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►► Innovation in Northern Sweden: Are there Lessons for Canada?

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Governments around the Circumpolar world seek the long-term viability of northern economies by supporting their natural resource sectors and promoting “new economy” commercial development. The challenge is formidable. The fact is few Arctic or sub-Arctic regions have the research capability, highly skilled personnel, venture capital, accessible markets and entrepreneurial drive necessary to compete in the global science and technology-based economy. In Canada’s case, bringing equitable prosperity to northern Canadian communities, particularly in a manner respecting Indigenous traditions, by providing long-term security for residents, and economic hope and opportunity to an economically disadvantaged region remains a far distant goal.

Canada has fallen into an odd and complex pattern of regional economic development in the North. There are massive hydroelectric projects, large and valuable mines, major forest operations – and endless dreams for future prosperity. Across the region, government dependency dominates, particularly in the territorial North (Yukon, Northwest Territories and Nunavut), where the federal fiscal transfers are exceptionally high by Canadian standards and where civil servants with federal, territorial, municipal and Indigenous governments have stable and often substantial incomes. The provincial North is much different. In areas with strong resource

economies, such as northern Alberta, parts of northern British Columbia and Labrador, the non-Indigenous populations and some Indigenous communities have high average incomes. However, many communities in the provincial North are among the poorest in Canada, with few economic prospects.

The Canadian North suffers, as well, from diminished expectations. Since before Confederation, the North was viewed, alternatively, as a veritable frozen wasteland or a national treasure chest, holding natural resource wealth that would bring prosperity to the whole country. In a classic example of internal colonialism, the North was viewed and developed as a repository of opportunity to be used for the benefit of Canada or, in the case of the Provincial North, for the individual provinces. The needs of northern communities were, until the late 20th century, sublimated to the larger national “good,” based on the basic assumption that the general economic activity, expanded infrastructure and improved government services would bring substantial benefits to the Indigenous and non-Indigenous peoples of the North. The reality proved much different, with the economic benefits going more to externally based companies, often mobile workers from the south and federal and provincial governments. The demand by northerners for a different approach to development, one that recognized the interests of Indigenous

peoples and other northern residents, grew rapidly through the 1960s and 1970s, but the identification of a new economic path for the Canadian North remained—and remains—elusive.

No other national experience is an ideal fit for the Canadian situation, and comparative policy development must be approached with caution. That said, valuable insights can be gained by considering how other nations have dealt with their northern regions. Sweden, a successful, high-income democracy, offers useful examples of regional economic development that demonstrate the importance of not falling victim to the assumption that the North is fixed on a path of economic marginalization and mixed dependency on government and natural resource development.

This policy brief considers efforts made by a series of northern Swedish communities to build sustainable jobs and businesses beyond traditional northern economic activities in the age of rapid technological transformation.

Less than three per cent of Sweden's 10.2 million people live in Norrbotten county, which covers the northern quarter of Sweden and straddles the Arctic Circle. Of the 275,000 people in the region, almost one-third live in the city of Luleå. The rest are scattered in smaller communities throughout the 150,000 sq. kilometres. In the past, the natural resources of northern Sweden (hydroelectricity, timber and minerals) contributed significantly to Sweden's nationwide industrialization and maintained a high level of regional prosperity throughout the 20th century. Over the past forty years, many Norrbotten communities have built on their natural resource base and developed new sectors of their economies.

In the fall of 2019, the authors went on an extended research trip through northern Sweden, meeting community economic development officers and business leaders, visiting commercial establishments and exploring the diversity of regional adaptations to 21st century economic conditions. Leaders spoke of the economic transitions underway, tied to the decline of employment in the forest industry, uncertainty and renewal in the mining sector, and growing national and international interest in northern tourism. They described, too, the movement of regional young people to major centres in the South, the difficulty of holding the attention of the national government, the uneven impact of technological change, and the cycles of economic opportunity in the region.

Still, Luleå (population 78,000) has emerged as among the most technologically advanced in the Circumpolar world. Luleå decided to use its cold climate as a positive attribute, realizing its long winters provided an opportunity in the digital economy. Server farms, which provide the backbone of the Internet-based economy, require a great deal of energy and give off heat. In a cold climate, fans can pull in outside air and cool the warm servers inexpensively. Facebook saw the advantages of Luleå, which provided substantial tax exemptions on electricity that made Sweden cost-competitive with Norway, and opened its first server farm there in 2013 (Wong,

2017) and later added a third 93,000 sq. metres server farm in the community (Dawn-Hiscox, 2018). Facebook's data centre had 150 employees (Harding 2018), while also supporting the development of a start-up culture based on data management and data mining.

The Arjeplog region just south of the Arctic Circle, consists of a main town of the same name with approximately one thousand citizens along with six Sami villages and numerous tiny communities, collectively home to another 1800 people, spread out over many square kilometres of mountains and lakes. The regional economy was built around a sawmill and a silver mine, both now closed. Soon after, the Argentis Business Council was formed to devise economic development strategies for the region. Today, Argentis' five staff help local businesses, including everyone from Sami reindeer herders to retailers and restaurateurs, build economic opportunities.

In 1972, three engineers from Teldix, a German aircraft electronics company which had recently developed an automotive anti-skid braking system, came to Arjeplog looking for a place to winter test cars and car components. They met with two local entrepreneurs, David Sundström and Per-Axel Andersson, who maintained an winter airline landing strip on a local lake. The parties reached an agreement that the Germans could use the runway for car testing.

Arjeplog is well suited for winter car testing, with more than 8,000 lakes. The Icemakers, a local car-testing company created by Sundström and Andersson, bought snow clearing machines, built storage facilities and learned how to create excellent ice testing conditions. Demand for car testing services in Arjeplog grew. In the 1980s other companies entered the sector. Porsche, Mercedes, and BMW (along with a range of component companies) arrived in the area. Arjeplog is now the winter car testing capital of the world. European, Asia, and North American auto companies, subcontractors and component producers test four to five thousand cars annually, creating a turnover of approximately US\$100 million (Granström and Lestander, 2019).

Cars and components are tested for functionality in cold climates. (Fifty cars are driven all day, in three shifts of about 500 kilometres each.) Service companies provide a wide range of services that include tracks on ice and land, cold chambers, garages, administrative buildings, gas stations and work rooms (Sölvell, 2016).

Developments 400 hundred kilometers to the north illustrate efforts to capitalize on natural resources while planning for a different economic future. Kiruna, a city of 23,000 people north of the Arctic Circle, is the site of the world's largest and highest quality iron ore mine. Mining began at the Kiruna mine site in 1898, and more than 1 billion tonnes of ore have been mined. The iron extracted to date represents only about one-third of the 4.0 kilometre long 1.5 km deep ore body ("Kiruna Mine", n.d.). While a great deal of ore remains, the miners have dug so far underground near to the city that a widening crack in the earth is threatening the city's safety and, in the longer-term, its existence.

Faced with the combination of a gathering crisis and a still-rich ore body, in 2004, the the mine's owner (Luossavaara-Kirrunavaara AB or LKAB) decided to move the city about four kilometres so that mining could continue. The city relocation is an enormous undertaking and could cost about \$1 billion. The town centre should be re-established by 2022 while the full relocation could take until 2040. (Michael, 2018; Anzilotti, 2018)

In conjunction with SSAB (a highly specialized steel producer) and Vattenfall (a large European energy producer), LKAB has invested in research on the carbon-free production of steel. A new technology called HYBRIT would allow for the production of steel using hydrogen and fossil-free electricity, expanding demand for locally produced iron ore ("SSAB in brief," n.d.).

Kiruna and the surrounding area of Swedish Lapland have also built up a tourism sector. There are direct flights in the winter from London, Tokyo and Shanghai. Visitors primarily come in winter to see the northern lights or to stay at the Kiruna Ice Hotel. The main part of the hotel is newly built each fall out of blocks of ice harvested from the nearby Torne River. Artists from around the world submit designs for the room decorations. Next door is the Icehotel 365, which has twenty ice rooms open year-round. Icehotel 365's Icebar sells drinks in glasses and goblets made of ice. Most guests like to spend just one night in a cold room but switch to a warm room and stay to partake in the various activities on offer: dog sledding, ice sculpting, snowmobiling in winter and fishing, river rafting and hiking in the summer (Kiruna Ice Hotel, 2019).

Kiruna is also the site of a growing space industry (Bergstrom-Roos, 2019). The Esrange Space Center, a scientific research station and rocket range, was built in 1964 by the European Space Research Organization, later the European Space Agency. Esrange's activities include rocket launches to high altitudes, high altitude balloons and satellite tracking. A few kilometres from Esrange is a European Space Agency's satellite station. Also in Kiruna is the EISCAT (European Incoherent Scatter) Scientific Association's radar antenna site, which enables research on the upper atmosphere and the ionosphere and different phenomena such as space weather, space debris and the aurora.

Over the past 20 years, the Swedish government built on the space research cluster that exists in Kiruna and expanded educational programs in space and related areas. In 2001, the Graduate School of Space Technology was launched by the IRF and the Luleå University of Technology. The Kiruna Space and Environment Campus (KRM) opened in 2003. It offers summer and undergraduate courses as well as Masters and PhD programmes to domestic and international students. A Space High School opened in Kiruna in 2000. It recruits its 30 highly talented and motivated students from all over Sweden (Sandahl and Norberg, 2003; Sandahl and Wikstöm, 2005: 35-40). In 2014, the Luleå University of Technology (LTU) began to encourage business and research opportunities within the space sector.

► Skellefteå - From the Forest Industry and Mining to Gaming to Batteries

In 2017, after an international competition that attracted 40 serious community applicants, Northvolt a Swedish battery developer and manufacturer decided to build a massive 3.8 billion Euro electric battery factory on 200 hectares of land near Skellefteå. The first phase of the plant will open in 2023 and will be producing lithium-ion batteries for electric cars and other industrial uses.

Over the past decade, Skellefteå, once nicknamed "Gold Town", has made concerted efforts to diversify its economy and to lessen its reliance on resource development. By promoting Skellefteå's important advantages (including its location close to the Baltic Sea, a skilled workforce, inexpensive housing, and lower salaries for workers) Skellefteå tried to attract data companies and call centres. (Palm, 2019). The city established the Arctic Game Lab, building on Luleå University of Technology's Skellefteå's campus offerings in gaming and graphic design. The city encouraged graduates to stay in Luleå and create companies.

The Northvolt plant will be the fifth largest manufacturing operation in the country. It will be the largest lithium-ion battery factory in Europe, producing on an economy of scale that will half the current cost of batteries (Engström, 2020). Northvolt investors include Scania (a Swedish owned manufacturer of commercial vehicles), BMW, Volkswagen and IKEA. The plant will have 2,500 employees, with suppliers employing another 1,000 people.

These examples are not the only illustrations of northern Sweden's creative positioning and repositioning and of northern responsiveness to economic transitions in general. Numerous communities and businesses have understood the economic value of being Northern, particularly in terms of outdoor activities. Jokkmokk, a long-time centre for Sami culture and commerce, hosts a Sami Winter Market, continuing a 400-year old tradition. The week-long festival of Sami culture and handicrafts attracts close to 100,000 people per year, a massive "invasion" of the small northern community of some 3,000 people.

While Northern Sweden's economic well-being is not assured, the region demonstrates the kind of adaptation, innovation, collaboration and regional commitment necessary to remain competitive. The economic approach that evolved in Northern Sweden is more of a guide than a model for other Circumpolar and sub-Arctic regions, demonstrating the vital interplay of local governments and businesses, international investors, and global consumers. The most compelling message is that the North need not be confined to the traditional and limited sub-Arctic economy.

The Northern Swedish examples suggest several policy recommendations for provincial, territorial, and federal governments in Canada.

1. Northern districts and northern policy makers have to lift their vision from locally-focused activity and search, instead, for

opportunities that address much larger markets and audience and should be informed by an understanding of broader northern economic and commercial developments;

2. The next wave of northern development will almost certainly be driven by Indigenous entrepreneurs and Indigenous economic development corporations; a fair number of are already key investors in northern companies and projects. Following on the examples of the James Bay Cree, the Labrador Innu, Fort McKay First Nation (Alberta), the Tahltan (B.C.) and the Inuvialuit Development Corporation, Indigenous investors, entrepreneurs and communities will produce the most dramatic expansion of the Indigenous economy since the decline of the fur trade.
3. International investors have to be introduced more comprehensively to northern Canadian opportunities. New economy companies, in particular, must be exposed to regional economic prospects. These invitations do not best come from governments but rather from communities or groups of communities for the purpose of encouraging innovative business development in the northern areas.
4. Canada's northern economic development environment is dominated by a series of regional economic agencies (CanNor in the territories, Western Economic Diversification in the prairie North, FedNor in Ontario, etc.) and a complex web of provincial and territorial grant and support programs. Ideally, and in an exercise of federal-provincial relations as yet unseen in Canada, these programs would be streamlined into a single service that was more responsive than the current arrangements. While this is unlikely, revealing a fundamental flaw and inefficiency in Canadian federalism, the absence of coordination, speed and effective support will remain a real liability across the Canadian North.
5. The Canadian North needs major infrastructure developments. The North requires the kind of nation and region-building infrastructure investments that have served Canada well in the past (importantly save for a lack of consideration of Indigenous and environmental interests). A new phase of northern infrastructure projects—roads, railways, hydro-electric power, ports, Internet service, and the like—developed cooperatively with northerners and Indigenous governments could finally and to the collective benefit of northerners and the rest of the country begin to unleash the

potential of the North. Many of the Swedish innovations—winter car testing, winter tourism, server farms, Indigenous cultural tourism—could take place in the Canadian North. This country huddles along the Canada-USA border, its back turned on its defining region and season (winter). If Canada is to capitalize on the economic potential of the North, the nation must approach the North on its terms, which includes remoteness, cold, and darkness.

The Swedish example demonstrates the North need not be a prisoner of its history. Among the many compelling elements in the Sweden example is the creative, multi-sectoral approach to rebuilding and expanding economic opportunity in the region. The Canadian North requires a comparable mix of creativity, regional spirit, international engagement, government support and connectivity to the emerging 21st century economy.

► Bibliography

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