a "Study and Stay in NL" program to help students to run a business and develop a career in the province after graduation from post-secondary institutions. However, the criteria to run a business for recent graduates is difficult, the expectations are high, there is demand to get off the ground in a short period of time, and the application process takes a long time. Similarly, sharing personal experience, another participant complained that it took six months to get the temporary work permit and two years to get the permanent residency in NL for their family member who is an immigrant with a PhD degree from a high-level educational institution.

The interviews also showed concern regarding the priority given to the development of the forestry, fishery, and agriculture sectors in the region by the provincial government. Participants shared opposite views on this matter. Many participants indicated that it is important to define competitive sectors of the region and to move these sectors forward, supporting the Government of NL for relocating the Department of FFA from St. John's to Corner Brook. On the other hand, others argued that this trend inhibits the growth of other sectors since the allocated resources are used for the prioritized sectors.

The interview participants, who were also engaged in the RIS3 pilot project implemented by the Department of IET (as discussed in Section 4.4.1), cited that the meetings organized within the frame of the project in the Corner Brook region were an encouraging initiative by the provincial government but ineffective overall. It was noted that the meetings organized within the frame of the pilot project were a good way to bring out ideas and go through a facilitated process. However,

the ideas were not taken to the level of development and implementation. There was a lack of commitment to further follow the initiatives that emerged in these meetings. As one respondent put it, "we never finally got a project saying this is where we are going to. So, you lose interest after a while if nothing materializes."

When asked about the role of the municipal government in Corner Brook, the respondents answered that the capacity of the municipal government is weak. The municipal government has little resources and power. Instead, the municipal government has to deal with the city's infrastructure, water system, snow clearing, waste management, and many other technical aspects of city management with very limited resources, which keeps it from playing a key role in the economic development of the city. "There are always new things around tourism or other economic development areas that we would like to play a bigger role. But we have limitations. We do not have enough human resources to take many initiatives," described one of the municipal government representatives. The region lacks an initiative government body to launch and lead the economic development projects and programs. However, the participants were very positive about the performance of the municipal government on its duties and responsibilities. A few participants from the local community organizations and post-secondary institutions provided examples of how the City of Corner Brook staff has been communicative and helpful with their questions regarding the engineering and planning aspects of their projects. "The municipal government in Corner Brook has all the greatest ambitions to make the community better despite the limited resources," said one of the interview participants.

4.4.2 Post-Secondary Institutions

Throughout the interviews, the role of the post-secondary institutions was primarily evaluated with regard to their ability to create knowledge and transfer knowledge and technology.

While it is difficult to generalize the knowledge creation and transfer of the post-secondary institutions in the Corner Brook region because both CNA and GC-MUN have various levels of knowledge sharing with different actors, they have significant communication barriers, which will be analyzed in detail in the later sections of this study.

The region has a strong educational institutional presence, which provides opportunities to generate and share knowledge. The participants were appreciative of having the university and college campuses in Corner Brook. Post-secondary institutions were described as a major contributor to the development of innovations in the region. Participants were also pleased with the teaching capacity and ability of the post-secondary institutions, mentioning their role in graduating highly skilled and talented students for the job market. There are researchers from post-secondary institutions taking the lead to start initiatives, working actively on various projects in the region and providing crucial research input. CNA and GC-MUN are working collaboratively with different partners on the development of a range of projects that might significantly increase the economic capacity of not only the region but also the province. However, these projects have not come to fruition yet. The post-secondary institutions were described by the participants as great idea developers and initiators. There is a strong spirit of cooperation and willingness by the post-secondary institutions to develop new projects. However, there is usually a gap in the realization of the ideas because of the lack of resources. Three participants described how their projects with the post-secondary institutions remained unimplemented after spending a lot of time and effort trying to get the required funding and not being successful in the end.

Knowledge transfer from the post-secondary institutions of the region to the community was rated as "weak" since they are not well connected with the local community. The knowledge transfer is usually limited to the implementation of specific projects and courses and programs

offered by them. However, participants frequently indicated a shortage of courses and programs providing innovation and entrepreneurship knowledge offered by the post-secondary institutions of the region. Further, mentioning the presence of the makerspace and incubator in the campuses, one community organization leader stated that the post-secondary institutions need to use their capacities better in order to have a regular basis for knowledge sharing with the community. According to another community organization leader, the reason for the lack of knowledge transfer is that only a small group of the community engages in the activities and events organized by the post-secondary institutions. As the participant put it:

> The larger part of the community does not realize that space, activities, and events happening in the post-secondary institutions are for everybody, and they think these are reserved for academia, or the arts community, or a certain section of the population, and they don't see themselves as being part of that. I think works need to be done around that inclusion piece.

A staff member of one of the local community organizations highlighted that they are not sure if the post-secondary institutions bring their technology resources to the forefront as much as they need to. The participant emphasized that there is a need for more explanation to the public about the available resources of the post-secondary institutions.

Participants also were not satisfied with the knowledge and technology transfer to the private sector from the post-secondary institutions in the region. Interviews revealed that the post-secondary institutions and the industrial players "do not speak the same language in many ways." One business owner claimed that the post-secondary institutions do not understand the profit motive and time challenge. Another participant at GC-MUN stated that:

> We still lack, and we need to build a knowledge of how things can be commercialized, what it means to commercialize things, what is the value for a product. I think that there is a pretty significant group of small business owners that

> are not engaged in knowledge exchange with the university. Because we have not quite figured out what the benefit means.

It was indicated that while the university is interested in academic research, the industry is solution-focused. The previously quoted business owner expressed that the research capacity and direction of the university does not always meet the needs of the private sector:

> For example, the university campus is not capable of solving processing or mechanical engineering issues at CBPPL or Barry Group. The campus has a few professors with some expertise in the related fields, but fundamentally expertise is devoid in many areas these companies really need. So, it is hard for knowledge transfer to occur because there is not much relevant knowledge to transfer.

Similarly, it was noted that there are limited key staff members at GC-MUN to be involved in applied commercial or industrial research. "How much effect can four or five people really have?" stated the participant. Overall, according to the participants, there is a space for post-secondary institutions to increase knowledge exchange with the industry.

4.4.3 Private Sector

When asked about the ability of the private sector to innovate, the participants stated that the region lacks entrepreneurial spirit and knowledge. According to a local entrepreneur, local businesses are not willing to push the boundaries. They are usually satisfied with what they do and are not looking beyond their achieved plans. Similarly, one of the professors interviewed cited that the mindsets of the many players in the region are not conducive to innovation, which requires nonstop, continuous improvement. "We are comfortable with the way things are, and that is pretty much the opposite of innovation." They went on to highlight that many small businesses could not see the possibility of expanding their market to other places. It was described that innovation initiatives by SMEs in the region lack size and scale. Their market is usually limited to the visitors or community in Corner Brook, and they do not want to go outside of their comfort zone and

explore other markets. Trying to explain the current situation around market internationalization in the region, one government respondent stated that in the province, in many cases, the product specifications are determined by the manufacturer, not by the international market, which inhibits export. Local companies are trying to sell what they produce rather than adjusting to the international market's needs. They then shared their experience of meeting a fish buyer from Norway who travelled to Newfoundland to import fish, but none of the local companies could meet his specifications. They also added that a lot of work should be done by the government to support local companies to meet international standards in their services.

The topics of change, failure, and the role of obstacles in innovation were also discussed by interview participants. A post-secondary representative highlighted that businesses need to be more open to change and prepared to accept failure. They added that the business people of the region do not like change, and this inhibits innovation. One respondent from the private sector talked about how one local entrepreneur lost a lot of money before becoming successful and running his current company, adding that the region currently lacks a culture of failure. People need to embrace failure and understand that it is okay to fail if they want to be an entrepreneur. One community organization leader emphasized that in the region, a lot of people do not have the confidence to innovate. A business owner explained that people see their business plan as an obstacle before they want to start a business. People need to understand that a good business plan will indicate real market conditions, weaknesses, threats, etc. They have no other choice but to deal with these obstacles in order to develop their businesses, and they should not be upset about it. A previously cited private sector respondent acknowledged that there is a preconceived belief that a lot of money is required to start a business. People think they have to get a loan from a bank or hire 5-10 workers to start. People do not see it as an option starting small, starting with what

they have and growing as they increase their market. The respondent named a few successful business owners in the region who started small and grew. They then described their own experience of starting a business with only $250 and growing from there, currently working with more than 30 retailers. “We are missing the culture and understanding of where entrepreneurs start from and what the process is,” they said.

On the other hand, some participants suggested that implementing change within businesses is sometimes very challenging. One respondent said it is difficult to make radical changes, especially for established businesses that have been in operation for decades, such as CBPPL. These businesses have been doing the same thing for decades, and their workforce has expertise on that, which creates inflexibility for change. One post-secondary institution respondent stated that many SMEs in the region do not have the capacity to make adjustments. SMEs are usually busy with their day-to-day operations. Even though sometimes they understand where the bottleneck of their operation is, they do not have time to investigate the best solution that can make their business much more efficient and profitable. They also lack human resources to undertake innovation within their operations. Often in SMEs, it is just one person who takes all the responsibilities for inventory control, accounting, marketing, planning and other aspects of the business. Similarly, the private sector representative described their personal experience with not wanting to pay a professional web design company to build the website for their business and instead did it by themselves. “I think the barriers are ourselves and our willingness to outreach and pay for certain services and professionals to optimize our operations,” they explained.

Several participants indicated that businesses are often not willing to share their information with other businesses. There is a lack of information sharing among businesses in the region. One respondent from a community organization said:

> We would like to see businesses working more collaboratively, creating clusters where they share knowledge, resources, technology, and maybe jointly proposing projects that can support economic development. Unfortunately, we do not have many business collaborations currently.

However, another community organization leader said that businesses are willing to share information if it is not going to be to their detriment. They do not want to share only competitive information that might give other businesses an advantage over them.

Interview respondents suggested that despite the fact that the principal component of the RIS is the private sector, the region lacks leadership from its industry and businesses to drive innovations forward to the extent that respondents suggested should be occurring. The private sector is not the main employer in the region. It is the provincial government providing key employment opportunities for the community through various institutions. Therefore, interviews revealed that in Corner Brook, the private sector actors are not the innovation drivers. The respondents highlighted that the private sector actors of the region are usually a participant in innovation initiatives committees rather than a leader. Although they take part in the RIS initiatives that are led by the government or other actors, they rarely start or lead the initiatives themselves. "There are really no visible, innovative, or technologically advanced drivers for this process. That is probably one of the reasons why it has not moved forward perhaps as quickly as many of us would have anticipated," expressed a representative of the private sector. "When that is missing, it falls to other actors such as post-secondary institutions to backfill this position, which is not really a bad thing, but not necessarily the best thing," explained the leader of one of the community organizations in the region.

4.4.4 Community Organizations

According to many respondents, there is no shortage of community organizations in the Corner Brook region. However, throughout the interviews, respondents indicated that community organizations lack the power to have a directing function on the region's economic development. Many community organizations are limited in terms of human and financial resources, which makes it unlikely for them to be an innovation driving force in the region. These organizations heavily rely on government funding or grants. This significantly reduces flexibility in their planning and makes them align themselves with government agencies. One respondent from a community organization commented:

> We are funded by the government, usually on two years contracts, which impedes long-term planning. So, we are usually just implementing the next planned activity. We cannot look for long term expansive improvement, and that keeps us from being more successful.

According to some interviewees, there is a strong need for community champions in Corner Brook. "It is really important to have local champions within the communities to drive changes and push for innovation," said a community organization respondent. They provided an example of how one local entrepreneur brought new services and products to Corner Brook and changed the dynamic and attitude of the local community towards new services in the last ten years. "We do not have enough champions; we do not have enough reach on champions to be able to latch on to someone else," stated another community organization respondent.

The interviews revealed that community organizations are weak at bringing together local businesses to accelerate collaboration and growth of clusters. Although the Corner Brook Downtown Business Association (CBDBA), which was mandated by the City of Corner Brook, and GCBBT were the key organizations bringing businesses of the region together and

representing them with a common voice, CBDBA ceased its operations, and interviewees were not satisfied with the interaction of GCBBT with local businesses. It was also cited that GCBBT suffers from a lack of members from the private sector. Generally, the private sector respondents would like to see a more powerful role for key community organizations, industrial associations, and Chambers of Commerce in representing them and lobbying government agencies to address the needs of businesses in policies and government strategies. Participants emphasized that there are also limited connector events organized by the community organizations to bring businesses together and facilitate networking and knowledge sharing. In general, community organizations working towards the economic development of the region struggle to develop business clusters and accelerate business partnerships and information exchange between firms. On the other hand, there is low SME engagement in the events and meetings organized by the community organizations. Community organization respondents emphasized that it is usually the same people attending the meetings. SME respondents explained that they are busy with their day-to-day operations and do not have time to participate in the events and meetings held by community organizations during business hours. It was also cited that some businesses do not see the value of being involved in these activities.

4.5 How Do Quadruple Helix Actors Interact in the Corner Brook RIS?

When asked about the relationships of the quadruple helix actors of the RIS in Corner Brook, most of the interviewees answered that they are positive about the relationships of these actors. It was indicated that actors have goodwill and want to see development and economic growth. They have started to realize the benefits of communicating better and collaborating. It was also cited that partnership projects have a better chance of accessing funding from government agencies than solitary initiatives. However, communication among actors was identified as one of

the major barriers to growing the regional economy. Communication issues raised by respondents were many and varied. Generally, communication is lacking or sporadic among actors within the quadruple helix in the region. Participants emphasized that it is sometimes difficult for actors to understand each other. For example, the local community finds it challenging to understand the language of the university or government. Similarly, the post-secondary institutions and the private sector have different objectives when it comes to working together. This sometimes makes it complicated to bring these parties around the same table and accomplish the goals of initiatives.

Respondents also cited the lack of communication between different levels of government. The interviews revealed that there is no communication plan to regularly engage the municipal government of Corner Brook with the provincial and federal governments. Without a plan, communication between various levels of government is limited to project-specific communication. The federal and provincial governments work with the municipal government only through projects, without ongoing communication. This keeps the municipal government unaware of the strategies and policies going on in the provincial government.

The collaboration between the municipal government in Corner Brook and community organizations was perceived as strong and valuable. Municipal government and community organizations respondents provided examples of collaboration and information sharing. As one community organization respondent described:

> We have had excellent support from the City of Corner Brook. If we have questions, we contact the engineering staff of the City of Corner Brook and ask them. And they are very helpful to us. We do have a good relationship; we help them out with particular projects, and they help us out with our projects.

Similarly, a municipal government respondent stated that, "we are trying to reach out to local community organizations who have the expertise to help us with projects because we do not have

many staff or specific expertise in some areas. It seems to work really well for us." Community organization respondents were generally satisfied with their relationship with the provincial government and federal government agencies, specifically ACOA, emphasizing their financial assistance and exemplifying several successful partnership projects.

Interviewees across municipal government and the post-secondary institutions in Corner Brook referenced a strong partnership between these two groups. There have been examples of a number of successful partnership projects implemented by post-secondary institutions and the City of Corner Brook in recent years. There are also several ongoing projects, such as the development of the Research and Innovation Center in Corner Brook (as described in Section 3.1.4), in which the municipal government, CNA, and GC-MUN work collaboratively with other partners. The City of Corner Brook and GC-MUN are also collaborating on an annually recurring "City Studio" project, which is a learning project for students at Grenfell Campus addressing City priorities. Therefore, two-way benefits are intended through this project. The two organizations are also working together to develop a new Aquatic Center in Corner Brook. Also, in 2019, CNA signed a five-year Memorandum of Understanding (MOU) with Municipalities Newfoundland and Labrador (MNL) and Professional Municipal Administrators (PMA) to collaboratively develop and deliver activities related to innovation and economic development (College of North Atlantic, 2019).

One of the major barriers to the economic development of the region is that the interaction of various players with SMEs is limited. Key interviews revealed that SMEs are poorly networked with all three levels of government, post-secondary institutions, and community organizations. As one post-secondary institution respondent put it, "there is no one going out to firms to find out what problems they have. I do not think our industry is going to grow as fast as we are hoping

without that kind of constant support." Similarly, another respondent cited that "as business owners, we are on our own."

When the private sector interview participants were asked about government support, business owners complained that they were not consulted or engaged. "We lack interaction. Small businesses do not get an opportunity to express their needs. I am frustrated that I can not partner with government agencies," said one of the respondents. Emphasizing the lack of commitment from the provincial government, another business owner shared their experience that:

> The provincial government representatives came once and asked what you need for your business. We thought this was fantastic. So, we explained to them how we need the government to engage in order to help us in business development. However, we never heard back from them. We did not get a report.

Interviews with respondents from post-secondary institutions and the private sector indicated that although the post-secondary institutions have a growing relationship with larger industrial players, they lack interaction with SMEs. "The percentage of the SMEs engaging with the university is not high," cited one post-secondary institution respondent. Several SMEs respondents emphasized that they never had an opportunity to collaborate with the post-secondary institutions. Generally, despite growing interest in collaboration projects, interviews indicated that there is still space for collaboration between post-secondary institutions and other actors of RIS. One of the examples initiated to foster collaborations was the Fast Track to Research project implemented by GC-MUN. The initiative collected data from approximately 40 researchers and 40 community organizations, businesses, and industry representatives to connect researchers with the other actors of RIS for potential collaborations. The project facilitated collaborative research projects between GC-MUN and the private sector members (Office of Research and Graduate Studies, n.d.).

Key interviews with the private sector and community organization respondents revealed that community organizations are not closely networked with SMEs. There is not regular ongoing communication between many local businesses and community organizations. The interviews showed that while, on the one hand, firms have been "lazy" in seeking support from community organizations and doubtful about the usefulness of their help, on the other hand, community organizations have not been successful in promoting and introducing themselves to firms. There were frequent complaints by the private sector respondents, for example, that the community organizations do not carry out site visits to businesses to ask about their needs and help to address them.

Knowledge sharing of community organizations with each other was seen as satisfactory by the respondents, as demonstrated by the following observation from a community organization respondent:

> We are always working together and helping each other. Anyone who comes to see me for support, I am putting them in touch with other organizations, to which the ideas I get might be beneficial. We really do not work in silos here, which is a great thing.

Respondents indicated a high level of communication between community organizations. It was also mentioned that since the region has a small community, people working in community organizations know each other well. They often come together at the same meetings or conferences, which allows them to interact more actively compared to other actors of the system.

Interviews with the respondents from GC-MUN and CNA showed that interaction between these two institutions could further be increased. Participants provided a few examples where communication issues occurred between these post-secondary institutions while developing partnership projects. While GC-MUN is more focused than CNA on basic research, CNA conducts

more applied research. CNA is more solution-focused while working with the industries or SMEs, trying to solve their practical problems. On the other hand, GC-MUN tries to develop a more scientific knowledge base. This sometimes leads to communication gaps between the institutions. Sometimes, CNA is interested in developing the projects faster. For GC-MUN, it usually takes more time to work on the projects. "We work in a different space, with different methods and timescales on the same problem," said one post-secondary respondent.

4.6 Discussion

The study revealed that the region has various challenges and opportunities for fostering innovation. The majority of the respondents were hopeful about the future of the region, emphasizing growing interest and an appetite for innovation and entrepreneurship. Strong knowledge infrastructure, the presence of enough support organizations, rich natural resources, quality transportation infrastructure, close-knit ties within the small community, and sufficient financial support programs for organizations create a potential for the economic growth of the region. On the other hand, the high average age among the population, a lack of skilled labour, high out-migration and low immigration rates, social barriers for immigrants, and lacking a culture of innovation increase economic adversity in the region.

Investigating the role of the quadruple helix actors in RIS in the Corner Brook region, the study found that there is a lack of leaders acting as strong advocates of innovation in the region. The findings indicated that the region needs more leadership from its government bodies and the private sector. The study participants referenced the need for a greater role of governments and the private sector in improving the conditions to grow the regional economy. This finding was also cited by Carter & Vodden (2017) and Greenwood, Pike, & Kearley (2011). The findings from the context analysis suggested that the lack of resources and capacity makes it harder for the municipal

government of Corner Brook to provide the sought leadership. Also, given the weak private sector engagement, with further expected challenges from the COVID-19 pandemic, it seems unlikely that significant leadership and investments will come from them. Without long-term, strong, local leadership from these actors, regional advantages are unlikely to be used. As discussed in Section 4.4, when leadership from governments and the private sector is missing, it remains to other actors, including post-secondary institutions, to take the lead role, which is not the ideal context.

One of the main concerns expert participants expressed was the lack of entrepreneurial and innovation knowledge and skills within the business community. Without more education and training in entrepreneurship and innovation, it is doubtful that the success rate of firms to sustain or grow the regional economy will be increased. Fortunately, an abundance of support organizations and a strong post-secondary institutional presence in the region create greater local capacity to tackle these issues. Providing more education on innovation was also one of the future directions offered for advancing and supporting innovation in NL by the report *Challenges, Opportunities, and Strategies for Advancing Innovation in Newfoundland and Labrador* of the AINL project (Hall, Walsh, Vodden, & Greenwood, 2014), where post-secondary institutions, government agencies, and community organizations have a role to play.

Cultural impediments in the region, such as weak tolerance of risks, failure, and change, as well as lack of willingness to push boundaries, etc. are also worth consideration, keeping in mind that similar cultural aspects, studied by Walsh & Winsor (2019), were suggested to be barriers to the evolution of the entrepreneurial ecosystem in NL. The findings from the context analysis show that the region's business community often perceives risks and changes as a threat rather than an opportunity to grow. Lack of risk-taking culture, tolerance for honest mistakes and failure,

contrarian thinking, and lack of willingness to push the boundaries may account for the lack of business innovation and economic growth of the Corner Brook region.

Finally, findings revealed a lack of interaction and collaboration between the quadruple helix actors, especially with the private sector. Interviews across all levels of government, post-secondary institutions, the private sector, and community organizations indicated a weak, inconsistent relationship despite the great potential with the small and tight-knit community and abundance of actors from each sector (despite the size of the region) in the region. With the consistent emphasis on the connection between the private sector and other actors of the quadruple helix, there is a lack of synergies among multi-sectoral collaboration. The findings also revealed that there is a lack of interaction among the private sector actors in the Corner Brook region. The region suffers from insufficient business clusters. The research findings show that the interaction between organizations in the RIS of the Corner Brook region reflects the linear model, as the collaboration mainly consists of specific projects. Poor communication with only project-based contacts, lack of enthusiasm to seek out external knowledge (also suggested by Winsor & Carter, 2018), 'speaking different languages,' working in different timescales, lack of opportunities for networking (see also Spigel & Harrison, 2018), and cultural impediments (see also Walsh & Winsor, 2019) were indicated as the major reasons for the lack of interaction. This deficit reduces not only collaborative projects in the region but also knowledge generation and transfer among the actors. However, generally, within the frame of the context analysis, the interview respondents expressed positivity about the future of multi-sectoral collaborations with the hope of growing awareness about its benefits. Fortunately, the above-indicated deficiencies are within the power and capacity of quadruple helix actors to change. This will, however, require more strategic collaboration and commitment from each actor.

Chapter 5. Findings: A Case Study – CBPPL Greenhouse Project

The application of the case-study approach provides more data for analysis toward a deeper understanding of RIS in the Corner Brook region. This chapter explores the RIS in Corner Brook in practice using an example of the CBPPL Greenhouse Project to highlight some of the key quadruple helix actors in the region, their roles, interactions among them, and barriers and opportunities for innovation. This will help to answer each research question introduced in Section 1.4 of this thesis. More specifically, the chapter discusses how supportive the environment in the Corner Brook region is to encourage an innovation project. This includes a discussion of the development of the project, the results related to the willingness of the local organizations from different sectors to build a partnership and exchange knowledge, community support to the local project, the availability of financial support programs, and barriers for the project development. The application of the case study in this thesis also contributes to the comparison and a better understanding of the results and findings derived from Chapter 4.

The chapter is structured as follows: Section 5.1 describes the innovation project studied. Section 5.2 introduces the quadruple helix actors involved in the project and explains their role in the project development. This also includes a description of opportunities for the development of an innovation project in the Corner Brook region. Section 5.3 gives an overview of the partnership building process of the project, and Section 5.4 discusses the interaction of the partners during the development phase of the project and suggests challenges in the development. Finally, Section 5.5 discusses the overall case study findings.

5.1 Project Description

In recent years, GC-MUN has conducted a growing range of academic research studies associated with agricultural practices. Several research opportunities to address food security were

included in discussions between GC-MUN and CBPPL. This was facilitated through the Centre for Research and Innovation (CRI) project, an initiative that brings together CBPPL, GC-MUN and other regional stakeholders (as discussed in Chapter 3). Thus, the partnership between CBPPL and GC-MUN through the CRI project established several research projects (Centre for Research and Innovation, 2021). This initiative facilitated joint projects with CBPPL designed to tackle food security and other agricultural and forestry issues pertinent to Newfoundland through improved utilization of selected byproducts. This also included the feasibility study of using waste heat from CBPPL to operate a greenhouse facility.

Early discussions between CBPPL and GC-MUN started in 2017, focusing on the potential research opportunities, including alternative uses for waste byproducts (e.g. wood ash, sludge, waste heat) resulting from CBPPL's operations. However, the idea of using thermal heat from CBPPL was not a new one. As indicated in Section 3.1.4, there were similar studies conducted by FVB Energy (2008; 2010) investigating the feasibility of using waste heat from CBPPL to develop a District Heating System in Corner Brook. In 2017, these studies became a motivation for a group of four students at GC-MUN to participate in the 'Create-a-thon' entrepreneurship idea competition organized by the Grenfell Office of Engagement, Humber Valley Entrepreneurs, and Navigate, by developing a business idea of using low-cost thermal heat from CBPPL to run a hydroponic greenhouse. The project was selected as the best among the twelve ideas presented in the competition (Environmental Policy Institute, 2017). When the proposal was developed for the CRI project, the feasibility study of using waste heat and CO_2 from the industrial operations of CBPPL was also included within the research component of the project. When the CRI project was approved for funding, the feasibility study for the greenhouse project was conducted through my first internship, starting in December 2019.

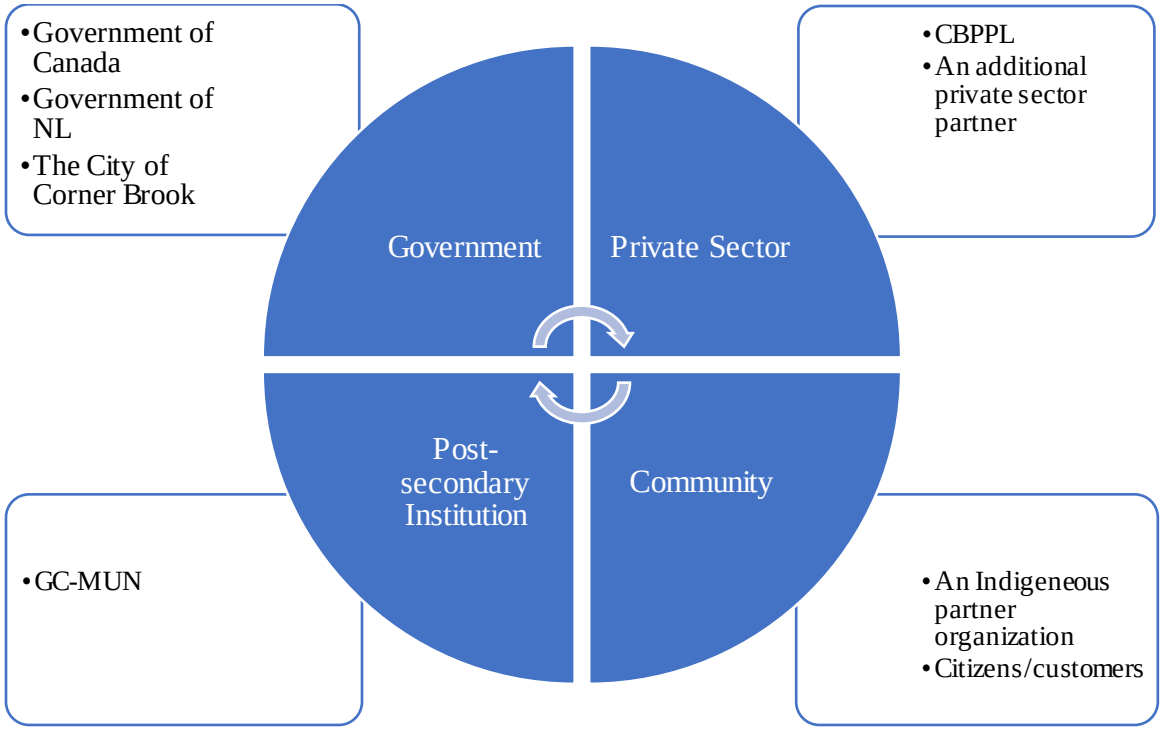
Following a hydroponic greenhouse model, this innovation project aims to address Newfoundland and Labrador's food insecurity and related health issues by producing high-value local fresh vegetables year-round through the energy derived from industrial waste streams (e.g. waste heat, CO_2) and therefore reduce the industrial environmental impact in the Corner Brook region and, more widely, in the province. This project will divert waste heat for use as an energy source for a greenhouse facility enabling local greenhouse production in a northern boreal climate due to the very low energy costs. The project will also capture CO_2 from the steam released from CBPPL operations to pump into the greenhouses to maximize growth. This innovative initiative of using waste energy and steam from an industrial operation has the tremendous potential to enhance food security not only in the Corner Brook region but also in the whole province while reducing the province's carbon footprint and providing positive economic outcomes. More specifically, such a facility in Corner Brook can deliver the following benefits: 1) environmental – by considerably reducing the waste steam and effluent from the industrial operation of CBPPL; 2) social – by providing the residents of NL with locally produced fresh vegetables to help in the prevention of health issues (i.e., diabetes, obesity) linked to the low consumption rate of fresh produce, strengthening collaboration between local partners; and 3) economic – by generating new revenue streams for commercial partners, reducing waste removal costs for CBPPL, offering employment opportunities for the local community, and providing space for agricultural research that might lead to new innovation initiatives.

5.2 Quadruple Helix Actors and Their Roles in the Project Development

This greenhouse project speaks to the social nature of innovation and the need to support interactions among quadruple helix actors – government, university, private sector, and the community. The project is being developed through a partnership of GC-MUN, CBPPL, and

private sector and Indigenous organizations, with the support of government agencies. All project partners play a pivotal role (see Figure 5):

Figure 5. *Key Actors of the Greenhouse Project*



As discussed in Section 4.3.2, GC-MUN has been increasing its research capacity around forestry, the environment, and agriculture and food studies in the last several years. GC-MUN has been a major proponent of several innovation initiatives (e.g. the establishment of the Research and Innovation Centre) and actively supports regional development. The involvement of GC-MUN in this project offers significant research to support project development and operation, including environmental, agricultural, and commercialization research components of the greenhouse. On the other hand, this greenhouse complex will provide space for GC-MUN researchers to conduct their agricultural research.

As Chapter 4 suggested, CBPPL has been the major player in the forestry industry of Corner Brook since its establishment in 1925. Being the key supporter of this innovation project, CBPPL has a strong desire to abate the environmental impacts of its operations in regard to wastewater effluent and steam released into the atmosphere. CBPPL will provide some of its available land to develop the greenhouse facility as well as technical assistance for the construction. GC-MUN and CBPPL have been playing a crucial role in the development of the greenhouse project, working actively together on the idea through the years (to be further discussed in the next section).

The involvement of the additional private sector and Indigenous partner organizations in the project allows increasing the size and scope of the development of the intended greenhouse through two phases. The first phase will be a pre-commercial stage, which includes constructing an initial greenhouse facility for agricultural research and training purposes. It will ensure necessary greenhouse production training for the Indigenous community and graduate students of GC-MUN and will serve as a lab for the research projects (including environmental, agricultural, and commercialization research) to support the development of the agricultural sector of the region. The second phase aims to expand into a larger, profitable, commercial venture supporting food security, employment opportunities, and the continued abatement of industrial environmental impacts. This facility will be managed by the private sector partners of the project.

The interviews with representatives from local retailers, wholesalers, and restaurants allow us to understand the community perspective in purchasing from the local greenhouse since the people who live in the community are their customers. These interviews revealed that the term ‘local’ in production adds to the market value of the product in the grocery stores and restaurants in the region. When asked about their willingness to buy local, all participants indicated a great

interest explaining that their customers prefer to buy local products. A local restaurant manager said that "we prefer buying local because then we can advertise that it is all local and people like that." Similarly, a local restaurant owner stated, "I try to support local. So, I go to a local grocery store first before I go to others." Generally, restaurant participants emphasized that they purchase from a local market (local farms, fishers, etc.) whenever available. The participants provided several other reasons to explain why customers prefer buying local. Some stated that local products have a longer shelf life and are fresher compared to imported ones, because long-distance transportation reduces freshness. Another reason described was that because Corner Brook is a small region, "often local businesses are owned by your friends or neighbours, and you want to support them rather than a multi-million dollar retailer" (a local restaurant owner). It was also explained that buying local promotes more local wealth. The money spent at the local businesses recirculates and stays in the local economy. Therefore, supporting local businesses encourages entrepreneurs to invest in local communities. "Especially, supporting local in small communities is essential to encourage businesses," explained one respondent. Therefore, local business owners and managers said that they promote local products whenever possible and are willing to advertise produces from a local greenhouse in their business. Overall, the interview participants were very supportive of this innovative greenhouse project. These findings are also consistent with the survey results conducted with local residents in Corner Brook by the above-mentioned GC-MUN students within the 'Create-a-thon' entrepreneurship idea competition, where all the participants surveyed indicated that they would support a greenhouse that produces vegetables and fruits using waste heat from the industrial operations of CBPPL (Western NL Entrepreneurs, 2017).

The implementation of this project is not feasible without support from government agencies. The project partners are actively seeking financial contributions and support from all

three levels of government. While the municipal government has the capacity to ensure that the construction activities of the project align with the City of Corner Brook Development Regulations & Guidelines, the staff from federal and provincial government agencies provide assistance to apply for available funding programs offered by their agencies. Available government financial support programs have been long discussed during the meetings between the partners of the project. Having more than one component (clean technology, food security of the province and associated health issues, access to fresh food and training and employment opportunities for the Indigenous community, research and learning) makes the project applicable to various financial programs offered by the provincial and federal governments. The discussions between parties have been around which program is the best fit for the objectives of the project. Regular communications have been maintained with responsible staff from federal and provincial government agencies to help determine for which funding program the project might be eligible to apply to and to guide on the program application details. In fact, information exchange between stakeholders and investigation into funding programs revealed that there are sufficient available financial support programs for this project by the federal and provincial governments. Some of the discussed programs are described in Table 4.

Table 4. *Funding programs available for the greenhouse project*

Agency	Program	Description
Agriculture and Agri-Food Canada (AAFC)	AgriInnovate Program	offers financial support for projects that aim to strengthen agri-sectors in Canada through innovation-based clean technology, advanced manufacturing, automation or robotics. The program offers up to 50% of the funding towards project costs (to a maximum of $10 million) to support the commercialization, adoption and demonstration of innovative products or

		processes (Agriculture and Agri-Food Canada, 2021).
	Indigenous Agriculture and Food Systems Initiative	is offered by the AAFC to increase the economic welfare of Indigenous Peoples and communities in Canada. This initiative supports partnership projects between federal and non-federal actors that aim to increase access of Indigenous community to healthy food while also providing training to Indigenous community to scale up an agricultural operation (Agriculture and Agri-Food Canada, 2020).
	Agricultural Clean Technology Program	is provided by AAFC to promote the reduction of GHG emissions and delivery of sustainable and clean growth to support agriculture and agri-based bioproducts through R&D and adoption of clean technologies (Agriculture and Agri-Food Canada, 2018a).
	Canadian Agricultural Partnership	is a five-year investment (2018-2023) by federal, provincial, and territorial governments that contributes to the agriculture, agri-foods, and agri-products sector in Canada to support food self-sufficiency, secondary processing, employment and economic growth (Agriculture and Agri-Food Canada, 2018b).
Infrastructure Canada	Investing in Canada Infrastructure Program	is a financial support program delivered by the Government of Canada (i.e., the Department of Infrastructure Canada) to help communities in Canada to reduce air and water pollution and to foster a clean-growth economy through innovation projects (Infrastructure Canada, 2020).
The Department of Environment and Climate Change, Government of NL	Climate Change Challenge Fund (CCCF)	is an application-based grant program that encourages the private sector, municipalities, Indigenous organizations and public sector to implement greenhouse gas reduction projects in NL. The program is financed by the Government of NL and through the Low Carbon Economy Leadership Fund of the Government of Canada, Environment and Climate Change Canada. The aim of the program is to support projects that reduce GHG emissions and energy costs by improving energy efficiency, promote economic growth and create employment opportunities (Environment, Climate Change and Municipalities, 2019).

At the current stage of the project planning, the CCCF is believed to be the most relevant program to apply for funding for this project. However, the decision between parties to develop a project proposal specific to the CCCF program has not been made yet.

5.3 Partnership Building Process of the Project

With the purpose of establishing a large-scale commercial greenhouse operation using waste heat provided by CBPPL, the mill and the (above-mentioned) private sector organization mutually agreed to develop a concept design for the project. Thus, in March 2019, a concept design and construction budget for the project was prepared. However, the project was not taken to the implementation stage by these two actors. In the summer of 2020, when my first internship through the CRI project finished, GC-MUN representatives arranged a meeting between GC-MUN, CBPPL, and the private sector organization to discuss a potential partnership between the three actors through the project. The meeting was held in a small café in Corner Brook. By a happy chance, the (above mentioned) Indigenous organization representative was also in this café, and this led to a small discussion of the potential role for the Indigenous organization in this project. The meeting was fruitful and led to further discussions on ways that cross-sectoral partnerships could contribute to the food security of the province and enhance the environmental performance of CBPPL. Given this, and through several meetings between representatives from CBPPL, GC-MUN, the private sector and Indigenous organization, it became apparent that there was an opportunity for a synergistic partnership between all parties to meld individual targets into a single innovative project.

5.4 Interaction of Partners and Challenges to the Project Development

The planning phase of the project is being developed in a way that intends for all partners to have a voice in the process. The project stakeholders meet regularly, as required, through online

means (given COVID-19 related precautions) to move the project forward. These meetings are facilitated by a representative of GC-MUN. At the current stage, which includes defining the construction and operation costs of the project, partners are looking to advance the proposal by applying for financial support towards the project expenses, with guidance coming from funding agencies. In addition, to prepare a MOU between partners, the role of each partner in the project development and implementation, including in-cash and in-kind contributions, are being discussed. More specifically, topics of discussion at these meetings include MOU development, expectations, project timeline, development of project proposal, available funding opportunities, and financial and in-kind contributions from each partner. Input from each partner is compiled together to develop a project proposal and partnership agreement.

As discussed, the idea to utilize waste heat is not new and has been discussed over several years by various stakeholders (i.e., the private sector members, government bodies) for different purposes (i.e., Corner Brook District Energy, greenhouse, etc.). Despite several feasibility studies and well-known potential, this waste heat has not been utilized. Perhaps this reflects a lack of determination by previous regional stakeholders to establish a partnership and convert an initial idea into a large-scale innovation project. Due to this or other reasons, this opportunity to help address the province's food insecurity and generate positive environmental and economic impacts through regional partnerships has not been utilized so far. However, with the GC-MUN's facilitation, the CBPPL Greenhouse Project partnership gives reason for hope to produce a tangible outcome. Considering the partnership of the project was agreed upon roughly a year ago, it was observed that the partners are still determined to implement the project and work together towards a common goal.

Currently, perhaps the major factor that impedes the CBPPL Greenhouse Project from achieving the conditions to come to fruition sooner is associated with internal processes related to establishing a separate entity and planning the project's specific details. The components of the partnership agreement and project planning are being decided and designed gradually. This is because the project is a collaborative initiative involving four key stakeholders from different sectors, where all partners are engaged in the decision-making processes. Establishing a separate entity with a major corporation (CBPPL) makes the process more time-consuming because decision-making within the corporation itself takes time. Therefore, planning is a crucial stage in the project development and is carefully considered by each partner, making the process time-consuming. Certainly, these challenges are all resolvable with more effort and input from the project partners. Fortunately, these are products of decision making, not lack of capabilities, community support, or financial support programs.

5.5 Discussion

This chapter has contributed to the understanding of the local environment for innovation in Corner Brook. The case study shows that the region has the potential to develop a large-scale innovation project through the quadruple helix approach to deliver positive economic, social, and environmental impacts. The case study also suggests there are sufficient financial support programs provided by government agencies to encourage agricultural innovations in the province. The innovation literature has emphasized the importance of government incentives, including direct financial assistance, in innovation-driven economic development (Scotchmer, 2004; Szopik-Depczynska et al., 2017; Yigitcanlar et al., 2018). Similarly, Cohen et al. (2002) stated that public funds and incentive programs play a significant role in increasing companies' innovation

capacities. Having adequate government financial support programs to support companies' innovation activities is promising for improvement in innovation rates for the Corner Brook region.

In terms of community support to local innovation initiatives, the case study found that local people are very supportive of the CBPPL Greenhouse Project and prefer to buy local products whenever available. As suggested in Section 4.4, community plays a significant role in shaping the needs of the local market, which impacts the feasibility and spheres of local innovations. Isenberg (2010) states that local potential customers are the key component of a strong entrepreneurship ecosystem. Therefore, having an innovation-supportive community allows the Corner Brook region to develop local innovation initiatives.

Discussions from this chapter indicate that although the opportunity was conceptualized over a decade ago, numerous proposals by various regional stakeholders to use this potential have not come to fruition. It was discussed that this might be due to a lack of determination from various regional stakeholders (i.e., the private sector members, government bodies) to establish a partnership and take the project to the implementation stage. However, the idea has been under active consideration for years, leading to formal partnership recently with facilitation from GC-MUN and the CRI initiative, which gives hope for a tangible outcome. This case shows that establishing a cross-sectoral partnership and planning implementation of the project through this type of partnership can be a time-consuming process. However, the role of each actor in the project development and management is crucial for the feasibility of the project. The involvement of partners from various sectors allows for the development of a greenhouse facility for agricultural research and training purposes and later to expand into commercial ventures supporting food security and employment opportunities in the region. The interaction between these actors seems quite positive. All partners are engaged in the decision-making process of the project planning and

work together to move the project forward. Overall, the application of the quadruple helix model of RIS in this project might bring tremendous benefits to the region with more dedication by the partners.

Chapter 6. Conclusion, Recommendations, Limitations, and Areas for Future Research

This chapter presents the key research findings emerging from Chapters 4 and 5 to answer the research questions. In addition, based on the research findings, the chapter provides recommendations for the quadruple helix actors to further develop RIS in the Corner Brook region. In the following sections, the chapter discusses the limitations of this study and provides recommendations for future areas of research.

6.1 Conclusion

Utilizing the quadruple helix approach, this study attempted to investigate the current state of the RIS in Corner Brook and surrounding area. The importance of the study is that it aimed to contribute to the limited empirical research on innovation and RIS in peripheral, resource-dependent regions. Through a primarily qualitative approach, the current study sought to answer four research questions raised in Chapter 1. With respect to these questions, the following conclusions can be derived:

1. With regard to the barriers to innovation in the region, the findings from the context analysis suggested that demographics, emigration of young talents, a lack of skilled labour, a less than welcoming environment for immigrants, and a lack of innovation culture are the major concerns. The region's lack of innovation culture was attributed to the historical role of resource-based sectors in the regional economy. It was also linked with the lack of exposure to innovation concepts for children from kindergarten up to post-secondary education. Also, it was discussed that innovation in the region occurs primarily in specific sectors – often traditional resource-based sectors, while other sectors, such as tourism, stay inactive. These results are supported by the findings of other studies that investigated

innovation and entrepreneurship in the provincial context or other regions of NL (Hall & Walsh, 2013; Hall & White, 2013; Walsh & Winsor, 2019).

The context analysis findings also indicated a number of advantages for the Corner Brook region to foster innovation. These included the strong post-secondary institutional presence and knowledge infrastructure, natural resources, transportation infrastructure, and small size of communities in the region that allows to build close and trustworthy contacts. Some of these opportunities were also stated in the report for the Western NL Innovation Workshop, prepared by Hall & White (2013). The case study findings showed adequate government financial support programs for businesses in the Corner Brook region to implement innovation initiatives. It was also discussed that the community, which plays an essential role in the realization of regional innovation activity, is supportive of local innovation initiatives. As suggested by Greenwood, Pike, & Kearley (2011), building on these existing opportunities and addressing the challenges is important to foster innovations in the region.

2. Through the context analysis of this thesis, key quadruple helix actors of the Corner Brook RIS were identified based on the responses from the interview participants. Respondents mentioned various key actors of the RIS in Corner Brook and surrounding area and/or gave examples of several stakeholders they have worked with. The list of often cited actors is provided in Table 5.

Table 5. *Key quadruple helix actors in the Corner Brook RIS*

Key Quadruple Helix Actors		
Government	Government of Canada	ACOA, NRC, BDC, ISC
	Government of NL	TCAR, IET, FFA, IPGS

	The City of Corner Brook	
	Qalipu First Nation	
Post-Secondary Institutions	GC-MUN	
	CNA	
Private Sector	Large-size firms/companies	CBPPL, Barry Group Inc., Growing For Life Ltd., Hew & Draw Hotel, Colemans
	SMEs	Sorrento, Cycle Solutions, Newfound Sushi, Juniper BBQ Scraper, Brewed Awakening, Crooked Feeder Gastropub
Community Organizations	CBDC Humber, Futurpreneur Canada, Navigate, NLOWE, NLWIC, GCBBT, Western NL Entrepreneurs	

The development phase of the CBPPL Greenhouse Project (discussed in Chapter 5), involving actors from government, university, private sector, and the community, provides further evidence of the quadruple helix approach being applied in Corner Brook and area region. More specifically, the project is being developed through a partnership of GC-MUN, CBPPL, and private sector and Indigenous organizations, with the support of government agencies, in which all involved actors play a pivotal role.

3. The study evaluated the role(s) of the quadruple helix actors in developing innovation in the region. Even though the findings both from context analysis and case study revealed sufficient financial support programs offered by the provincial and federal governments, some concerns around the complexity of the application process were mentioned by participants. Also, funding recipients often have to adjust their projects to fit a smaller budget provided by the government. Furthermore, it was discussed that the four-year

election schedule inhibits long term planning by the provincial government, which is necessary for RIS improvement. The municipal governments in Corner Brook and surrounding area seems to have little resources and power to be a lead innovation facilitator government body of the region.

Despite these limitations, the contributions from all three levels of government were discussed as important for the development of the CBPPL Greenhouse Project. With regard to the role of the post-secondary institutions in the region, the study participants were pleased with the teaching capacity and ability of GC-MUN and CNA to graduate highly qualified students for the job market. However, it was revealed that knowledge sharing with the community is limited to specific projects or programs. Technology and knowledge transfer to the private sector were also rated as limited by the participants. This is because the research capacity and interests of the post-secondary institutions do not always meet the needs of the private sector, although the case study showed that the private sector actors and GC-MUN could develop a successful partnership. The involvement of GC-MUN in the CBPPL Greenhouse project has offered important research support for project development and operation.

The findings on the private sector indicated a lack of knowledge among local businesses to innovate. The findings on the cultural impediments within the private sector, such as lack of willingness to change and to push the boundaries, confidence to innovate, and tolerance to failure, are also worth highlighting (similar cultural impediments were also discussed by Walsh & Winsor, 2019). Another important discovery made in the research is that there is limited knowledge sharing among the businesses. It was discussed that businesses are not willing to share information with their peers. On the other hand, the

study by Lam et al. (2013) indicated that numerous entrepreneurs were interested in working with their peers, which could lead to new networking opportunities in Corner Brook. The findings of the current research also indicate a lack of leadership from the private sector to initiate innovation activities. The case study (discussed in Chapter 5) shows how the well-known excess thermal capacity from CBPPL was not used over several years. It was discussed that this might be due to a lack of determination from various regional stakeholders (i.e., the private sector members, government bodies) to establish a partnership and take the project to the implementation stage. A new partnership was only agreed upon when GC-MUN took the lead to bring the private sector actors together to discuss how to implement the project. It was further discussed in Chapter 4 that the private sector is not the primary employer of the region. This limits the growth of innovation activities in the region.

Finally, the importance of community organizations was clearly identified by the interview participants. However, it was discussed that community organizations are not the major innovation driving forces in Corner Brook and surrounding area. This was attributed to their limited human and financial resources. Community organizations are often dependent on government funding to implement initiatives. Furthermore, it was discovered that community organizations of the region are not successful enough to bring together local businesses and facilitate networking. The lack of connector events organized by the community organizations was emphasized. Also, the private sector respondents noted that community organizations and industrial associations are not much effective in articulating the needs of the private sector to government agencies to influence policies and strategies.

4. Concerning the fourth question, the thesis investigated interactions among the key actors of the quadruple helix in the region. The findings discussed in the context analysis indicate a lack of communication between all levels of government in the province. For example, the municipal government of Corner Brook is not actively involved in the development of provincial policies and strategies, which also influence the regional context. The collaboration between the City of Corner Brook and community organizations, on the other hand, was rated as strong and valuable. Also, the municipality has an established and successful relationship with the post-secondary institutions of the region. Relations of community organizations with the provincial government and ACOA were generally described as satisfactory. The interactions between the private sector and other actors (i.e., all levels of government, post-secondary institutions, and community organizations), however, do not seem strong, in that interviewees from local businesses explained that they do not get enough support from these actors. With regard to the interaction of community organizations with each other, it was indicated that there is a good level of collaboration and knowledge exchange between them. This was partially attributed to the community's small size, which often causes community organizations' personnel to come together at the same meetings. Finally, it was found that interactions between post-secondary institutions of the region need to be increased. The findings indicate that having different expectations from collaborative projects can lead to communication issues between these institutions. It also becomes evident from the case study's findings that developing a multi-sectoral collaboration project in the region can be challenging and time-consuming, although the interaction among these actors is positive. This was associated with the challenges of

establishing a project as a separate entity with key stakeholders since the decision-making process within these institutions takes time.

6.2 Recommendations

The following section discusses key findings and provides recommendations for the actors of the RIS in the Corner Brook region, applying the quadruple helix approach to develop innovation potential and enhance the opportunities. These recommendations try to answer the question: what can all levels of government, community organizations, GC-MUN and CNA, and private sector members do to contribute more towards the development of the RIS in the Corner Brook region? Each recommendation is derived from specific gaps or barriers identified in Chapters 4 and 5 of this thesis and outlines the relevant research findings. These relevant research findings are listed after each recommendation provided. Also, the summary of barriers and relevant recommendations for each actor is presented in a table at the end of each section (see Tables 6, 8, 9, 10).

6.2.1 Government Agencies

Recommendation #1: Establish a completely new department within the Municipal Government of Corner Brook with support from the Provincial Government of NL to undertake the role of lead for innovation and economic development in the region

Respondents consistently reported a lack of leadership in the region to seize opportunities to develop innovation. It was mentioned that there is a sufficient number of players in the region to develop the RIS, and every player has something to contribute, including knowledge, finances, skills, etc. However, there is a lack of leaders who can gather these players around the same table and lead the initiatives. This was also discussed in the case study of this project. Regardless of

whether this leadership should come from the government or the private sector, improvement of the long-term innovative performance and increase of economic growth of the region will not occur without long-term, strong leadership. Compared to the Government of NL, municipalities can provide more effective oversight at the regional level, being at the ground level and having a better sense of the needs of their communities. However, lacking the necessary resources, the City of Corner Brook does not have the capacity to be the lead for the economic development in the city. According to Carter & Vodden (2017), regions with a weak private sector and lack of capacity at the municipal level of government need to resolve these problems to increase collaboration between the quadruple helix actors.

It is recommended to form a new department within the Municipal Government of Corner Brook supported by the Provincial Government of NL. The City of Corner Brook would be responsible for administering the new department with the funding provided by the Government of NL. This department would work closely with the key actors of the RIS in Corner Brook and support them with the necessary services and resources to create a competitive environment to grow the regional economy. To build the sought leadership in the region, the new department should be designed to focus on establishing effective communications with the private sector, community, and post-secondary institutions and developing ongoing partnerships with all three levels of government. In a successful and similar practice, the City of Greater Sudbury's economic development arm – The Greater Sudbury Development Corporation (GSDC) supports businesses in the region through funds received from the City of Greater Sudbury (Greater Sudbury, 2021).

Relevant research findings for this recommendation include:

- Lack of leadership to develop the RIS
- Weak capacity at the City of Corner Brook

Recommendation #2: Establish a communication plan

The most common thread reported among respondents was the weak communication system between the provincial government and other stakeholders. The findings show that the provincial government's communication with other actors of the RIS is primarily project-based. There is not an established regular communication plan between the municipal government of Corner Brook and the provincial government of NL. Similarly, the lack of interaction with the private sector is something of concern in the region. Isenberg (2010) states that the government cannot build the innovation system alone and must engage the private sector to achieve the system's success. According to him, reaching out to the private sector and asking for frank advice can help to avoid many structural barriers and develop entrepreneur-friendly policies and programs. Hall, Walsh, Vodden, & Greenwood (2014) suggest that the government should embed all stakeholders of the quadruple helix in the decision-making process. The critical gap preventing the region from being more innovative, identified by the respondents, was the absence of continual interaction between the government and the key stakeholders of the RIS. In order to make sure that policies and plans are appropriately designed, implemented, and evaluated, all levels of government should work closely with all stakeholders. Regarding that, there is a strong need to establish a communication plan to constantly engage the actors of the RIS with the provincial government. To improve the innovation ability of the region, the provincial government needs to expand the knowledge and involvement of local actors. This requires a concerted effort of regular communications.

To boost communications with other stakeholders of the RIS, the provincial government will need to kick off an established communication plan on regional innovation. The plan will need to be readily available, outlining communication channels, goals, objectives, a timeline, and

specific actions that the government will take to connect with the local actors. The actions might include regular meetings/roundtables, bilateral meetings with the representatives from each strand of the quadruple helix, collective meetings with quadruple helix actors, establishment of a website, etc. Successful implementation of the plan will require consultation with all levels of government, post-secondary institutions, community organizations, and the private sector members during the planning process. After completion of the plan, the provincial government will need to send a copy of the plan to the consulted actors to discuss the next steps. The plan should be updated in a timely manner or as required to adjust the emerging needs through implementation.

Relevant research finding for this recommendation include:

- A weak communication system between the Government of NL and other actors

Recommendation #3: Establish formal networks for specific industries

The findings revealed that there is a shortage of clusters from the private sector in Corner Brook. Similarly, Lam et al. (2013) suggested that the local businesses in Corner Brook are not as clustered or densely connected as desired. Therefore, the lack of information sharing was described as one of the major challenges to accelerate regional economic development. This finding is also consistent with Winsor & Carter (2018) and Walsh & Winsor (2019).

To create an innovation culture in Corner Brook, Lam et al. (2013) recommend encouraging sector-based networking initiatives. He suggests establishing formal networks for specific industries, such as tourism, art, environment, etc. According to Walsh & Winsor (2019), the government should create the necessary conditions to encourage peer-to-peer interactions and knowledge exchange. It is necessary to connect businesses with the appropriate networks and facilitate the networking process. The governments need to organize more formal and face-to-face

gatherings for businesses from specific industries. Mentioning the existence of the informal network of farmers in Corner Brook, one respondent emphasized the potential to set formal networks across various industries. Providing the necessary resources and facilitation, the governments can initiate formal networks to encourage clustering and knowledge spillover.

Relevant research findings for this recommendation include:

- Lack of business clusters
- Lack of information sharing among the local businesses

Recommendation #4: Facilitate cross-sectoral partnerships through partnership-based financial assistance programs

Another interaction challenge that prohibits the development of innovations in the region is the lack of cross-sectoral collaborations. The interviews indicated that communication among the actors from various sectors is lacking or sporadic in the region. One respondent stated that the region does not have an established culture of looking outwardly for different organizations to collaborate to solve the existing problems.

The success of the RIS depends largely on its ability to facilitate more interaction between quadruple helix actors. Lam et al. (2013) recommend integrating and promoting collaboration among actors from different sectors to enhance the innovation culture in Corner Brook. CBPPL Greenhouse Project, discussed in Chapter 5, is an example of how organizations from various sectors can establish a partnership and work together to utilize existing opportunities in the region. To encourage the development of cross-sectoral partnerships, the provincial and federal governments could offer (or increase) financial assistance for the implementation of partnership

projects. These partnership-based financial assistance programs could increase innovation and technology collaboration and partnerships and serve the needs of the partners.

Relevant research findings for this recommendation include:

- Lack of collaboration between the quadruple helix actors

Recommendation #5: Promote the offered programs

In response to the concern expressed by many interview participants regarding the extensive and complex paperwork to apply for the programs offered by the provincial government, this research project recommends that governments improve the clarity of their programs and expectations. The CBPPL Greenhouse Project showed that the representatives from the government agencies provide the necessary assistance regarding the application to the financial assistance programs. However, individual service might take time since there are fewer people on the ground to assist with grant applications. This is particularly important since SMEs are usually busy with their day-to-day operations and do not have time to go through the complex criteria to get financial assistance or other services from the government. Regarding this idea, the report "*Challenges, Opportunities, and Strategies for Advancing Innovation in Newfoundland and Labrador"* (Hall, Walsh, Vodden, & Greenwood, 2014) suggests that the Government of NL should launch an innovation awareness campaign. The report recommends that in order to advance and support innovation in NL, the government should promote its programs more extensively and provide better clarification to assist businesses to follow through the challenging application process and collection of programs. This can increase the interaction between organizations looking for financial assistance and the government. Also, more organizations, including SMEs, would consider improving their services through the government contributions.

Relevant research findings for this recommendation include:

- Complex paperwork to apply for the offered government programs
- Confusing information requires additional help for clarification

Recommendation #6: Create key performance indicators to monitor and measure the impacts of innovation policies and strategies

Some participants in the study believe that the provincial government does not measure the impacts of its policies and strategies. This impedes the government from understanding how much change occurred and how much can be linked to the implemented policies. It is recommended to develop key performance indicators based on the set targets and objectives to measure and monitor the success of the implemented innovation policies and strategies. Creating key performance indicators would provide an analytical basis for decision making for the provincial government and allow to focus on the key impact areas. If applied properly, evaluation of the policies can be instrumental in understanding the barriers and forming future goals.

Relevant research findings for this recommendation include:

- There are concerns that the provincial government does not measure the impacts of its strategies

Table 6. *Recommendations for government agencies*

Gaps/Barriers	Recommendations
• Lack of leadership to develop RIS • Weak capacity at the City of Corner Brook	Establish a completely new department within the Municipal Government of Corner Brook with support from the Provincial Government of NL to undertake the role of lead for innovation and economic development in the region
• A weak communication system between the Government of NL and other actors	Establish a communication plan

• Lack of business clusters • Lack of information sharing among the local businesses	Establish formal networks for specific industries
• Lack of collaboration between the quadruple helix actors	Facilitate cross-sectoral partnerships through partnership-based financial assistance programs
• Complex paperwork to apply for the offered government programs • Confusing information requires additional help for clarification	Promote the offered programs
• There are concerns that the provincial government does not measure the impacts of its strategies	Create key performance indicators to monitor and measure the impacts of the innovation policies and strategies

6.2.2 Post-Secondary Institutions

Recommendation #1: Increased collaboration between CNA and GC-MUN

Interviews with the post-secondary institution respondents showed that CNA and GC-MUN do not collaborate enough to conduct technical and social science research to provide advice to other stakeholders of the RIS and facilitate broader knowledge mobilization on the development of innovations. They often face communication issues while developing partnership projects. In collaboration, CNA and GC-MUN must become leaders in developing education and awareness around innovation in the region. This is not possible without increasing their partnership capacity and developing more collaborative research projects. It is recommended that GC-MUN and CNA develop a strategic partnership plan to explore whether and how partnerships can grow between these organizations. The plan should outline the objectives, needs, expectations of each organization, opportunities and challenges for partnership, potential areas for joint initiatives, next steps, etc.

Relevant research findings for this recommendation include:

- Lack of collaborative projects between CNA and GC-MUN

Recommendation #2: Develop a better connection with the private sector

Applying an interactive and inclusive approach with the private sector will be key for the future success of the RIS in Corner Brook. Considering that weak interaction between post-secondary institutions and local SMEs and lack of innovation knowledge in the region are critical barriers for the RIS, post-secondary institutions should devote more people and resources to collaboration with firms. According to Hall, Walsh, Vodden, & Greenwood (2014), CNA and GC-MUN should be leaders in engaging with the private sector with an emphasis on knowledge transfer and commercialization.

CNA and GC-MUN can support firms through the implementation of various education and awareness activities around innovation. Respondents often recommended implementing collaborative projects with local firms operating in different industries, including arts, tourism, agriculture, etc. Grenfell Office of Engagement supports innovation and entrepreneurship through partnerships. For example, the CRI initiative described in Chapter 5 is an encouraging partnership initiative between the GC-MUN, CNA, and CBPPL. However, the need for more collaboration with the private sector organizations could have an economic impact in the region. The post-secondary institutions can also help small businesses to become more tech-savvy, understand time investment, become more knowledgeable in payroll service, understand commercialization, etc. Hall, Walsh, Vodden, & Greenwood (2014) propose conducting more research around the role and importance of business networks in rural regions. A few respondents stated that the post-secondary institutions could appoint a researcher to do site visits to firms to speak directly to business people about their operational bottlenecks, production challenges, technology adoption issues, and funding challenges, as well as to help with these challenges. There were also suggestions to post-

secondary institutions to develop an entrepreneurship training program to get engagement from the local entrepreneurs and to increase entrepreneurial and business skills of new and experienced entrepreneurs. Such a program can also play a significant role in the development of the business community of the region. See Table 7 for the recommended activities for CNA and GC-MUN.

Table 7. *Summary of the recommended activities for the post-secondary institutions*

Recommended activities for CNA and GC-MUN to develop a better connection with the private sector
• Implement collaborative projects with local firms operating in different industries, including arts, tourism, agriculture, etc.
• Conduct more research around the role and importance of business networks in rural regions
• Appoint a researcher to do site visits to firms
• Develop an entrepreneurship training program to get engagement from the local entrepreneurs and to increase entrepreneurial and business skills of new and experienced entrepreneurs

Relevant research findings for this recommendation include:

- A weak interaction between post-secondary institutions and local SMEs
- Business community of the region lacks innovation knowledge

Recommendation #3: Offer specialized courses on innovation and consider the development of postgraduate diplomas/master's programs in innovation and entrepreneurship

As indicated in this study, a lack of expert capacity, trained professionals, and educational programs in the region make innovations less feasible to occur. Respondents generally agreed that there is a shortage of trained professionals and a lack of expert capacity in Corner Brook. CNA offers only general financial accounting in its business administration program; GC-MUN does not offer any specialization in entrepreneurship or innovation at the graduate level. Generally, there

are limited opportunities to study innovation at the graduate level. Furthermore, some participants agreed that the grade school students are not exposed well to innovation concepts throughout their education.

According to Walsh & Winsor (2019), innovation and entrepreneurship education should be provided to children starting from an early age. Children are less likely to get this knowledge from their family or friends. They should be exposed to innovation-driven entrepreneurship skills, such as inventing, redesigning, critical thinking, and problem-solving, starting from primary school. One post-secondary institution respondent emphasized that CNA and GC-MUN should provide more education and training in innovation and entrepreneurship to their students. "This is important to overcome some of the cultural issues around innovation in NL." Hall, Walsh, Vodden, & Greenwood (2014) recommend offering specialized courses focusing on innovation. According to them, developing postgraduate diplomas/master programs in innovation should also be considered by the post-secondary institutions.

Relevant research findings for this recommendation include:

- A lack of expert capacity, trained professionals, and educational programs in the region
- Grade school students are not exposed well to innovation concepts throughout their education

Recommendation #4: Develop, host and promote public lectures to the community

Innovation literacy and awareness empower the community to overcome the underlying cultural impediments, play a stronger role in the RIS, and support appropriate innovation-related initiatives. The case study found that the community in the Corner Brook region is supportive CBPPL Greenhouse Project, which is an innovation project. This was one of the major factors increasing the feasibility of the implementation of this innovation project. However, many

respondents in the context analysis of this study believed that there is a lack of knowledge and awareness about innovation among the general public in the region. Respondents often cited that the local community is not tolerant of honest mistakes, honourable failure, risk-taking, and contrarian thinking, which are the indicators of lacking innovation awareness. Without a change in these cultural aspects, the significant growth and development of innovations will be unlikely in the region.

Providing innovation literacy to the community could be essential to address the underlying cultural impediments. Public lectures could help to inform the general public, as well as the business community, about both the potential and challenges of innovation development in the region. Post-secondary institutions could host and promote public lectures with financial support from the government. The primary focus of these lectures should be ongoing education and awareness of the general public regarding the approach to innovation and entrepreneurship. The recommendation also encourages the provincial and federal governments to fund these initiatives and support the post-secondary institutions to develop and host public lectures.

Relevant research findings for this recommendation include:

- A lack of knowledge and awareness around innovation among the general public

Recommendation #5: Communicate with the private sector and community

Respondents noted that the academic language used by post-secondary institutions might be challenging for the business community of the region to understand. Participants emphasized a lack of awareness among the business community regarding previous research conducted in the province. Research conducted by CNA and GC-MUN faculty and other researchers is often

unknown or unclear to the community. This is a barrier to the knowledge transfer from the university to the community.

Participants suggested that post-secondary institutions need to translate relevant research outcomes into non-academic language to facilitate knowledge transfer. Long scientific papers such as journal articles or technical proposals can be turned into a brochure, short video, news and emails with eye-catching headlines, etc. "A farmer can easily watch a video and apply the knowledge in the business," a government respondent suggested. The post-secondary institutions should adopt new methods and channels to deliver necessary messages to the business community.

Relevant research findings for this recommendation include:

- A lack of knowledge transfer from the university to the firms and local community due to usage of scientific language

Table 8. *Recommendations for the post-secondary institutions*

Gaps/Barriers	Recommendations
• Lack of collaborative projects between CNA and GC-MUN	Increased collaboration between CNA and GC-MUN: develop a strategic partnership plan that outline the objectives, needs, expectations of each organization, opportunities and challenges for partnership, potential areas for joint initiatives, next steps, etc.
• Weak interaction between post-secondary institutions and local SMEs • Businesses community of the region lack innovation knowledge	Develop a better connection with the private sector
• Lack of expert capacity, trained professionals, and educational programs in the region • Grade school students not exposed well to innovation concepts throughout their education	Offer specialized courses on innovation and consider the development of postgraduate diplomas/master's programs in innovation and entrepreneurship

• A lack of knowledge and awareness around innovation among the general public	Develop, host and promote public lectures to the community
• A lack of knowledge transfer from the university to the firms and local community due to usage of scientific language	Communicate with the private sector and community

6.2.3 Private Sector

Recommendation #1: Seek out external knowledge support for lacking knowledge and skills

The findings of the context analysis of this study show that there is a lack of interaction between firms and other actors of the RIS in the Corner Brook region. The other actors of the system do not connect with the local businesses proactively. On the other hand, the firms are not motivated to ask for support from other stakeholders. Community organization respondents often complained about the lack of participation by the private sector members in the events, gatherings, and meetings organized by them. There were also consistent comments regarding the lack of innovation knowledge and skills among the businesses.

The literature on the economic development of the province emphasizes the importance of the connection between firms and other actors of the quadruple helix from the point of external knowledge flow and that a lack of interaction limits innovations (Lam et al., 2013; Hall, Walsh, Vodden, & Greenwood, 2014; Walsh & Winsor, 2019; Carter & Vodden, 2017; Winsor & Karter, 2018). In order to increase external knowledge support, local businesses should be proactive and seek out lacking knowledge and skills from support organizations, post-secondary institutions, and government agencies. The support organizations mentioned by respondents, including post-secondary institutions, can also assist firms with research on their needs. Government agencies

have officials to ensure a streamlined response to requests, referrals, consultations, etc., besides assistance programs and events.

Relevant research findings for this recommendation include:

- Local businesses are not motivated in seeking out support
- A lack of innovation knowledge and skills among local businesses

Recommendation #2: Seek out networking opportunities

Walsh and Winsor (2019) state that skills critical for innovation and entrepreneurship are primarily transferred among firms through mentors, volunteers, and informal networks. A strong network of firms is key for the development of higher skill levels. In this research, local networks have been identified as an important factor to stimulate innovation in regions (Spigel, 2013; Desrochers and Sautet, 2008). According to Spigel and Harrison (2018), NL has a poorly functioning innovation ecosystem with weak social networks that keep entrepreneurs from accessing the necessary resources outside of their immediate network of family and friends. The findings of this study consistently emphasize the lack of business clusters and networks in the region.

While there is a role for government and other stakeholders of the quadruple helix to create conditions that foster collaboration between the private sector, businesses also should seek out networking opportunities and create sustainable connections without long-term intervention from other actors (Lyons, 2002). A post-secondary institution respondent put it that "entrepreneurs have to connect with each other; they have to put in time not just on their business, but also on working with other like-minded entrepreneurs." Although there are limited activities created by other actors of the quadruple helix to be sufficient to establish sustainable networks in the region, businesses

should use these opportunities to the best of their abilities. The business community of the region should: be more proactive in attending networking events, such as 10000 coffees, entrepreneur coffee break, networking breakfasts, innovation drinks, etc.; join formal and informal networks created by various stakeholders: and engage in connector events held by industry associations and diaspora networks.

Relevant research findings for this recommendation include:

- Lack of business clusters and networks in the region

Recommendation #3: Be more tolerant of risks and failure

A number of cultural aspects of the RIS have become barriers for businesses to innovate in the Corner Brook region. Study participants agreed that the business community is not tolerant of risks and failure. As one respondent put it, "it may be because we live next to the North Atlantic, and North Atlantic does not allow failure. If you make a mistake on the ocean, you die." This finding is also consistent with the study by Walsh & Winsor (2019). According to them, the people in NL have historically worked in jobs under harsh and risky conditions, such as fishing and logging, which required no mistake. This cultural development taught the people not to take risks.

According to Isenberg (2010), although changing social norms around entrepreneurship in "a deeply ingrained culture" is very challenging, Ireland and Chile showed that this is possible, even in less than a generation (p. 46). He describes how tolerance for loan defaults, bankruptcy, and failure in general changed in a decade (from the 1980s to 1990s), and people learned it was possible to fail and recover from a failure in Ireland, after hundreds of new software companies were established in the country, many being successful. He then adds that as an impact of the Chilean government efforts, the attitude against entrepreneurship and opportunity-driven

investment changed in roughly ten years by the 1990s. In order to see more innovations in the region, the business community should be more open to failure and ready to regroup to try again. Local successful stories and promotion of them might play an important role in changing attitudes in a small community.

Relevant research findings for this recommendation include:

- The business community is not tolerant of risks and failure

Recommendation #4: Tackle cultural change to leave "comfort zone" and push boundaries

Another cultural impediment frequently cited by the study participants was that firms usually accept things as they are. Companies are not willing to step outside of their boundaries and make changes. A community organization respondent stated:

> Because we are a small community, we are even quicker to fall to the normal or expected rather than pushing boundaries of doing something unexpected, exceptional. That is not necessarily a bad thing but makes it difficult to see something amazing occurring.

It was also noted that firms do not like leaving their comfort zone and challenging local hostile conditions.

Isenberg (2010) states that the challenges of resource-scarce environments often trigger entrepreneurial resourcefulness. "Icelandic entrepreneurship is built upon a legacy of fishing when the fish are there, not when the weather is good," as he put it (p. 47). In order to make innovations occur, the region needs stronger players who are determinants to change and improve. Companies should change their attitude of willingness to protect the status quo and to stay in their comfort zone. They need to discover behind the horizon, tackle the region's hardships, and seek ways to turn them into opportunities. In other words, leaving the comfort zone can be: adding new products

or services; increasing work capacity by hiring new employees; exploring other markets; using online marketing and social media, etc.

Relevant research findings for this recommendation include:

- Companies are not willing to step outside of their boundaries and make changes

Recommendation #5: Be more open to an exchange of ideas with other firms

One of the concerns of the respondents was regarding siloed knowledge between companies. Scobie (2016) explains that the silo effect emerges as a barrier to share information between actors. Walsh & Winsor (2019) call this "lobster" syndrome in NL. This is because in a lobster tank, when one lobster crawls out of the tank, the other lobsters grab it and pull it back into the tank. The study by Winsor & Carter (2018) revealed that there was little knowledge-seeking between companies in NL. The study showed less than 25% of knowledge-seeking by entrepreneurial companies was directed to their peers, while they preferred to seek more knowledge from government agencies and support organizations.

Walsh & Winsor (2019) suggest that an innovative region demonstrates active information sharing and voluntary mentoring among its firms. A well-connected network of firms with regular information sharing is a key to skills development. Firms need to be more open to share and receive information from their peers to improve their products or services. Winsor & Carter (2018) recommend that firms enhance their knowledge-seeking relationship and develop regular communication with their peers. It is essential for companies to exchange knowledge with other businesses both from outside and inside the region in smaller communities. In NL, there is low knowledge-seeking by firms from their peers both from outside and inside the province (Winsor & Carter, 2018). The small size of the community in Corner Brook might be advantageous for the

region to establish trust and cooperation between local businesses. According to Floysand and Jakobsen (2010), the region's small size can play a vital role in building trust and collaboration. As discussed in Recommendation #2, while other actors of the quadruple helix have a role in creating the environment for the businesses to encourage networking and knowledge sharing between them, the businesses should use these opportunities. Knowledge sharing could help businesses generate new ideas, have access to a significant amount of information, increase awareness among employees, etc. In other words, knowledge exchange can help businesses improve their performance.

Relevant research findings for this recommendation include:

- Lack of information exchange of firms with each other

Table 9. *Recommendations for the private sector*

Gaps/Barriers	Recommendations
• Local businesses are "lazy" in seeking out support • A lack of innovation knowledge and skills among local businesses	Seek out external knowledge support for lacking knowledge and skills
• Lack of business clusters and networks in the region	Seek out networking opportunities
• The business community is not tolerant of risks and failure	Be more tolerant of risks and failure
• Companies are not willing to step outside of their boundaries and make changes	Tackle cultural change to leave "comfort zone" and push boundaries
• Lack of information exchange of firms with each other	Be more open to an exchange of ideas with other firms

6.2.4 Community Organizations

Recommendation #1: Facilitate networking and knowledge sharing between interested parties by being a broker

The findings emphasize that there is a strong need in the region for intermediaries, brokers, facilitators, or catalysts to encourage networking and knowledge sharing between interested stakeholders. Community organizations are the potential network weavers for businesses. They should take the lead on enhancing connections between local firms. However, according to the respondents, community organizations are weak in supporting business networks and facilitating knowledge spillover in the Corner Brook region. They should play a stronger role in this regard.

The next step is promoting informal networks among businesses by bringing them together to initiate knowledge sharing and collaborations. Community organizations can do so by encouraging more initiatives that transfer knowledge among firms. Walsh & Winsor (2019) indicate that community organizations need to arrange grassroots gatherings for local entrepreneurs and startups. Lam et al. (2013) recommend organizing speed networking events, such as "Networking Breakfasts" and "Innovation Drinks." They also suggest delivering business networking sessions for firms. A post-secondary institution respondent recommended providing a space and facilitation to support entrepreneurs getting together and talking to each other. Hall, Walsh, Vodden, & Greenwood (2014) propose organizing more innovation/business tours to encourage local managers to learn from each other. One respondent suggested that a good way of building a business relationship is organizing coffee hour discussions, as Navigate does, where entrepreneurs come together, drink coffee, and talk about business. Currently, with the COVID-19 pandemic's in-person gathering restrictions, many of these activities could be run in a virtual environment – online format.

Relevant research findings for this recommendation include:

- Weak role of community organizations to bring local businesses together and encourage networking

- Lack of information sharing among the local businesses

Recommendation #2: Organize startup weekends regularly (monthly, bimonthly, annually, etc.)

Considering lack of entrepreneurial culture and knowledge in the region, startup weekends can be a powerful way to gain more skills and knowledge around specific business ideas and build confidence for young entrepreneurs to start a company. Planning startup weekends is a great way to develop local startup community and build community bonds by encouraging connections and networks. This is a three-day program where passionate individuals form teams around business ideas and promote case studies on these ideas. Startup weekends provide an opportunity for like-minded startup enthusiasts to connect with each other and turn their ideas into a demo. Regularly hosting startup weekends will also enable community organizations to be more widely recognized as support institutions and form deep and meaningful relationships with the region's business community.

Relevant research findings for this recommendation include:

- Lack of entrepreneurial spirit and knowledge in the region

Recommendation #3: Seek potential partnership opportunities that could benefit the community

A key lesson learned from the case study of this research is that partnership projects could have significant benefits to the partners, and therefore, the region. For example, the implementation of the CBPPL Greenhouse Project can generate social, economic, and environmental benefits for the community. This suggests that community organizations need to engage in more collaborative projects that could have a positive impact on the local community. Pooling resources and innovating together with other actors, community organizations can stimulate job creation, address community issues, increase community capacity, etc.

Relevant research findings for this recommendation include:

- Benefits of the cross-sectoral partnerships to the community

Recommendation #4: Organize business management workshops

As acknowledged in the above sections, the findings indicate a lack of capacity, awareness, knowledge, and culture at the firm level to develop innovations in Corner Brook. Despite the lack of management skills, many businesses do not see value in participating in the meetings or events organized by community organizations. It was revealed that these activities do not meet local business managers' expectations. One private sector respondent stated that he is interested in attending workshops to learn how to work with the staff, develop performance indicators to measure performance, use various tools to improve services, communicate with customers, but the current meetings do not sufficiently address these topics. Hall, Walsh, Vodden, & Greenwood (2014) emphasize the need for new methods to attract business owners to the events.

Lam et al. (2013) recommend developing workshops for the business community on issues relevant to their operations, such as opportunities, funding, etc. Hall, Walsh, Vodden, & Greenwood (2014) suggest developing and hosting business management skills workshops. Community organizations can also organize workshops to provide information about specific government financial assistance programs' application process since many firms either are not aware of these opportunities or find it challenging to apply. Consultants or experts of relevant topics might be invited to facilitate the sessions. Offering workshops for local businesses on various topics can effectively improve their knowledge capacity and help them understand business needs and skills requirements.

Relevant research findings for this recommendation include:

- Lack of capability, awareness, knowledge, and culture at the firm level to develop innovations in Corner Brook
- Business owners do not see value in engaging at the events organized by community organizations

Recommendation #5: Promote successful local stories

To deal with the lack of innovation culture of the region and to encourage the business community to innovate, one respondent suggested promoting success stories. According to Isenberg (2010), even a single success story can play a stimulating effect on the community by encouraging the public and inspiring imitators. He named this effect the "law of small numbers." Isenberg described how Skype in Estonia, Baidu in China, and Celtel in the sub-Saharan Africa region inspired people to establish their own companies and generated new entrepreneurs. He recommends being bold about promoting thriving entrepreneurial ventures via media, public events, etc., and celebrating them with publicized awards, speeches, interviews. Similarly, Hall, Walsh, Vodden, & Greenwood (2014) recommend celebrating successes through a social media campaign. Since Corner Brook has a small community, one success can easily reverberate throughout the region if promoted by community organizations.

Relevant research findings for this recommendation include:

- Lack of innovation culture, inspiration and interest to innovate

Table 10. *Recommendations for community organizations*

Gaps/Barriers	Recommendations
• Weak role of community organizations to bring local firms together and encourage networking	Facilitate networking and knowledge sharing between interested parties by being a broker

• Lack of information sharing among the local businesses	
• Lack of entrepreneurial spirit and knowledge in the region	Organize startup weekends regularly (monthly, bimonthly, annually, etc.)
• Potential benefits of the cross-sectoral partnerships to the community	Seek potential partnership opportunities that could benefit the community
• Lack of capability, awareness, knowledge, and culture at the firm level to develop innovations in Corner Brook • Business owners do not see value in engaging at the events organized by community organizations	Organize business management workshops
• Lack of innovation culture, inspiration and interest to innovate	Promote successful local stories

6.3 Limitations

This study is not without limitations. The following section will describe the known limitations of the study. A summary of these can be found in Table 11.

The primary limitation of this study is imbalance between the different category of participants during data collection for the context analysis. Due to time restraints and lack of access to expert participants, in total, 21 semi-structured interviews with experts from post-secondary institutions, all levels of government, the private sector, and community organizations. The data was collected over a five-month timeframe from July 2020 to November 2020. Access to participants was a limitation for the data collection. The principal investigator faced difficulties recruiting participants within the frame of the context analysis. While participants from the post-secondary institutions and community organizations were highly interested in the project, it was difficult to recruit participants from the private sector and the provincial and federal governments.

For example, during the time at which interviews were conducted with participants, departmental changes occurred within the provincial government. This affected the ability of experts from the provincial government to participate in the study. Furthermore, a number of potential expert participants from the federal government did not respond to the recruitment invitations, which limited the data collection from the federal government to only 1 participant. Also, the majority of the participants who agreed to participate in this study were from Corner Brook, with only a few participants from the surrounding area. This limited the data to have more detailed insights about the role and functioning of municipalities in the surrounding area of Corner Brook. Overall, the depth of the study could have been improved with more participants from the federal and provincial governments and the private sector.

Another important limitation is that some aspects of this study do not consider the impacts of the COVID-19 pandemic on the application of the RIS approach in Corner Brook. For example, the availability of government financial support programs for innovation might change due to the economic crisis brought by the pandemic. When the data collection of this study occurred, COVID-19 restrictions were newly in place. Accordingly, the collected data did not capture the pandemic's full impact on the actors. This study primarily assessed the state of the RIS at the time of the data collection and may not be a precise illustration of the state of the RIS over a post-pandemic period. However, many themes that emerged from this study are relevant for the RIS of Corner Brook and will continue to remain relevant over time.

Although interviews are a well-established and widely applied method to collect data from the participants, the collected data might include biased thoughts and inaccurate information. The findings are primarily based on the personal thoughts and experiences of the participants, not on the particular facts that can be analyzed or testified. Although the project tried to engage

participants from various sectors to increase the accuracy of the data, the personal citations by the respondents might contain inherent biases. Similarly, as discussed in Section 3.2.2, it is possible that observations described in the case study of this thesis are biased. However, the author kept the notes of the observations throughout the development of the project to address this issue.

When the interviews were conducted with the participants within the frame of this study, COVID-19 restrictions were in place in NL, limiting in-person meetings. Indeed, all of the interviews were undertaken either via telephone or online platforms (i.e., Zoom and WebEx). It is possible this may have affected the openness and sincerity of the responses by the participants to the asked questions. Face-to-face meetings might be a more effective way to discuss or share complex content. Virtual meetings make it difficult or sometimes impossible to read the body language or expressions of attendants, which prevents more open communication and better understanding.

The results and recommendations provided are not generalizable as the focus and context of the study make it specific to the area it investigates. Caution should be used when interpreting this study's findings as a point of reference for NL. This study covers only the Corner Brook region in NL. As place-based innovation emerges under the region's specific circumstances and conditions, it does not comply with the one-size-fits-all approach. Although this study may offer hints for other regions with similar contextual factors in NL, it should not be considered as the major benchmark while evaluating the RIS in these regions.

Table 11. *Summary of the limitations of the study*

Limitations of the study
• There is an imbalance between the different category of participants during data collection for the context analysis due to time restraints and lack of access to expert participants

• The study primarily assessed the state of the RIS at the time of the data collection and may not be a precise illustration of the state of the RIS over a post-pandemic period
• The data collected through interviews and participant observations might include biased thoughts and inaccurate information
• It is possible that virtual interviews may have affected the openness and sincerity of the responses by the participants to the asked questions
• The results and recommendations provided are not generalizable as the focus and context of the study make it specific to the Corner Brook region

6.4 Areas for Future Research

Based on the gaps that emerged from the findings of this study, this section suggests more research for further investigation of the following areas (a summary of the suggestions for future research can be found in Table 12):

One of the challenges identified in this study to foster economic growth in the regions of the province was that the Government of NL remains weak in measuring the impacts of its policies and strategies. Similarly, Hall, Walsh, Vodden, & Greenwood (2014) emphasize the shortage of formal evaluation of business innovation in NL. Future research might analyze the recent innovation policy agenda launched by the TCII (currently named IET) department of the Provincial Government in 2018, *Newfoundland and Labrador's Business Innovation Agenda: The Way Forward on Business Innovation* – how has it developed innovations in the province and how has it served NL?

Another concern addressed by the participants was that the Government of NL designs plans for the short term – 5 years – lacking long-term plans and policies. There was a suggestion that developing plans for the longer term might be more effective and compatible with sustainability. There is limited literature in the province on policy planning comparison – short-term versus long-term planning. Research is required into short-term or long-term planning is a more appropriate approach to foster sustainable innovations and economic growth.

Table 12. *Suggestions for future research*

Suggestions for future research
• Analysis of the impacts of *Newfoundland and Labrador's Business Innovation Agenda: The Way Forward on Business Innovation* in the development of innovations in the province.
• Investigate whether short-term or long-term government planning is a more appropriate approach to foster sustainable innovations and economic growth in NL
• Investigate how the pandemic affected the state of elements of RIS in Corner Brook.
• Investigate the social and economic impacts of implemented government-supported projects or programs in strengthening regional innovation capacity in the Corner Brook region or other regions of NL.
• Examine how extensively innovation and entrepreneurship knowledge and skills are taught at the grade school level and how they can further be enhanced.

As discussed in Section 6.3, this study does not cover much the influence of the COVID-19 pandemic on the state of the RIS in Corner Brook. Future research might investigate how the pandemic affected the state of elements of the RIS in Corner Brook.

Despite the abundance of funding programs provided by provincial and federal governments in the province, the findings indicated many firms do not take advantage of these programs due to either unawareness of the existing opportunities or complex paperwork to apply. Therefore, there were concerns by the participants that the financial assistance usually goes to the same applicants, putting the effectiveness of financial programs to develop innovations in the province under question. On the other hand, Isenberg (2010) claims that "it's a mistake to flood even high-potential entrepreneurs with easy money: More is not necessarily merrier," pointing out governments should be careful with the administration of financial contributions (p. 47). Thus, it is important to investigate the social and economic impacts of implemented government-supported projects or programs in strengthening regional innovation capacity in the Corner Brook region (or other regions in NL) and analyze their cost-effectiveness.

Although the lack of graduate programs and courses providing innovation and entrepreneurship knowledge offered by the region's post-secondary institutions was a primary concern, some participants also acknowledged that education at the grade school level does not expose students to innovation and entrepreneurship concepts well. Thus, it is necessary to investigate the curriculum for grade school students in the province. Future research into how extensively innovation and entrepreneurship knowledge and skills are taught at the grade school level and how they can further be enhanced may be a catalyst to foster innovation culture in the province.

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Appendix A: Semi-Structured Interview Questionnaires

A1. Interview Questionnaire for the Government Representatives

Researcher: Elmaddin Bayramov

Interviewee (name, occupation title, and organization):

Date and time:

1. Primary Questions

- Could you please introduce yourself and describe the involvement of your organization in the regional innovation system (RIS) in Newfoundland and Labrador (NL) (and/or within the Corner Brook region specifically)? (e.g. policies, funding programs, or other innovation supports.)
- How would you describe the current state of innovations within rural regions in NL (and in the Corner Brook region)?
- How would you describe the level of collaboration among actors/stakeholders of RIS in the Corner Brook region to support sustainable innovations (between government and other sectors specifically)? (Are the relationships positive or negative?; What roles do various relationships play?; Do you find the interaction between various players of RIS satisfactory? (or there is a lack of interaction?)
- How would you describe the frequency and efficiency of communication between the various levels of government?
- How would you rate knowledge and technology transfer among the key actors of RIS in the Corner Brook region? (do you think it is satisfactory, or is there a lack of transfer/Do you think knowledge and technology transfer is one of the barriers to the development of RIS in NL?)
- How would you describe the current state of government support for businesses to develop sustainable innovations in NL? (e.g. the measures taken, program or policy supports?)

- How often does the federal/provincial/municipal government consult with businesses in the Corner Brook region?
- How did the Corner Brook region benefit from the RIS Pilot Projects related to forestry and agriculture?
- What are the main barriers to the development of RIS in NL?
- How would you describe the current state of access to appropriate financial support for local firms to grow and expand?
- In your opinion, what are the key factors leading to the growth of RIS in the Corner Brook region?
- How would you describe the current state of goal setting and policy development more generally regarding the development of sustainable innovations in NL?
- How can the roles of government agencies be improved to stimulate innovations in NL? What are the next steps for the government to accelerate the growth of RIS in the province?
- What roles can the federal/provincial/municipal government play in the implementation of the CBPPL Greenhouse Project?

2. Wrap-Up Questions

- Is there anyone you would recommend having an interview with who might be able to contribute to the objectives of this research?
- Do you have any other comments/suggestions?

A2. Interview Questionnaire for the Post-Secondary Institution Representatives

Researcher: Elmaddin Bayramov

Interviewee (name, occupation title, and organization):

Date and time:

1. Primary Questions

- Could you please introduce yourself and describe the involvement of your organization in the regional innovation system (RIS) in Newfoundland and Labrador (NL) (and/or within the Corner Brook region specifically)? (i.e., policies, funding programs, or other innovation supports.)
- How would you describe the current state of innovations within rural regions in NL (and in the Corner Brook region)?
- Who, in your experience, are the key actors in the innovation system in the Corner Brook region?/Who are the region's innovation and entrepreneurial stakeholders?
- How would you describe the level of collaboration among these actors/stakeholders in the Corner Brook region to support sustainable innovations (between post-secondary institutions and other sectors specifically)? (Are the relationships positive or negative?; What roles do various relationships play?; Do you find the interaction between various players of RIS satisfactory? (or there is a lack of interaction?)
- What is the role of post-secondary institutions in RIS in the Corner Brook region?
- How would you rate knowledge and technology transfer among the key actors of RIS in the Corner Brook region? (do you think it is satisfactory or there is a lack of transfer/Do you think knowledge and technology transfer is one of the barriers to the development of RIS in NL?)
- How would you describe the current state of government support for post-secondary institutions to develop sustainable innovations in the Corner Brook region? (e.g. the measures taken, program or policy supports?)
- What are the main barriers to the development of RIS in the Corner Brook region?
    - Is there any barrier for the development of the sustainable innovations by the government? (e.g., policy impediment, lack of support)
- In your opinion, what are the key factors leading to the growth of RIS in the Corner Brook region?

- According to you, what is the regional competitive advantage of the Corner Brook region?
- How would you describe the current state of access to talent in the province?
- Do you think the government support being provided for the development of sustainable innovations in NL is satisfactory? Please explain (i.e., what works, what doesn't).
- How can the roles of government agencies be improved to stimulate innovations in the region? What are the next steps for the government to accelerate the growth of RIS in the region?

2. Wrap-Up Questions

- Is there anyone you would recommend having an interview with who might be able to contribute to the objectives of this research?
- Do you have any other comments/suggestions?

A3. Interview Questionnaire for the Private Sector Representatives

Researcher: Elmaddin Bayramov

Interviewee (name, occupation title, and organization):

Date and time:

1. Primary Questions

- Could you please introduce yourself?
- How would you describe the current state of the business environment within rural regions in NL (and in the Corner Brook region)?
- Who, in your experience, are the key actors representing the private sector in the Corner Brook region (and/or in your region)?/Who are the region's innovation stakeholders?

- How would you describe your peer-to-peer interaction (e.g. knowledge sharing, mentoring) with other businesses in your region?
- Do you share information with businesses outside the region?
- How would you describe the level of collaboration among businesses and other actors of the innovation system (government, community organizations, post-secondary institutions) in the Corner Brook region to support sustainable innovations (Are the relationships positive or negative?; What roles do various relationships play?; Do you find the interaction between various players satisfactory? (or there is a lack of interaction?)
- How would you describe the current state of government support for businesses to expand their capacity in the region? (e.g. the measures taken, program or policy supports?)
    - Beside funding opportunities, how government can support the development and implementation of innovation projects?
    - Are you satisfied with the government support being provided for the development and expansion of business services in NL? Please explain (e.g. what works, what doesn't).
- What are the main barriers to the development of businesses in the Corner Brook region?
    - Is there any barrier for the development/expansion of the businesses by the government? (e.g. policy impediment, lack of support)
- How would you describe the current state of access and awareness of appropriate financial support for local businesses to grow and expand?
- In your opinion, what are the key factors leading to the growth of industry/businesses/firms/entrepreneurs in the Corner Brook region?
- According to you, what is the regional competitive advantage of the Corner Brook region?

- Do you think businesses in the region have tolerance for change, risk, and failure?
- Which attitude should businesses change to grow?
- How would you describe innovation knowledge in the region? Do you think there is a lack of knowledge?
    - Who should take the responsibility to provide necessary information and knowledge to the businesses: the government, community organizations, or post-secondary institutions?
- Do you think there is enough leadership by the industry in the region?
- How would you describe the current state of access to talent in the region?
- How can the roles of government agencies be improved to stimulate innovations in the Corner Brook region? What are the next steps for the government to accelerate the growth of RIS in the region?
- What do you think about the future of business development in the region? (Are you positive or negative?/Why?) Do you think the business environment will be more favorable to grow?

2. Wrap-Up Questions

- Is there anyone you would recommend having an interview with who might be able to contribute to the objectives of this research?
- Do you have any other comments/suggestions?

A4. Interview Questionnaire for the Community Organization Representatives

Researcher: Elmaddin Bayramov

Interviewee (name, occupation title, and organization):

Date and time:

1. Primary Questions

- Could you please introduce yourself and describe your role within your organization?
- How would you describe the involvement and experience of your organization in the regional innovation system (RIS) in Newfoundland and Labrador (NL) (and/or within the Corner Brook specifically)?
- How would you describe the current state of innovations within the Corner Brook region?
- Who, in your experience, are the key actors in the innovation system in the Corner Brook region?
- How would you describe the importance of the involvement of community organizations in the development of RIS in the Corner Brook region?
- How would you describe the level of collaboration among community organizations and other actors of RIS in the region to support sustainable innovations? (Are the relationships positive or negative?; What roles do various relationships play?; Do you find the interaction between community organizations and other actors of RIS satisfactory? (or there is a lack of interaction?)
- In your opinion, how can the involvement of the community organizations be improved within RIS in the Corner Brook region?
- How would you rate knowledge and technology transfer among the key actors of RIS in the region? (do you think it is satisfactory or there is a lack of transfer/Do you think knowledge and technology transfer is one of the barriers to the development of RIS in the region?)
- As a community organization, what barriers have you encountered to your involvement and contributions to the innovation system in the region (e.g. policy impediment, lack of resources, lack of support from other actors)?
- Are you satisfied with the government support being provided for the development of sustainable innovations in the Corner Brook region? Please explain (e.g. what works,

what doesn't)/ What kind of financial programs are available for the businesses in the region to apply?

- How can the roles of government agencies be improved to stimulate innovations in the region? What are your expectations from the government and other actors of RIS?
- In your opinion, what are the other key factors leading to the growth of RIS in the region?
- According to you, what is the regional competitive advantage of the Corner Brook region?

2. Wrap-Up Questions

- Is there anyone you would recommend having an interview with who might be able to contribute to the objectives of this research?
- Do you have any other comments/suggestions?

Appendix B: Structured Interview Questionnaire

Researcher: Elmaddin Bayramov

Interviewee (name, occupation title, and organization):

Date and time:

1. Primary questions for potential buyers (i.e., wholesalers, retailers, restaurants) (specific to the CBPPL Greenhouse Project):

- Could you please introduce yourself and describe your involvement/role in your organization?
- How do you assess the market potential for locally grown crops? (e.g. do you think there is demand for local products?)/ Do you see economic benefit to operating greenhouse for local supply of fresh produces in NL?
- If there were opportunities for additional locally produced crops (e.g. fruits, herbs, vegetables), would you be willing and able to purchase to support local production? If yes, how much (volume and price)?
- Which locally grown produce would you be interested in purchasing?
- From a value perspective, what are the most profitable crops that you sell to the customers?
- Do you think the local people would be interested in purchasing the products of CBPPL Greenhouse? In general, do you think the local people would support this project?
- Would you say that local producers receive a higher, lower or the same price for their vegetables than produce coming into the province?
- In your opinion, is there a way to increase the value of commodities grown locally?
- What factors influence the customers' decision in purchasing vegetables or other fresh produce?

- Do you promote local products in your business (e.g. in your store or in your restaurant)?
- Do you think, for you or your customers, there would be any difference in the perception of locally grown produce that is: a) grown in an urban (Corner Brook) greenhouse vs. outdoor crop production? b) a greenhouse with an industrial operation like CBPPL vs. a small agricultural business. If yes, please explain.
- Are there any potential obstacles for you to purchase CBPPL greenhouse products?
- Would the idea of using "waste" energy to enhance the sustainability of CBPPL operations have any value (or impact) in the marketplace?

2. Wrap-Up Questions

- Do you have any other comments/suggestions?

Appendix C: Recruitment Letters

C1. Recruitment Letter for Semi-Structured Interviews

Research Project: A Quadruple Helix Approach to the Regional Innovation System in Corner Brook and Surrounding Area: Case Study of a Local Innovation Project Applying Waste Heat from Corner Brook Pulp & Paper Limited for Greenhouse Operations

Researcher(s): Elmaddin Bayramov (Master of Arts in Environmental Policy (MAEP) program student, Environmental Policy Institute, Grenfell Campus, Memorial University. Tel: 709-632-8065), email: ebayramov@grenfell.mun.ca

Supervisor(s): Dr. Kelly Vodden (Associate Vice-President (Grenfell) Research and Graduate Studies and an Associate Professor (Research) with the Environmental Policy Institute, Grenfell Campus, Memorial University. Tel: 709-639-2703), email: kvodden@grenfell.mun.ca

Dear participant,

My name is Elmaddin Bayramov, and I am a graduate student within the Environmental Policy Institute at Grenfell Campus, Memorial University of Newfoundland. I am currently collecting data for my research project entitled "*A Quadruple Helix Approach to the Regional Innovation System in Corner Brook and Surrounding Area: Case Study of a Local Innovation Project Applying Waste Heat from Corner Brook Pulp & Paper Limited for Greenhouse Operations*." This research project is being conducted under the supervision of Dr. Kelly Vodden, Associate Vice-President (Grenfell) Research and Graduate Studies and an Associate Professor (Research) with the Environmental Policy Institute at Grenfell Campus, Memorial University. Given your expertise, I am writing to invite you to participate voluntarily as an interview participant in this research project.

The aim of this research is to evaluate the role of government agencies, post-secondary institutions, the private sector, and community organizations in the regional innovation system of the Corner

Brook region. Therefore, the study will investigate the cooperation of these actors to drive innovations in the region.

To accomplish these objectives, I will conduct semi-structured/open-ended interviews. Each interview is expected to last 40-60 minutes at a mutually agreed upon time and location. Your participation involves answering the questions included in the questionnaire attached. Your participation is entirely voluntary, and there will be no negative consequences if you decide to withdraw from the study or refrain from answering certain questions.

Interviews will be digitally recorded and then manually transcribed by the researcher. The information you provide will be handled as confidentially as possible. The data from the participants will be stored only in a secure Dropbox account accessible only to the researcher in order to protect confidentiality. The information you provide will be used for academic and research purposes. The results used from this research may be published in standard academic outlets such as journals, community reports. Prior to the interview, a free and informed consent form will be sent to you.

Please note that the Grenfell Campus Research Ethics Board (GCREB) has reviewed this research proposal and approved it to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the GC-REB at gcethics@grenfell.mun.ca or by telephone at (709) 639-2736.

If you would like to participate in this project, please confirm your availability for an interview by responding to this email at ebayramov@grenfell.mun.ca. You are welcome to ask questions at any time during or after your participation in this project. If you would like to get more information about this research, I can be reached at 1(709)632-8065 or online at ebayramov@grenfell.mun.ca. You can also contact my supervisor Dr. Kelly Vodden by email at kvodden@grenfell.mun.ca.

I look forward to meeting you. Thank you for your assistance with this project.

Yours Sincerely,

Elmaddin Bayramov

Master of Arts in Environmental Policy (MAEP) program student

Environmental Policy Institute

Grenfell Campus, Memorial University

C2. Recruitment Letter for Structured Interviews

Research Project: A Quadruple Helix Approach to the Regional Innovation System in Corner Brook and Surrounding Area: Case Study of a Local Innovation Project Applying Waste Heat from Corner Brook Pulp & Paper Limited for Greenhouse Operations

Researcher(s): Elmaddin Bayramov (Master of Arts in Environmental Policy (MAEP) program student, Environmental Policy Institute, Grenfell Campus, Memorial University. Tel: 709-632-8065), email: ebayramov@grenfell.mun.ca

Supervisor(s): Dr. Kelly Vodden (Associate Vice-President (Grenfell) Research and Graduate Studies and an Associate Professor (Research) with the Environmental Policy Institute, Grenfell Campus, Memorial University. Tel: 709-639-2703), email: kvodden@grenfell.mun.ca

Dear participant,

My name is Elmaddin Bayramov, and I am a graduate student within the Environmental Policy Institute at Grenfell Campus, Memorial University of Newfoundland. I am currently collecting data for my research project entitled "*A Quadruple Helix Approach to the Regional Innovation System in Corner Brook and Surrounding Area: Case Study of a Local Innovation Project Applying Waste Heat from Corner Brook Pulp & Paper Limited for Greenhouse Operations*." This research project is being conducted under the supervision of Dr. Kelly Vodden, Associate Vice-President (Grenfell) Research and Graduate Studies and an Associate Professor (Research) with the Environmental Policy Institute at Grenfell Campus, Memorial University. Given your expertise, I am writing to invite you to participate voluntarily as an interview participant in this research project.

The aim of this research is to evaluate the role of government agencies, post-secondary institutions, the private sector, and community organizations in the regional innovation system of the Corner Brook region. Therefore, the study will investigate the cooperation of these actors to drive innovations in the region. The research includes the case study example of a project being designed to use waste heat and additional energy from Corner Brook Pulp & Paper Limited (CBPPL) to operate a commercial greenhouse in the City of Corner Brook to provide the community (and surrounding region) with locally produced crops. The project is in the development phase currently. The case study is a part of and will contribute to this innovation initiative. Within the frame of this greenhouse project, I am investigating market potential of locally grown vegetables and customer perspectives regarding local production.

To accomplish these objectives, I will conduct structured interviews with potential customers who would be interested in purchasing vegetables from this greenhouse. Each interview is expected to last 20-30 minutes at a mutually agreed upon time and location. Your participation involves answering the questions included in the questionnaire attached. Your participation is entirely voluntary, and there will be no negative consequences if you decide to withdraw from the study or refrain from answering certain questions.

Interviews will be digitally recorded and then manually transcribed by the researcher. The information you provide will be handled as confidentially as possible. The data from the participants will be stored only in a secure Dropbox account accessible only to the researcher in order to protect confidentiality. The information you provide will be used for academic and research purposes. The results used from this research may be published in standard academic outlets such as journals, community reports. Prior to the interview, a free and informed consent form will be sent to you.

Please note that the Grenfell Campus Research Ethics Board (GCREB) has reviewed this research proposal and approved it to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the GC-REB at gcethics@grenfell.mun.ca or by telephone at (709) 639-2736.

If you would like to participate in this project, please confirm your availability for an interview by responding to this email at ebayramov@grenfell.mun.ca. You are welcome to ask questions at any

time during or after your participation in this project. If you would like to get more information about this research, I can be reached at 1(709)632-8065 or online at ebayramov@grenfell.mun.ca. You can also contact my supervisor Dr. Kelly Vodden by email at kvodden@grenfell.mun.ca.

I look forward to meeting you. Thank you for your assistance with this project.

Yours Sincerely,

Elmaddin Bayramov

Master of Arts in Environmental Policy (MAEP) program student

Environmental Policy Institute

Grenfell Campus, Memorial University

Appendix D: Informed Consent Form

Title of Research Project: A Quadruple Helix Approach to the Regional Innovation System in Corner Brook and Surrounding Area: Case Study of a Local Innovation Project Applying Waste Heat from Corner Brook Pulp & Paper Limited for Greenhouse Operations

Researcher(s): Elmaddin Bayramov (Master of Arts in Environmental Policy (MAEP) program student, Environmental Policy Institute, Grenfell Campus, Memorial University), ebayramov@grenfell.mun.ca

Supervisor(s): Dr. Kelly Vodden (Associate Vice-President (Grenfell) Research and Graduate Studies and an Associate Professor (Research) with the Environmental Policy Institute, Grenfell Campus, Memorial University. Tel: 709-639-2703), email: kvodden@grenfell.mun.ca

You are invited to take part in a research project entitled "*A Quadruple Helix Approach to the Regional Innovation System in Corner Brook and Surrounding Area: Case Study of a Local Innovation Project Applying Waste Heat from Corner Brook Pulp & Paper Limited for Greenhouse Operations.*" This is the informed consent process. It should provide you with the basic idea of what the research is about, what your participation will involve, and what will happen to the information you provide if you agree to participate in this research. It also describes your right to withdraw from the study. To decide whether you wish to participate in this research project, you should understand enough about your role to be able to make an informed decision. Take time to read this carefully and to understand the information given to you. Please feel free to ask if you have any questions about the study or for more information not indicated in this form before you consent to participate in this study.

Introduction:

My name is Elmaddin Bayramov, and I am a graduate student within the Environmental Policy Institute at Grenfell Campus, Memorial University of Newfoundland. I am currently collecting data for my research project entitled "*A Quadruple Helix Approach to the Regional Innovation System in Corner Brook and Surrounding Area: Case Study of a Local Innovation Project Applying Waste Heat from Corner Brook Pulp & Paper Limited for Greenhouse Operations.*" This

research project is being conducted under the supervision of Dr. Kelly Vodden, Associate Vice-President (Grenfell) Research and Graduate Studies and an Associate Professor (Research) with the Environmental Policy Institute at Grenfell Campus, Memorial University.

Purpose of study:

The aim of this research is to evaluate the role of government agencies, post-secondary institutions, the private sector, and community organizations in the regional innovation system of the Corner Brook region. Therefore, the study will investigate the cooperation of these actors to drive innovations in the region. The research includes the case study example of a project being designed to use waste heat and additional energy from Corner Brook Pulp & Paper Limited (CBPPL) to operate a commercial greenhouse in the City of Corner Brook to provide the community (and surrounding region) with locally produced crops. The project is in the development phase currently. The case study is a part of and will contribute to this innovation initiative. Within the frame of this greenhouse project, I am investigating market potential of locally grown vegetables and customer perspectives regarding local production.

What you will do in this study:

You are being asked to participate in an interview in order to help to accomplish the objectives of this study. Your participation involves answering the questions included in the questionnaire attached.

Length of time:

The interview is expected to last 40-60 minutes, depending on the flow of the interview. You may end the interview at any time.

Withdrawal from the study:

You are free to withdraw from the research study until the collected data analyzed. After analysis of the raw data collected from the participants, the initial findings of the research might be shared with academic supervisors or a few others regarding the purpose of the research. Beyond this date, the possibility of removing requested data will depend on how much of the data has been analyzed, and whether the initial findings have been shared with somebody yet. If you would like to withdraw from the research study, please contact the principal investigator, Elmaddin Bayramov. There are

no consequences to withdrawal from this study. If you choose to withdraw from the research project, your data/involvement will be removed as soon as possible after the withdrawal request made – all copies of interview recording and any supplementary electronic materials will be deleted permanently, interview notes, and other physical supplementary materials will be disposed of.

Possible benefits:

Although there are no particular direct benefits to you, the eventual dissemination of findings may benefit from increasing the awareness of the issues to understand barriers to sustainable innovations in the region. Therefore, increased awareness may result in the development of local innovation projects, better planning capabilities of government agencies regarding innovation projects, increased cooperation among government agencies and other actors of the regional innovation system.

Possible risks:

There are no direct anticipated risks for your participation in this study. Your name or any identifying information will not be published in any way in the research. The results of the analysis of the raw data will remove any identifying information and protect anonymity. If any statement or comment from you is quoted or paraphrased in the thesis, it will be attributed generically and will not use your name (e.g. "According to one of the university scientists…"). Any materials (e.g. documents, reports) provided by you will not be published directly in the results section, however, might be paraphrased in a similar way. However, there is a possibility to experience social or financial harm if you made a particularly critical comment during the interview and somehow, your comment was traced to you. However, since the raw data collected from the interviews will be accessible only to the principal investigator, and the confidentiality will be protected, these risks are minimal.

Recording of data:

You are invited to participate in an interview that will be digitally recorded. This recording will be transcribed by the researcher, who has signed a confidentiality agreement. The digital recording and the transcript will be analyzed by the principal investigator, Elmaddin Bayramov. The purpose of the recording is to ensure that the interview is accurately documented and that issues raised do

not go unnoticed as a result of human error. At any time during the interview, you may ask to have the digital recorder turned off. If you prefer that this interview not be recorded, I will take notes during the interview.

Confidentiality and storage of data: Since you are being asked to participate in the research as an official representative of your organization, department, or agency, anonymity and confidentiality cannot be assured. Because only a small number of participants will be interviewed from each category/organization, you might be identified for a quoted interview response. Also, if you have been selected via snowball sampling and intermediaries, others who know about the research may be able to determine that you have participated; however, they will not know what data was collected from you. Generally, there is very low risk to protect the confidentiality of the collected data, since the data you provided will be accessible only to Principal Investigator and you.

Any material or data collected in a physical form (e.g., interview notes, supplementary materials provided by the participants) will be kept in the care of the principal investigator in a secure place accessible only to him. Interviews will be recorded digitally using recording devices. After conducting each interview, the principal investigator will keep the recording device securely in his person, upload the recording to OneDrive (to share with the respective interview participant) and secure Dropbox account of himself (for further analysis of the raw data), and then delete the recording from the recorder. In the medium term, the recordings may be downloaded to the password-protected personal computer of the principal investigator to analyze the data. In the long term, the only copies of the interview recordings and any soft copies of the collected data during interviews will be in a secure Dropbox account of the principal investigator and will be available only to him (they will be removed from OneDrive and personal computer of the researcher). Any emailed supplementary materials from the interviewees will be downloaded to the password-protected personal computer of the researcher, and from there to his secure Dropbox account, and then the soft materials will be deleted from the computer as soon as possible after it is uploaded to the Dropbox account. Then the original email, its backup, and possibilities for recovery will be deleted. The Principal Investigator will be responsible for long term storage of collected data and then its destruction. Electronic and hard-copy data will be stored for five years, and then electronic data will be deleted permanently, and hard-copy data will be disposed of.

Reporting of Results:

The information you provide will be used for academic and research purposes. The results used from this research may be published in standard academic outlets such as journals, community reports.

Questions:

You are welcome to ask questions at any time during or after your participation in this project. If you would like to get more information about this research, I can be reached at 1(709)632-8065 or online at ebayramov@grenfell.mun.ca. You can also contact my supervisor Dr. Kelly Vodden by email at kvodden@grenfell.mun.ca.

Please note that the Grenfell Campus Research Ethics Board (GCREB) has reviewed this research proposal and approved it to be in compliance with Memorial University's ethics policy. If you have ethical concerns about the research (such as the way you have been treated or your rights as a participant), you may contact the Chairperson of the GCREB at gcethics@grenfell.mun.ca or by telephone at (709) 639-2736.

Consent: Your consent means that:

- You understand the information about the research contained in this document.
- You have been able to ask questions about this study.
- You are satisfied with the answers to all your questions.
- You understand what the study is about and what you will be doing.
- You understand that you are free to withdraw from the study until analysis of your data (data analysis is expected within four months of your interview date) without having to give a reason and that doing so will not affect you now or in the future.
- You understand that you have the right to request any data collected from you up to the point of your withdrawal to be either destroyed OR retained by the researcher for use in the research study.

If you give consent, you do not give up your legal rights, and this does not release the researchers from their professional and legal responsibilities.

☐ I agree to be audio-recorded during the interview.

☐ I agree to the use of quotations (if you do not check this option, we assume you do not agree to the use of quotations)

☐ I agree my general occupation title to be identified in any publications resulting from this study (if you do not check this option, we assume you do not agree to your occupation title being identified) Occupation title to be used: _____

I have understood the descriptions provided; I have had an opportunity to ask questions, and my questions have been answered. I consent to participate in the research project, understanding that I may withdraw my consent at any time. A copy of this Consent form has been sent to me for my records.

☐ Consent was obtained orally

_____ _____

Signature of participant Date

I have explained this study to the best of my ability. I have invited questions and produced answers. I believe that the participant fully understands what is involved in participating in this study, potential risks of the study and I believe that he/she has freely chosen to participate.

_____ _____

Signature of investigator Date