

5G Mobile Broadband: Challenges for Rural and Developing Regions

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*ISER: More than 50 years
of public policy research in Alaska*

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The Promise of 5G...

- **Broadband mobile**
- **Emergency/First Responder Networks: FirstNet in US**
- **Internet of Things (IOT)**
- **Virtualization of network services**
- **“Anything as a service”**
- **Microcells:**
 - in-house networks: hospitals, warehouses
- **Small cells, network slicing:**
 - lower costs for new entrants
- **A Disruptive Technology?**



The Promise of 5G?

Industry forecasts

“By the end of 2023, there will be 1 billion 5G subscriptions, accounting for around 20 % of mobile data traffic.” (Ericsson)

... “wireless providers will invest \$275 billion over the next decade in next generation wireless infrastructure deployments, which could generate three million new jobs and boost the U.S. GDP by half a trillion dollars.” (Accenture)

“securing U.S. global leadership in 5G is imperative for our economy “(CTIA)

Regional/national plans

European Commission:

**Digital Agenda for Europe (DAE)
and 5G Action Plan**

FCC:

Declaratory Ruling on 5G (Sept 2018)

A paradigm shift?

Are we at the hype stage?



Need for Spectrum

- **The ongoing need to accommodate new entrants**
 - Lower frequencies (e.g. 700 MHz): longer range but limited bandwidth
 - Higher frequencies (e.g. 3400 MHz and higher): more bandwidth, but limited range
 - Need for more antennas
 - Already used for some satellite services
 - What services get priority? Who has to move?

“Repurposing mid-band spectrum to spur America’s 5G leadership against nations like China and South Korea will be a critical part of this effort, and we encourage the FCC to open up the 3.7-4.2 GHz band for commercial terrestrial use as quickly as possible” (CTIA, 2018)

5G: The Rural Challenge

- **Small cells: expensive to cover rural regions**

Rural UK study:

could cover 90% of population by 2027 for £6 billion

Exponentially increasing costs to cover remaining 10%: > £12 billion

“may not be an attractive prospect for industry or government”

- **Cheaper solutions (e.g. lower frequencies) would result in digital divide with much lower rural speeds, hindering rural businesses, services, and other users**
- **Spectrum: already in use for satellite services in remote regions**

5G: Rural Policy Issues

- Potential digital divides in available speeds and 5G services may penalize rural economies
- Lack of requirements to serve rural/remote regions
- Capped fees for antenna/tower location may not suffice if limited demand
- New entrants or strengthened incumbents?
- Spectrum auctions



Text from boat off Utqiagvik (Barrow):
“A whale is coming”

5G Case Study: Northern Canada Spectrum Policy Issues

Canadian government spectrum policy objectives:

- Economic benefits
 - social benefits
 - market forces
 - public interest
 - global competitiveness
 - universal access to reliable and affordable services
-
- **General Canadian spectrum policy objective (2007):**
 - “To maximize the *economic and social benefits* that Canadians derive from the use of the radio frequency spectrum resource.”
 - **Policy Guidelines include:**
 - (a) *Market forces* should be relied upon to the maximum extent feasible.
 - (b) Notwithstanding (a), spectrum should be made available for a range of services that are in the *public interest*.

The Northern Context

- **Generally small, isolated communities**
 - Small markets
 - Expensive to serve
- **Demographics**
 - Young, fast growing populations
 - Large households
 - Low/seasonal incomes
- **Demand**
 - Many users per household
 - Many applications – social media, education, work, entertainment
- **Technology**
 - Variety of backbone technologies: satellite, microwave, optical fiber
 - Bandwidth limited and expensive
 - Variable Quality of Service (QoS)

Aboriginal peoples of North America's Boreal region



Northern Canadian Mobile Context

- **Canadian mobile market: oligopoly with three major providers**
- **Wireless market is a de facto monopoly in the North:**
 - one large incumbent had 86 percent of the wireless service subscriber market share in the North.
- **Wireless coverage in the North lower than in any of the provinces**
- **Wireless penetration rate also lower at 64.5 percent (subscribers as a percentage of the covered population)**
- **Average monthly wireless service revenues per subscriber in the North C\$ 93 in 2017**
 - Higher than in any of the provinces
 - 168 percent higher than the lowest provincial ARPU
- **Number of subscribers with a data plan in the North in 2016 was less than 1 percent of the Canadian total**
 - Growth from the previous year was only 5.6 percent, the lowest of any Canadian region

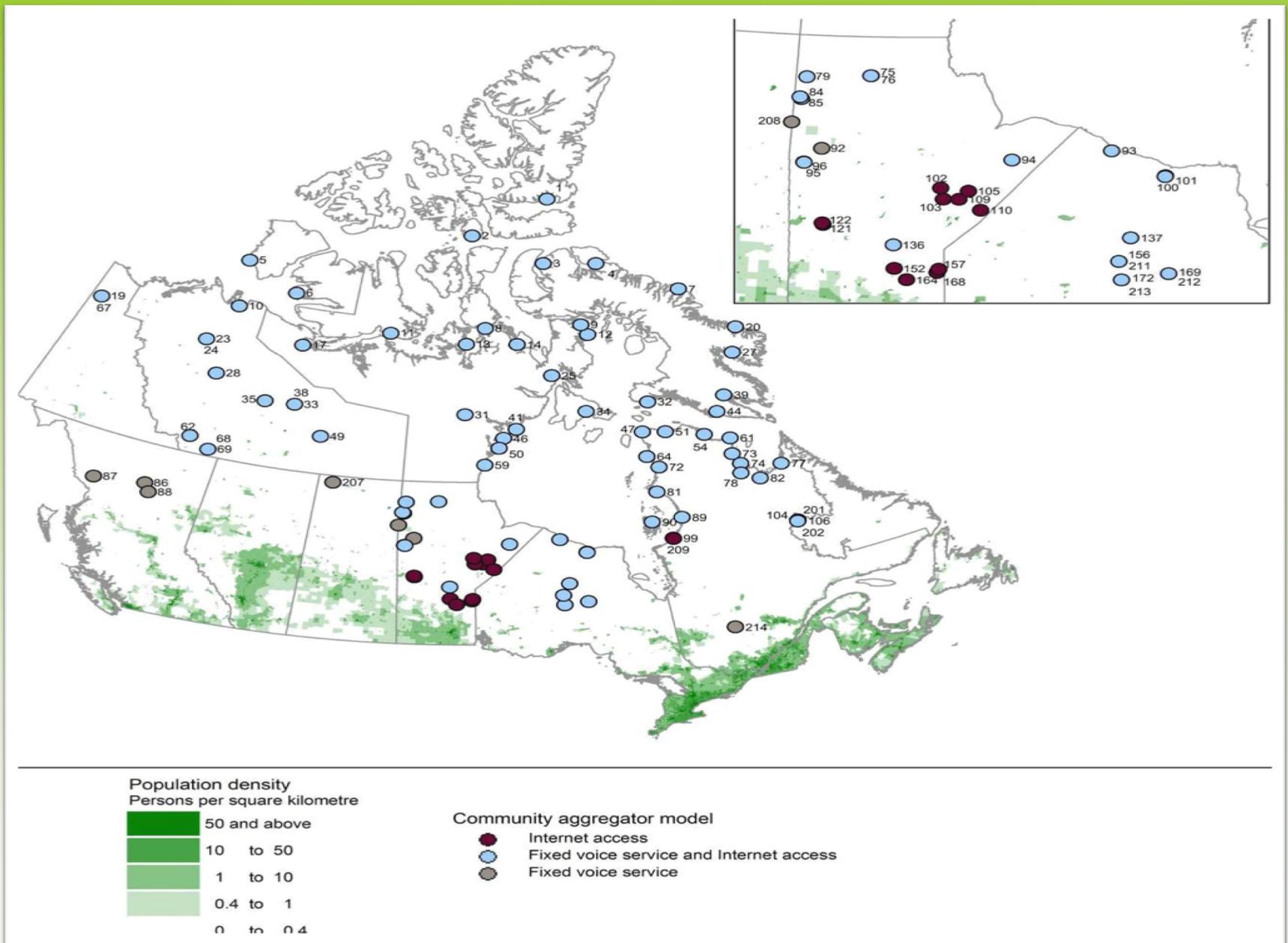
Canadian Policy Context

- Objective in *Telecommunications Act* is “to promote the availability of *reliable and affordable services to all regions of Canada.*”
- CRTC decision 2016: broadband is a basic service available to all Canadians
 - targets of 50 Mbps download and 10 Mbps upload
- Spectrum managed by government ministry (ISED), not regulator (CRTC)
- ISED concluded that it “needs to repurpose the spectrum to quickly and efficiently support the introduction of the 5G ecosystem”
- Government Consultation on revision to 3500 MHz and 3800 MHz bands to make these bands available for 5G services
- Objectives :
 - “foster innovation, investment and the evolution of wireless networks by enabling the development and adoption of 5G technologies;
 - support sustained competition, so that consumers and businesses benefit from greater choice; and
 - facilitate the deployment and timely availability of services across the country, *including rural areas.*”

Use of 3500 MHz in the North

- Many remote and indigenous communities rely on satellite communications
- Remote communities rely on some of these frequencies (3700 to 4200 MHz) for telephony and Internet services provided by satellites (FSS)
some fixed terrestrial wireless
- These satellite frequencies also transmit TV signals for local over-the-air and cable distribution.
- Currently 927 licenses issued to 281 licensees for services in this band.





Canadian Government Proposed Transition Plan

- ISED proposes to accommodate 5G and existing services using these frequencies through a transition plan “that will allow for the timely deployment of mobile services in urban areas while providing rural providers of fixed services with more time to transition to [a] new flexible use system.”
- Incumbent licensees that would interfere with planned deployment of new licensees would be protected:
 - in urban areas for six months
 - in surrounding regions for two years
 - in rural areas (population less than 30,000) for three years
- Transition plan:
 - Does not require provision of 5G for all Canadians, including the North
 - Does not guarantee that broadband services meeting the CRTC’s speed targets of 50 Mbps down and 10 Mbps up would be available in these rural regions.

Responses to Government Proposals

- **Small providers emphasized need for spectrum and role in rural connectivity:**
“The single most effective measure that the Government of Canada can take to promote rural broadband connectivity is to make spectrum available to small, regional, and rural service providers.... Making spectrum accessible to small companies in rural Canada will promote investment, innovation, employment, and economic development in rural Canada.”
Challenges of small markets and high costs of extending 5G:
“...demand exists for the 5G potential, but it is market failure that may delay its rollout to rural areas.”
- **Satellite operators:**
 - “...demand for C-band satellite services is strong and growing, driven by the explosion in broadband demand and the characteristics of the spectrum, and is supported by a huge investment in space and ground infrastructure.”
 - “...for the foreseeable future any sharing ...in this frequency band must make certain to protect existing FSS users.”
- **Indigenous consortium: Use it or lose it:**
 - “Any policy to allocate additional spectrum for mobile wireless should require that the spectrum be used within a specified period (for example, no more than three years) or be forfeited.”

Additional Issues ...

- **Spectrum Auctions**
 - Favored by large providers
 - Will be used in the US (FCC)
 - Small and community providers may not be able to compete in auctions for 5G spectrum
 - “By discouraging competitors in small regional markets, auctions have served urban Canadians at the expense of rural communities”
 - Given the quasi monopoly in the North, there may be no competition for spectrum there (there was no competition in Alaska in rural mobile broadband auctions)
- **The issue is not timelines, but *available and affordable alternatives***
 - “... services and frequencies for internet and broadband in the 3500 MHz band using fixed wireless and satellites should not be withdrawn in rural, remote and Indigenous regions and communities until reliable and affordable wireless broadband of at least 50 Mbps download and 10 Mbps upload is available using alternative technologies.”

Conclusions and Lessons for Other Regions

Challenges for regulators and policy makers

- **Balancing objectives: Economic benefits, social benefits, market forces, public interest, global competitiveness, universal access to reliable and affordable services**

Conclusions

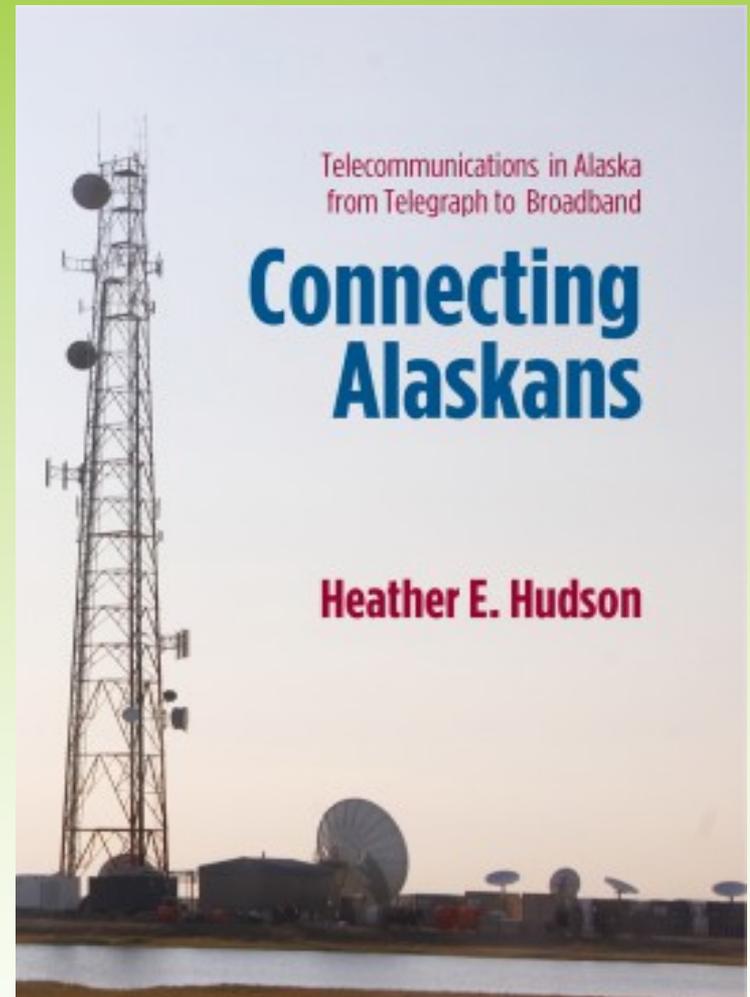
- **Allocation of spectrum for new services such as 5G should be governed by a framework that enables small, rural, and regional operators to invest in networks that support rural broadband.**
- **New entrants and small providers should be eligible to use spectrum for 5G services through spectrum sharing, micro licenses, or other means.**
- **Techniques for flexible use of spectrum may be appropriate as long as there is recognition of, and accommodation for, conditions in remote and indigenous regions and technologies currently in use.**
- **Any policy to allocate additional spectrum for mobile wireless should require that the spectrum be used within a specified period or forfeited.**
- **Licenses for frequencies used for fixed wireless and satellite services should not be withdrawn in rural, remote and indigenous regions until reliable and affordable broadband is available using alternative technologies.**

Thank you

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