

# Regional Innovation

## KNOWLEDGE BRIEF



### INTRODUCTION

For a region to be competitive and attractive in today's global marketplace it has to take on the responsibility of actively driving innovation and development in regional industry sectors.<sup>1</sup> This includes recognizing that regional innovation requires more than attempting to rely on the internal capabilities of a single company.<sup>2,3</sup> Collaboration among multiple industry players is key to regional innovation.<sup>2,4-8</sup> This knowledge brief focuses on **key innovation concepts that are most relevant to regional economic development in rural regions.**

### CHALLENGES TO INNOVATION IN RURAL REGIONS

Rural regions often face challenges to spurring on innovation. Rural regions are peripheral to urban areas that have higher concentrations of businesses and economic activities. In comparison to these urban areas, industry sectors in rural regions often have a lack, or limited number, of companies and supporting organizations (e.g., post-secondary schools, vocational training organizations, research centres, business associations, financial services). This is referred to as **organizational thinness.**<sup>2</sup> Innovation is lower in rural regions than in regions where a critical mass of companies and supporting organizations are clustered together to enable collective learning.<sup>2,8</sup> Further, companies located in rural regions are often limited to branch plants and small and medium sized enterprises, which are less engaged in research and development (R&D) than large corporate head offices.<sup>5,8</sup>

There are two other key challenges that industry sectors in rural regions can experience. **Fragmentation** refers to a lack or limited trust and cooperation within an industry sector.<sup>2</sup> Having the relevant companies and organizations located within close proximity to each other will do little to stimulate a regional system of innovation if these players are unwilling or unable to collaborate and build interpersonal linkages (e.g., networks).<sup>2</sup>

**Lock-in** refers to regional industries being overspecialized in outdated technologies.<sup>2</sup> Industry sectors suffering from lock-in face the opposite challenges to industry sectors experiencing organizational thinness. Lock-in occurs when companies and organizations in a mature industry are too strongly clustered together and overspecialized in a declining technology.<sup>2,8</sup> This problem can be exasperated when politicians and labour unions work to protect and subsidize companies in the declining industry.<sup>2</sup>

These categories of innovation problems are not mutually exclusive, and in many cases a region will be confronted with a mix of these challenges.<sup>8</sup> Additionally, some rural regions may experience different sets of challenges that have not been as well studied. For example, rural regions where innovation and development exist mainly come from public organizations (see *Public Organizations and Innovation in Rural Regions* text box).<sup>5</sup>

## CLUSTERS

Clusters are geographic concentrations of inter-dependent companies, suppliers, and service providers that operate in the same or related industry sectors.<sup>2</sup> Companies are part of a local network that incorporate suppliers and service providers, and may involve co-operation between companies working at the same production stage.<sup>2</sup> Companies operating in a cluster exchange components, services, information, and knowledge.<sup>2</sup>

## REGIONAL INNOVATION SYSTEMS

The concept of Regional Innovation Systems (RIS) has been inspired by other innovation concepts. First, it draws on what are known as territorial models of innovation (e.g., clusters, industrial districts, and innovative milieux), which look at the role of innovation in a local or regional context.<sup>4</sup> Second, RIS builds the related concept of national innovation systems, which was developed in the 1980s to offer a systems approach to understanding innovation.<sup>4</sup>

RIS are interactive subsystems that support innovation within a regional economy through the generation and exploitation of knowledge.<sup>9</sup> Unlike clusters, regional innovation systems may stretch across several industry sectors within a region's economy.<sup>9</sup> They are also linked to global, national, and other regional systems.<sup>9</sup>

While clusters are normally considered an important component of RIS, a RIS is not necessary for the functioning of a cluster.<sup>4</sup> Additionally, literature on clusters is more focused on market relationships (i.e., competitiveness and performance) between companies and other organizations, and more influenced by mainstream economic theory, whereas RIS literature emphasizes non-market networking relationships between companies and other organizations, such as building social capital, cooperation, trust, and regional learning within an evolutionary framework.<sup>4</sup>

Stakeholders involved in the innovation process include companies, research institutes, education and training organizations, policy makers, financial organizations, regulatory authorities, and intermediary organizations.<sup>5</sup>

Asheim and colleagues explain, “At the core of the RIS approach is an emphasis on economic and social interactions between agents, spanning the public and private sectors to engender and diffuse innovation within regions embedded in wider national and global systems.”<sup>4</sup> In other words, RIS assumes that the production of innovations can happen when many regional stakeholders (both inside and outside of companies) interact. Innovation, according to RIS, is a “territorially-embedded” process based on the specific resources, and social and institutional context of a region.<sup>7</sup>

To develop a region’s competitive advantages, the relationships built between stakeholders through economic and social interactions should involve some degree of interdependence, which in turn helps to build the systemic character of RIS.<sup>9</sup> Companies become better innovators by interacting with support organizations and other companies within their region.<sup>7</sup> It’s about improving local/regional competitive advantages by:

- working to increase localized strengths such as resources, skills, and support organizations that are embedded in both socio-cultural and socio-economic structures;
- building a regional culture of relationships that support learning and innovation; and
- embedding these relationships.<sup>7</sup>

## INNOVATION ECOSYSTEMS

The term innovation ecosystems emerged in the early 2000s<sup>10</sup> and has been used to describe a variety of contexts, purposes, and meanings.<sup>11,12</sup> There is currently a debate within academia about whether and how innovation ecosystems are different from (national and regional) innovation systems.<sup>10–13</sup>

While industries and governments (e.g., [European Committee of Regions](#)) commonly use the term innovation ecosystem, there is no consensus on its definition.<sup>11</sup> Some researchers argue that the lack of a clear definition is a strength because it reflects the organic and adaptable nature of innovation ecosystems.<sup>14</sup> However, others counter that this may only represent a

## PUBLIC ORGANIZATIONS AND INNOVATION IN RURAL REGIONS

A study in the region of La Pocatière, Quebec, provides a good example of how public organizations can be drivers of innovation processes and change in rural economies.<sup>5</sup> This small region (population: 6,225) has a long tradition of developing and adopting innovations through teaching, popularization, transmission, applied research, technological development, etc.<sup>5</sup> In this mostly agricultural area, the development of a regional innovation system began with a historical foundation of teaching institutions focused on applied research and technology transfer in agriculture and agronomy.<sup>5</sup>

The innovation system grew from teaching and research institutions that maintained close links to the production system (i.e., many small producers), and related entrepreneurial initiatives that grew around these public organizations.<sup>5</sup> When a large transportation company (Bombardier) took over a local motor factory, the region embraced the economic diversification opportunity by developing educational institutions with applied research activities in engineering and the creation of specialized transport companies.<sup>5</sup>

A key component of the RIS in La Pocatière has been public organizations such as technical colleges, research institutes, and technology transfer centres.<sup>5</sup> These organizations are sources of innovation within the region, and many local businesses have benefited from collaborations and other types of relationships with them.<sup>5</sup>

flawed analogy to natural ecosystems.<sup>11</sup> As Oh and colleagues argue, “An innovation ecosystem is not an evolved entity. Rather, it is designed.”<sup>11</sup>

To distinguish innovation ecosystems from innovation systems some scholars suggest that the term be used in reference to privately designed innovation ecosystems that are driven by market interests (i.e., profit-seeking).<sup>11,13</sup> These ecosystems are focused on co-creation of value within a network of interconnected and interdependent companies, customers, suppliers, and complementary innovators.<sup>12</sup> National and regional innovation systems, on the other hand, are networks characterized as university-industry-government relationships (i.e., triple helix systems) and public-private partnerships that serve the public interest (e.g., regional economic development).<sup>11</sup>

This **distinction between innovation ecosystems and RIS** is particularly important when it comes to public policy aimed at supporting activities that are meant to serve the public interests. This is because an increase in government support for innovation ecosystems cuts into space available to clusters, innovation systems, and public-private partnerships that encourage multiple companies to locate themselves in close proximity in a region and participate in the initiative.<sup>11,13</sup> Oh and colleagues make the point that “No company in a privately designed innovation ecosystem has an incentive to promote the wider Regional Innovation System.”<sup>11</sup>

## INNOVATION IN RURAL REGIONS

It is essential that each region develops its own tailor-made policies for innovation that reflect the regional context (i.e., managing specific challenges, problems, and opportunities).<sup>2,8</sup>

Researchers, Doloreux and Dionne, emphasize a similar point: “Every region, whether peripheral or central, has its own specific characteristics in terms of competencies, traditions, institutions and systems of relations between institutional and social actors.”<sup>5</sup>

A highly influential paper by Tödting and Tripl summarizes the literature on general innovation strategies, as well as strategies for dealing with organizational thinness, fragmentation, and lock-in.<sup>8</sup> They offer the following recommendations for general innovation policy strategies:<sup>8</sup>

1. To develop innovation systems, networks, and clusters, a shift from a traditional company-oriented perspective to a more system-centred approach is required in innovation policy.
2. A broad view of innovation and learning processes is needed in policy making. Initiatives need to focus on a wide variety of areas, including: physical capital (e.g., research and development, and technology infrastructure), human capital (e.g., workforce development and training), social capital (e.g., building trust between regional players), and financial capital.
3. Policy formulation and implementation should move away from top-down government decision-making towards collaborative and interactive approaches that involve clear communication, close interaction, and consensus building with all regional stakeholders.
4. There is a need for coordination of policies both horizontally within a region (i.e., across economic development, workforce development, education, finance, and other arenas) and in collaboration with other regions, the province, and nationally.

Tödting and Tripl also find wide support for the use of “picking a winner” strategies in selecting which projects and locations are offered public policy support to help potential industries and regions improve their competitiveness and innovativeness.<sup>8</sup> However, other scholars have criticized such strategies because they may disadvantage some regions right from the beginning or limit the selection to the same “winning” industries (e.g., biotechnology) that are commonly

supported, and because it is impossible to predict which industry sectors will emerge and grow in the future.<sup>4</sup>

### STRATEGIES FOR ORGANIZATIONAL THINNESS

For strategies aimed at strengthening and upgrading innovation in the economy of a rural region suffering from organizational thinness, Tödting and Trippel recommend:<sup>8</sup>

1. Innovation policies should focus on organizational and technological learning that helps companies (small and medium enterprises in particular) catch up on new organizational practices, product and processing technologies, etc. within their industry. The purpose is to steer behavioural changes towards approaches that stimulate innovation.
2. Policy makers should develop strategies to strengthen potential clusters. This includes supporting the formation of new companies, enhancing innovation capabilities of existing local/regional companies, attracting innovative companies from outside regions, and linking regional companies to other companies and knowledge/innovation sources (e.g., research institutes) both inside and outside of the region.
3. Policy makers should work to attract branches of national research institutions and research centres that would benefit industry sectors in the regional economy. Effort should also be put into the provision of medium skill level education and training (e.g., establishing technical colleges, engineering schools, management schools, etc.).
4. Policy initiatives should work to improve networks and social capital. This is essential. Companies need to be actively supported in building up relationships with regional knowledge providers/transfer agencies, as well as with those outside the region (i.e., to help them “import” outside knowledge and ideas that is not available locally).

### INNOVATION AND COLLABORATION IN BEAUCE, QUEBEC

In urban areas where a high concentration of industry sector players exist, collaborations in innovation activities tend to become increasingly confined to the area overtime, though there is still some degree of reliance on national and international connections to some degree.<sup>7</sup> Conversely, in a rural region where there is often fewer local organizations and infrastructure, the region may benefit from a higher degree of cooperation with outside partners in nearby urban areas.<sup>7</sup>

In a comparative study of regional innovation systems in the metropolitan area of Ottawa, Ontario, and the rural region of Beauce, Quebec, findings showed that companies in each region had important collaborations both within and outside their respective regions.<sup>7</sup> However, industry sectors in the Beauce region involved more collaborations with external sources such as customers, suppliers, universities, and research institutes in the province’s nearest metropolitan area, Quebec City.<sup>7</sup> Ottawa was more focused on regional collaborations, although one area of major external resources came from international science collaborations.<sup>7</sup>

The main sectors studied in the Beauce region were lumber and wood products, metal products, textile and mill products, and industrial machinery. The study also found that the low tech industries surveyed tended to conduct more experimental research (versus fundamental and applied research) and were less likely to patent innovations.<sup>7</sup> However, companies in these industries are not just users of knowledge and technology, they are drivers of change in learning and innovation.<sup>7</sup>

In general, companies located in rural regions tend to collaborate with companies and organizations from outside their region, and in some cases they do this more than companies located in urban areas.<sup>6</sup> A balance of collaboration and partnerships both within a region and with nearby metropolitan areas may help support innovation and economic activities (see *Innovation and Collaboration in Beauce, Quebec* text box).<sup>15</sup>

Companies can also be successful without regional systems of innovation provided that they have access to the necessary innovation supports nationally and/or internationally.<sup>2</sup> In fact, some scholars argue that companies in small (i.e., small population, small number of firms, a narrow industrial base, and few knowledge organizations) and rural regions need to source knowledge from outside their region in order to achieve radical innovation activity.<sup>16,17</sup> In their analysis, Isaksen and Karlsen identify the following three modes of innovation taken by companies:<sup>16,17</sup>

1. **Science-Technology-Innovation (STI):** This mode of innovation is strongly focused on science-based learning and R&D activities. These innovation activities largely take place in the in-house R&D departments of a company, research-intensive companies, and universities and research institutes. Knowledge and innovations created through this mode of learning are generally more rooted in a science push (i.e., creating radical innovations through basic research; developing and testing formal scientific models) than a pull from the market (i.e., filling an existing demand/need for new innovations). STI-focused companies are more likely to be located in large cities and specialized universities where they have access to researchers and research groups with new innovative ideas.
2. **Doing-Using-Interacting (DUI):** This mode of innovation is built on experience-based knowledge and often creates incremental changes in products and ways of doing things. Employees apply what they learn from on the job experience and competence to solve new challenges and problems, either within a company's own activities or in relation to the needs and requirements of customers and users. To encourage innovation, DUI-focused companies benefit from regular contact with demanding customers and strategic suppliers, and from access to experience-based knowledge (e.g., through a local labour market). Companies in rural regions experiencing organizational thinness and an economy dominated by traditional industries will likely rely on the DUI mode of innovation because, unlike in large cities, rural companies cannot easily access specialized researchers.
3. **Complex and Combined Innovation (CCI):** This mode of innovation links and adapts experience-based knowledge with science-based knowledge from different sources in innovation projects (e.g., demands from customers and knowledge from research organizations). In general, employees develop tacit knowledge about their work activities that is not verbally communicated, but is at the heart of much of the experience-based knowledge that they apply to incremental innovations. In CCI, this knowledge needs to be made explicit in order to combine it with scientific methods and knowledge of external knowledge sources (e.g., research institutes located outside the region).

A problem with having mainly DUI-focused companies in rural regions is that while incremental innovations occur, this can trap a company or industry sector onto a particular path.<sup>17</sup> It is difficult for radical new innovations to be developed in that region without new science-based activities and access to knowledge sources from outside the region.<sup>17</sup> For this reason, Isaksen and Karlsen conclude that companies in rural regions “need to develop organizational learning strategies in order to be able to exploit external knowledge from distant sources in their internal innovation processes.”<sup>17</sup> In other words, transitioning from a DUI-focused into a CCI-focused company that links local experience-based knowledge with external science-based knowledge.<sup>17</sup> Farsund Aluminum Casting (now [Benteler Automotive Farsund AS](#) - BAF), in the rural Lister region of Norway, is an example of a CCI-focused company that combines the knowledge of local factory workers with a partnership with a major Scandinavian research institute to develop some unique technology.<sup>17</sup> This company of 300 employees is the first tier supplier of aluminum parts for the

European automotive industry, including being the only producer in the world that is able to make a vital part (rear suspension) for a Porsche model.<sup>17</sup> BAF's metallurgic innovation depends both on its workforce's experience and long-term links with national knowledge organizations.<sup>17</sup>

### STRATEGIES FOR LOCK-IN

Regions with industry sectors that are locked-in to old technologies need policies to encourage innovations in new fields, paths, products, and processes in order to access new markets.<sup>8</sup>

Tödtling and Trippl recommend the following strategies:<sup>8</sup>

1. Encourage the development of clusters in new and/or related industries or technologies with policies that support economic diversification and modernization activities of existing companies and the new start-ups. Policies that attract and establish long-term investment from outside the region (e.g., foreign direct investment) are essential for bringing in knowledge that complements the region's old and new clusters.
2. Rebuild the regional knowledge base by creating new support organizations (e.g., research organizations and universities in new industrial and technological fields) and reorient existing ones. Build up the new skills that are required (e.g., through technical colleges, universities).
3. Induce and support the transformation of the region's existing networks by creating policies that promote networking at regional, national, and international levels that is focused on new industries and technologies.

### STRATEGIES FOR FRAGMENTATION

Tödtling and Trippl's policy recommendations for regions with fragmented industry sectors are mainly aimed at urban regions. Nonetheless, some of the following strategies are useful for rural regions facing similar challenges:

1. Adopt a strategy clearly focused on cluster building. This includes identifying related industries that are emerging and have a strong local knowledge base, and promoting their growth and development (e.g., by developing complementary activities and a common knowledge base). Assisting start-ups and spin-off companies in knowledge-based industries and working to attract global companies and foreign direct investment are also important.
2. Policy initiatives should aim to improve and fill in the gaps of regional innovation infrastructure (e.g., specialized research centres and educational organizations).
3. Policy strategies should promote network building and collaboration among companies and through partnerships between industry and post-secondary schools.

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