FarrPoint

Digital Policy and Climate Change

Canada Study Report

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Digital Policy is Climate Policy

Climate change, and the warming of the planet, caused by greenhouse gas emissions (GHGe) is an existential crisis and all tools available to national governments need to be employed to tackle its impact and reverse its effects. The first stage in limiting the impact of climate change is addressing the increasing levels of GHGe in the atmosphere. Limiting these emissions to net-zero by 2050 is a challenge accepted by G7 countries, building on from the success of the 2015 Paris Agreement.

Many countries, including Canada, are currently behind where they should be in order to achieve net-zero GHGe targets and need to create actionable policy to speed up the delivery of emissions reduction.

Reports have shown that digital solutions could reduce GHGe by as much as 20% by, for example, decreasing the need to travel for work and social activities; by reducing levels of energy consumption; and by changing the way in which public services are accessed and delivered. In Canada this is a reduction of between c.120 and c.190 megatonnes of GHGe.

It is clear that digital policy has a significant role to play in the broader climate policy debate, but currently it is missing in those policy papers and discussions across the G7 and beyond.

The absence of digital policy relating directly to climate action across the G7 presents an opportunity for Canada. Although Canada is currently the worst performing country in the G7, in terms of climate and net-zero GHGe targets, there is an opportunity for Canada to become a world leader in this space by developing ambitious policies to support the benefits that digital solutions can bring to climate action.

Potential policy positions range from government support for investment in areas without suitable broadband and mobile networks, typically rural, remote and indigenous regions, to changes in personal and business taxation to incentivise home working and other changes in working practises. Further targeted tax incentives could also be used to promote the delivery of public services digitally and aid wider digital adoption within the economy and society by reducing financial barriers to entry. There is also a wider role for public procurement to ensure that participants (bidders/partners) have a credible carbon reduction plan, and that ecological impacts are included in economic appraisal for all public procurements and investment cases requiring public funding.

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Executive Summary

The existential threat of anthropogenic climate change has to be met by anthropogenic solutions. It must be addressed by significant changes in behaviour across all levels of society. Government, industry, and individuals all have a role to play, and they all matter. Each role is essential to reduce and reverse the impact of the climate emergency, to reset the balance of the various ecosystems under threat, to reduce the levels of greenhouse gas emissions (GHGe), and to achieve balance, net-zero GHGe, in the second half of this century as set out in the 2015 Paris Agreement.[1]

Digital can help reduce GHGe by up to 20%

Digital technology has had a revolutionary impact on the progress of society. It has changed the way we live, work, and interact with services (public and commercial). It has a clear role to play in limiting the impact of climate change and achieving net-zero GHGe by maintaining a familiar standard of living across developed nations.

For the purpose of this report the term 'digital' will refer to digital infrastructure (wired and wireless communications infrastructure) and the use of this infrastructure via devices and systems. Government policy and investment is linked directly to the deployment of such infrastructure, whereas citizen and business use is determined by its availability. Policy must be developed to encourage and enable both.

Internationally recognised research[2] has suggested that digital solutions can reduce GHGe by 15-20%. Digital enabled reductions in GHGe at this level are equivalent to the GHGe of all global transport systems. This research points to lifestyle changes facilitated by digital solutions e.g. homeworking, virtualising consumption of entertainment (e.g. streaming services), delivery of digital public services and driving efficiencies in the consumption of energy which all aggregate up to significant reductions in GHGe. For Canada effective and actionable digital policies could lead to reductions in a range of 120 to 190 megatonnes of GHGe[3].

Although digital solutions and the infrastructure required to support them also come with an emissions cost, c.3% of global GHGe come from the manufacture and delivery of digital services, this cost must be viewed alongside the ongoing opportunities delivered by digital and associated technologies to:

- Drive down the consumption of energy, by making more efficient use of what energy we produce today, and enhance the move to renewable energy systems by lowering transitional demand;
- Create a circular materials market (based on e.g. mined materials - metals etc.) for industry, not only promoting the availability of materials, but including recycling manufacturing methods to build in the redistribution of recycled materials into the basic requirements of the industrial sector;
- Change the nature of the built environment, making smaller corporate hubs, rather than large corporate headquarters, the norm - capitalising on the ability of the workforce to work as efficiently from home, from smaller sites or some hybrid working pattern;
- Make mobility as a service (MaaS) systems efficient, and a real alternative personal transport solution and to supplement the use of public mass-transport systems;
- Create data-based interventions for land management to protect the land and return e.g. peatland, to its former state driving down the amount of GHGe that is released;
- Create more efficient food production and farming methods. Meat, and crop cycles can be monitored and optimised for both the food products they create and the welfare of the land they are grown on.

The use of digital solutions is rising exponentially across society and whilst it could be assumed that the associated increase in energy demand will come from renewable and low GHGe sources, the relationship between consumption and benefits must be better understood and monitored. With such potential for a positive GHGe reduction return relative to the Paris Agreement 1990 baseline, it presents an obvious area for policy development.

Digital is missing from climate policy in Canada

Canada is the worst performing nation in the G7 both in GHGe reduction targets and in actual performance against the 1990 baseline. However, having established the benefits digital solutions could deliver, Canada's federal, provincial, municipal, and indigenous governmental bodies now have an opportunity to develop actionable, deliverable, and meaningful, digital policy to capitalise on the potential 15-20% reduction in GHGe. In 2021 the Canadian government strengthened its climate action plan, ***A Healthy Environment, and a Healthy Economy***[4]. This report does not discuss any role for digital solutions or the need to invest in, or create, digital infrastructure, or develop specific digital policies. It is a report that references the February 2021 Canadian Institute for Climate Choices (CICC) report[5] **Canada's Net Zero Future: Finding our way in the global transition**, which similarly makes no mention, across the report's 130 pages, of the role that digital can play in helping Canada close the gap between its emissions today and a net-zero position by 2050. Given the reduction potential of c.20% through digital solutions, it should be clear that **Digital Policy is Climate Policy**.

What could Canada do to become a world leader in digital solutions for climate change?

Canada needs to develop a clear set of actionable policies. Other G7 nations (with the exception of the USA) are performing at a level that is expected to deliver net-zero GHGe by 2050, but like Canada, they do not have defined policies for the role of digital. Regulatory change, and a change of emphasis for digital infrastructure investment in Canada, would create a clear policy path for climate action. For example, promoting asset sharing, whether the assets are physical (fibre, cell towers etc.) or virtual (spectrum) would increase the efficient use of assets, lower the GHGe burden of solutions, and maximise the spread of digital infrastructure to deliver a stronger GHGe cost/benefit ratio. Overbuild must be an exception rather than an accepted form of network expansion and a policy position that places an emphasis on reaching 100% access to infrastructure over infrastructure competition would deliver digital inclusion as well as reducing GHGe emissions from unnecessary additional networks. Similarly unused, or horded spectrum must be brought back to market so that it can be used to deliver service, and not act as a barrier to entry for smaller mobile operators who can make community-based business cases work financially but do not have access to spectrum. Beyond networks, infrastructure and spectrum allocation policy makers must ensure they can capitalise on the up to 20% reduction in GHGe delivered by digital solutions. The Canadian taxation system is incentive based and can be used to encourage behaviours that support the climate goals of Canada. There is a clear intersection between the requirement to reduce GHGe and citizen behaviour. E.g., tax incentives that promote home working, and make the equipment needed to work efficiently from home more affordable will help reduce the need to travel for work. This, in turn, will create a positive chain reaction as well as reducing traffic on roads and therefore GHGe, it will reduce the pressure on public transport systems, remove the need for larger office buildings

further reducing power consumption and the associated GHGe they create. This approach will also support the delivery of public services digitally including e-health solutions. Finally, all federal and municipal government procurement processes must include climate benefits in the cost benefit ratio and require participants (bidders) to have an active carbon reduction plan.

Introduction

Background

The impact of Anthropogenic Climate Change is the crisis of our age, and time is running out to limit its impact, and to ultimately reverse it. There are few topics where such hyperbole would be acceptable, but this Anthropocene ending emergency needs extremes in the language used to describe it, and to capture and hold the attention of policymakers. It then requires policymakers to coordinate all the opportunities at their disposal to create a suite of policies to address it.

From the perspective of those actively engaged in tele-communications and broader digital industries, the role of digital solutions in achieving climate change targets is just such an opportunity for clear actionable policy.

There is a perception that this opportunity has not translated into the digital and climate policies of national governments, and that 'digital' does not seem to be directly perceived as a tool for improvement by the various global organisations that comment and inform on climate change issues.

Research Theme

This paper looks at a number of research themes:

THEME 1
Is there evidence to challenge the perception that the role of digital has not translated into the climate policies of national governments?

THEME 2
How are countries developing digital policy to address the impacts of climate change?

THEME 3
How is Canada evolving its digital policies to take account of a role for digital in addressing the climate crisis?

It will also look at the 'performance' of Canada compared to its partners in the G7[6].

THEME 4
What, if anything, can Canada learn from the G7 and others?

THEME 5
What will it take for Canada to become a leader in digital policy as a tool for climate action?

This paper produced for TELUS by *FarrPoint* is a step towards opening the debate in Canada on the role digital should play in national and regional climate plans and to argue for changes in, and the speed of, the deployment of infrastructure to further enable efficiencies across the many economic and environmentally assessed commercial/industrial sectors nationally and globally. This is a report that looks at the role digital solutions and digital policy will play in creating the conditions for achieving net-zero goals. It is not a report which looks at the specifics of climate change.

Climate Related Digital Policy

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Evidence of digital specific policies for climate action

THEME 1: Is there evidence to challenge the perception that the role of digital has not translated into the climate policies of national governments?

In the Autumn of 2021 the Canadian government strengthened its climate action plan, ***A Healthy Environment, and a Healthy Economy***[7]. This report does not discuss any role for digital solutions or the need to invest in, or create, digital infrastructure, or develop specific digital policies.

In February 2021, the Canadian Institute for Climate Choices (CICC) published their report[8] ***Canada's Net Zero Future: Finding our way in the global transition***, in full following their 2020 summary document. This report described by the Canadian government as the first comprehensive modelling report from an independent body[9], comments on the options for Canada to achieve its net-zero target for greenhouse gas emissions (GHGe). It makes no mention, in any of its over 130 pages of the role that digital can play in helping Canada close the gap between emissions today and a net-zero position by 2050.

THEME 2: How are countries developing digital policy to address the impacts of climate change?

The gap in understanding the role for digital is not limited to Canada. Across the G7 the role that digital infrastructure, digital devices, changes in behaviour and the technical innovations that digital supports, has not been considered within the broader climate policy documents of member states. This is of concern in two specific areas: the first is the GHGe cost of infrastructure, devices and supporting technologies, and the second is the potential benefits that the deployment of digital assets, including infrastructure and devices, could have on this existential climate crisis. In failing to consider digital, policymakers are missing the opportunity to maximise digital's potential in addressing climate change issues.

If the world is to continue to enjoy its digitally enabled future it will need to continue to invest, both fiscally and environmentally, in new digital infrastructure: thousands of km. of new fibre networks, and the global rollout of the next generation of mobile networks. While 5G is the current evolution for mobile technology, we must understand that the path to 2050 may contain a number of further iterations (a sixth and perhaps a seventh generation i.e. 6G & 7G) and other upgrades to the fixed and mobile networks that will support the digital economy and national global economies.

In the summer of 2020, *FarrPoint* produced a report for the devolved government in Scotland that looked at the direct impact Scotland's investment in digital infrastructure would have on its ability to hit its 2045 net-zero GHGe target. The conclusion of the *FarrPoint* report was that: ***there is limited data available that directly addresses the role for digital infrastructure in the climate agenda, nor is [digital] perceived as a direct route to achieve the goals and outcomes of the net-zero challenge***. And two years later very little has changed. The UK Government's Department for Digital, Culture, Media, and Sport (DCMS) is currently reviewing the impact its interventions in broadband and mobile infrastructure markets will have on net-zero GHGe. In a recent presentation to a UK infrastructure trade body INCA[10], representatives from the government department appealed for support as they are unable to find clear evidence of positive or negative contributions. Similarly, a 2021 report for the UK Spectrum Policy Forum[11] also commented on a lack of global digital policy.

Internationally, the ITU (International Telecommunication Union) has commissioned a number of reports and is standardising the way suppliers represent their emissions and consumption of energy, but to date has not created a standard protocol detailing the role for infrastructure in addressing climate change, although it

does recognise there is one. In its sector focused recommendations, looking at the trajectory of the Information and Communications Technology (ICT) industry and climate change[12]: ***'Greenhouse gas emissions trajectories for the information and communication technology sector compatible with the UNFCCC Paris Agreement'***, the one-page appendix commenting directly on the impact ICT could have in decarbonising other sectors includes this statement in the title, **'This appendix does not form an integral part of this Recommendation'.**

The appendix itself is useful and is consistent with the potential opportunities and impacts reflected in this paper. Moreover, it also recognises the twin aspects of the digital industry having both significant adverse impacts on the environment: through the consumption of energy, the need to mine raw materials in the development of infrastructure and devices, and the impact the deployment of infrastructure has on the environment itself, whilst also recognising the digital industry's role as an enabler of net-zero targets through lifestyle and commercial change.

Similarly, the European Union (EU) has not defined the role for digital in addressing the requirements for net-zero although it now recognises its importance[13]:

> *'Digitalisation is an excellent lever to accelerate the transition towards a climate-neutral, circular and more resilient economy. At the same time, we must put the appropriate policy framework in place to avoid adverse effects of digitalisation on the environment…'*

The USA has only recently returned to the Paris Agreement and with 4 years of an alternative view, policymakers, including the FCC (Federal Communications Commission), have yet to consider its role in the climate crisis.

Returning to the Canadian government and CICC reports, the apparent exclusion of digital solutions in the report along with a thin evidence base for a defined role for digital is not a sign that there is no clear role for digital in Canada's climate transition, but as with most other nations, it simply suggests that the role for digital, and the arguments for accepting the cost burden, fiscally and environmentally, for its ongoing development have simply not yet been made. The CRTC, the ***Canadian Radio and Television Commission***, has also not directly contributed to the debate.

THEME 1 & 2: Initial Conclusions

There is no evidence across the G7 that policymakers are directing digital policy to tackle the issues of climate change. This is likely to change, for example in the UK regulator, Ofcom's, annual plan where it is committed to publish a report towards the end of 2022 looking at the impact the sector has on the net-zero target for the UK and the role that digital may play in enabling change.

International industry bodies have tended to create plans and policies concerned more about 'greening' their industries, rather than looking at the benefits they can bring. In the mobile industry body GSMA report[14], ***Mobile Net Zero***, they detail the improvement they have made as an industry to become more energy efficient, and the policies they have created throughout the mobile supply chain. They do not directly address the benefits their industry can bring to effect behavioural change to support the global net-zero challenge.

This absence of evidence across the G7 presents a clear opportunity to the Canadian government and Canadian infrastructure companies to take a leading role in defining digital policies tailored to climate action. This leadership role would not only improve Canada's climate performance but give it a credible leadership role in an underdeveloped, but material space.

THEME 3: How is Canada evolving its digital policies to take account of a role for digital in addressing the climate crisis?

The lack of any kind of evidence that Canada is using digital policy as part of its climate action plan demonstrates a gap in the policy evolution for digital. If it is not contained in, the first comprehensive modelling report from an independent body, then it is unlikely to factor in the broader policy for climate change and the delivery of net-zero GHGe targets - something evidenced in the manner in which the CICC report and Canadian government report are cross referenced. To better understand whether this omission is material, it is necessary to establish the role for digital in climate action.

Making the case for digital

A significant amount of effort has been, and continues to be, expended on tracking the performance of countries and their emissions across a number of specific sectors. The sectors are available for review on the website of the Intergovernmental Panel on Climate Change[15] (IPCC) and are included in summary on page 15. There will be numerous roles for digital and technology-based solutions across the IPCC sectors as they continue to reduce GHGe and support global net-zero GHGe targets. In the 2018 Global e-Sustainability Initiative, (GeSI) report 'Smarter 2030', areas in which digital and ICT solutions could make a significant impact on GHGe are set out with the conclusion that reductions up to 20%[16] are possible. Where they have the potential to work most effectively is in driving efficiencies in consumption by, e.g., reducing the energy required to heat homes and commercial buildings, for transport (personal, public, and logistics), and by virtualising physical artefacts. The ability to enjoy an electronic book rather than a physical one reduces the cost of manufacturing and the potential for waste. In Ontario, for example, a third[17] of books read are digital so there is further scope for change alongside the ongoing digitisation of public records, old newspapers and other periodicals in libraries. Such simple examples, when scaled up, make a significant global impact.

As solutions evolve, digital technology's ability to collect and use data to, for example, create digital twins of real spaces that can be used to test solutions virtually before deploying them, will drive efficiencies and limit the impact of errors. In agriculture, this can help establish drilling patterns for optimum seed distribution, and in an urban setting can be used to establish optimum traffic flows for urban planning. Opportunities for efficiencies are limited less by the capabilities of the technology but rather the will to deploy them. Policymaking is an important step in promoting the capabilities of digital, but those same capabilities need to be acknowledged and understood in context. It is incumbent on this sector to develop climate change based use cases to demonstrate the role for digital.

For digital to fulfil its potential, all consumers and businesses must have access to a minimum standard of connectivity and policy must be developed to define and deliver this.

For Canada this must include a balance of investment between dense urban, and therefore commercially lucrative projects, and rural communities where the deployment of infrastructure is more costly and with a longer return on investment. The market is unlikely to engage in such an altruistic approach and so will need regulatory change and or tax incentives to encourage a change in behaviour.

Understanding the benefits of digital

The conclusions of the GeSI report are further enhanced by evidence gathered during the COVID-19 global pandemic that created an opportunity to look at a world-wide change in behaviour and to take that behaviour as a model for what could be achieved if people changed the way they work, travel and live. In 2020, global energy emissions year on year, fell by 5.8%[18],[19]. In Canada latest reports[20]

show a GHGe fall in 2020 of c.9% It should be noted that whilst global emissions fell overall, the emissions from the energy sector remained more or less static despite increases in energy derived from renewable sources. Contribution to the fall in emissions came about from a number of behavioural changes enabled by digital solutions including:

- Working from home;
- Changing consumer behaviour (more online shopping);
- Online education;
- Online non-emergency medical consultations;
- Travelling less for social and work-related activities; and
- Digitally enabled entertainment (incl. streaming).

This list exists within a range of other activities that have adapted to the prevailing COVID-19 policies of national governments.

Post the recent waves of infection, which are different country by country, GHGe levels are on the rise again, mostly as a result of an increase in international travel and increases in the consumption of oil and gas for power and to fuel vehicles This puts into relief the scope that digitally enabled behavioural change can play, but while it should not be overstated, it also should not be ignored.

Impact of digital on the climate sectors

Any examination of the role for digital as a tool to tackle climate change must conform to, or be aware of, the way in which climate action and performance are tracked. The IPCC has set out seven specific sectors against which GHGe emission are tracked and how changes, relative to a 1990 baseline, are reported. The IPCC sectors, against which climate targets are reported are:

- Energy;
- Industry;
- Buildings;
- Transport;
- Land use, Land use change and Forestry (LULUC&F);
- Waste; and
- Agriculture.

Digital will have direct benefits across the IPCC sectors, some of which will have interlocking benefits. Energy, industry, and buildings for example will have complementary uses for digital solutions as well as a requirement to include the costs of developing and delivering the same solutions in their performance reporting. It is, therefore, important that there are clear policy positions embedded across the defined IPCC sectors to ensure any identified benefits can be developed alongside the more sectoral approaches, normally associated with a reduction of use/construction/consumption currently understood.

Set out below are high level examples of climate related digital solutions across the IPCC sectors. It should be noted that there are no specific national digital policies to underpin the potential for digital to engage across the sectors. The only minor exception is energy consumption, but here digital is seen as both a consumer and as a tool to drive efficiencies.

Energy, Buildings and Industry

The ability to manage the consumption of electricity will require digital solutions to help balance the demand and availability equation. There will come a point where global electricity demands will be delivered with no GHGe but until then, making the most efficient use of electricity will help improve the balance between zero-carbon electricity and electricity generated via fossil fuels. Across the G7, smart metering technology has already been deployed to aid consumers in understanding how they use energy in the home, and to simplify the collection of data for billing. At a more extreme and climate conscious end of the scale, passive house and houses using heat exchange systems also require digital monitoring services to ensure that the homes remain habitable and safe.

Digitally enabled construction methods are also being deployed to create homes and workspaces. Whether this is in the construction of building components, or sections of the buildings themselves created through 3D printers, or mobile computer numerical code (CNC) jigs able to create bespoke timber framed buildings onsite, the building and construction industry has numerous uses for digital. The flexibility of such approaches will also have an impact on the materials that can be used in construction and will enhance the ability for this industry to reuse and recycle materials and existing buildings.

Transport

Opportunities in air and maritime transport are limited and tend to derive from efficiencies in logistics and supporting technology. For example, conference platforms are often used as examples of digital solutions employed in the reduction of business travel.

It is in land transport and personal transport where digital solutions create the broadest opportunities. Electric vehicles require a significant amount of supporting digital solutions. Charging points

require communication infrastructure to facilitate payment and to transmit telemetry (service status and in-use information). Digital solutions can help make using public transport services easier, ensuring real-time information is available to users. While transport and fossil fuel reduction policies exist, there is limited to no digital policy positions detailed by national governments.

Given the geographic scale of Canada transport GHGe is a significant issue and the ability of digital infrastructure and digital services to reduce the length and number of journeys could make an immediate and significant impact especially in rural Canada where journeys will naturally cover greater distances, and where the availability of digital infrastructure and services may be limited.

Agriculture and LULUC&F

A whole array of digital solutions is employed across the agriculture and land sectors largely in the form of monitoring technology. Data is an important tool to help achieve net-zero GHGe and maintain the conditions to improve the environment, examples of which include: monitoring the quality of peatland to measure its ability to store CO2; sensors and monitoring equipment to help understand if current levels of GHGe are having any direct impact on trees' ability to remove CO2 and to understand the consequential impact on soil and root systems; and flood monitoring equipment to assess risk to life and property. In agriculture supply chain management tools are used to limit waste and over production.

Waste Management

Waste derived from electronic devices, e-waste, is the fastest growing waste stream with global levels likely to exceed 52 million tonnes this year.

Digital, as well as creating waste, is part of the solution design for waste management. Intelligent sensing decks are able to separate waste into recyclable categories and perhaps more importantly, in recognition of its contribution to the waste, many digital device manufacturers are building devices with recycling in mind.

Encouraging a shift in behaviour – a 'new normal' for climate action

People will adapt more easily if the impact on their lives is only moderately perceptible. Digital solutions excel in creating the conditions for the myriad of small changes people need to make to their daily lives to adapt to climate change.

In an article[21] produced for the World Economic Forum (WEF), the Exponential Roadmap Initiative for climate action claims that digital solutions could cut global emissions by as much as 15% supporting the conclusion of the GeSI report, albeit with a slightly reduced impact. There are a number of supporting reports[22] and articles setting out, or reconfirming, the GeSI opportunity and expanding on the potential of digital solutions – solutions that should be driving digital and climate policy.

The counter to this positive position is a paper from the French think tank, ***The Shift Project***[23]. It raises concerns that our collective use of digital products and solutions could create up to an 8% rise in GHGe to 2030[24] based on the consumption of energy and materials and excluding the impact of deploying more fixed and wireless infrastructure. Regardless of this pendulum swing, what can be understood is that digital solutions will have an impact on the collective ability to hit net-zero GHGe targets, and that without digital solutions the global economy will suffer.

The development of digital solutions is the price we must pay, and so understanding its cost and abatement potential must become a key element for climate and digital policymakers.

Climate related policy - conclusion

There is evidence that digital solutions have a role to play in addressing climate change and assisting in the delivery of net-zero GHGe targets, but digital policy has not been developed to make the most of the technical opportunity. This is the case in Canada, but it is also the case more widely across the G7.

G7 policymakers seem to understand the need for digital solutions but so far, a clear set of digital policies has not emerged. The lack of specific digital policy across the G7 is expected to change and actionable policy is expected to be developed in the next eighteen months for the EU members of the G7 and in the UK. For Canada, given its relative position as worst performing nation in the G7 action is needed now.

Digital Policies for Climate Action

Theme 4 - What, if anything, can Canada learn from the G7 and others?

The climate crisis is global in nature, and as such the behaviours of partner countries and indeed any country has a direct impact on global outcomes. For the purpose of this paper, the behaviours and experiences of other countries also serve to help inform policy and fast-track opportunities for success.

A comparative overview is included as an appendix to this report; it looks at the policies, performance and availability of digital infrastructure across the G7 and a selection of other countries set out below:

- **The G7** - The G7 is a group of seven of the wealthiest global economies: Canada, France, Germany, Italy, Japan, the United Kingdom (UK), and the United States of America (USA).
- **Non-G7 Comparators** - In addition to the G7, this report also compares some of the policies and performance of Australia, Singapore, South Korea, and Spain.
- **The EU** - The European Union (EU) is not directly reviewed in this paper, but as France, Germany, Italy, and Spain are EU members they are subject to the EU wide policies for climate action and are regulated under centralised commissions for industrial sectors including telecommunications.

Digital Policy overview

The G7 and the other counties reviewed in this report have not demonstrated any specific digital policies that would put them ahead of Canada. The EU countries of the G7 and the UK are ahead of Canada in terms of GHGe targeting and their actual net-zero GHGe performance against the 1990 baseline. However, there are no coordinated digital policy positions expressed at this time and this provides Canada with an opportunity to move ahead of G7 partners and establish itself as a leader in the digital space, regardless of its performance across the traditional IPCC sectors.

The UK and the EU, who share a historic public procurement methodology, have introduced steps in their procurement processes to encourage companies to create their own GHGe reduction plans. In the UK, public funding for projects must also show the impact the investment will have on net-zero GHGe and with public funding for digital infrastructure continuing across the UK there is some overlap between public procurement policy and climate action. The inclusion of such guidelines and mandates would be easily replicable in Canada.

Conclusion

Climate Change is the key global challenge of our age which requires a concerted global response. Policymakers across the world need to coordinate action in order to create solutions to reduce global warming. 'Digital solutions' can play a major role in achieving net-zero ambitions; however, they have largely been ignored in the climate policy debate to date.

Digital and technology solutions have a role to play across a large proportion of the economy and society in reducing emissions and supporting global net-zero GHGe targets. The COVID-19 pandemic shone a light on how digital solutions can enable behavioural change, which in turn results in falling emissions through, for example, facilitating home working and remote access to public services, thus reducing the need for travel. Across the economy, digital and technology-based solutions can and are playing a key role in reducing GHGe in the main emission producing sectors, highlighted by the IPCC. Digital has the greatest potential impact on emissions by decreasing consumption, whether that be cutting energy demand for travel or heating or reducing the need for physical production of goods and services by enabling them to be consumed virtually, reducing both the use of energy and the creation of waste.

However, as this report demonstrates, there is a significant lack of evidence of any form of national government establishing centralised strategic digital policy to tackle climate change. Moreover, there is no specific international coordinated action to maximise the use of digital solutions to solve climate change.

Yet, there are some examples from around the world of countries using digital solutions to tackle climate change without a centralised policy construct. For example, in Japan and Australia, the focus is on utilising technology to enable citizens to reduce their emissions through increasing the use of the sharing economy. For Europe, whilst there are no specific strategic digital net-zero policies, programmes such as the EU wide copper network switch-off will impact upon the climate. It is not clear whether the political challenges in the USA are the reason they have not developed any digital climate change policies, and Canadian net-zero policy makes no mention of the impact digital could have on climate change.

Overall, climate change is recognised worldwide to be the most important challenge facing us today. The lack of coordinated digital policy action in reducing emissions will change, however concerted action by policymakers will be required for this to happen. If that occurs, then there is an opportunity for digital solutions to have a significant impact on the climate change debate.

Research themes:

THEME 1: Is there evidence to challenge the perception that the role of digital has not translated into the climate policies of national governments?

There was no evidence of clear, actionable, and specific digital policy being developed in Canada or across the G7 to assist in the goals for climate action, GHGe reduction and the 2050 target for net-zero GHGe. Policy is inherently an evolving discipline, and this will change, but again there was no clear timetable established by any of the comparator countries reviewed in this report.

THEME 2: How are countries developing digital policy to address the impacts of climate change?

There are no distinct digital policies evident from other countries, but there is an acceptance of the role technology is playing in helping to address the climate crisis. Key to most national policies is the role that technology (as distinct from digital) is playing in the way in which energy is consumed. This is a doubled edged benefit as the reduction in energy consumption is running in parallel with the move to renewables, enabling an efficient transition. There are specific digital opportunities here too, needing only a policy nudge to be enacted.

THEME 3 - How is Canada evolving its digital policies to take account of a role for digital in addressing the climate crisis?

There is no evidence of an evolving suite of digital policies in Canada, but there are opportunities for Canadian policymakers and industry to affect real change and take a leadership role as the potential benefits of this role are evident.

THEME 4 - What, if anything, can Canada learn from the G7 and others?

The G7 are not ahead of Canada in terms of digital policies, although they do occupy something of a moral high ground when it comes to targets and performance in accordance with net-zero GHGe. This lack of coordinated digital policy offers an opportunity to Canada to move ahead of G7 partners and establish itself as a leader in the digital space, regardless of its performance across the traditional IPCC sectors. The UK and the EU have introduced steps in their procurement processes to encourage companies to create their own GHGe (CO2) reduction plans. Companies must now have both a reduction plan and a monitoring report detailing emission levels and how achieving a net-zero GHGe outturn will be achieved. In the UK, the UK Treasury department now requires an assessment of how any project requiring public funds will impact on net-zero targets. This is something that would be easily replicable in Canada.

Recommendations

THEME 5 - What will it take for Canada to become a leader in digital policy as a tool for climate action?

The climate and digital policy bar has been set at a low level and arguably any coordinated digital policy in relation to climate action would put Canada ahead of G7 partners. Simply rewriting the government's, A Healthy Environment and a Healthy Economy report to include the measures that could be taken to deliver digital solutions would immediately improve Canada's standing. Similarly, the infrastructure review signposted in the report should add a focus on digital infrastructure as a means of facilitating solution design.

There are also some practical steps that should be considered. Digital solutions will work best when there is equality of access to infrastructure. Overbuilding in dense urban areas at the economic expense of developing solutions for rural communities makes economic sense, but it is not socially just, nor is it good for the environment. Economic models for competition have created a competitive landscape for digital infrastructure, fixed and wireless, across the G7. An ecological model that promotes asset sharing, both real in terms of physical assets such as fibre, masts etc and virtual in terms of spectrum should now be considered. Cost must be taken out of the challenge in bringing connectivity to remote communities, so their behaviours and opportunities mirror those in urban settings and their GHGe savings can be delivered.

This should be achievable for policymakers - they created the economic models for competition in the 1980s, they now need to create ecological models for cooperation in the 2020s.

At a practical and citizen level the Canadian government has the flexibility to incentivise behaviours through taxation. The development of a suite of tax incentives that promote e.g., homeworking, a 'digital first' policy for public services including e-health and other opportunities to encourage and reward the myriad changes required to reduce GHGe and achieve the significant savings, up to 20%, assumed in this report.

Appendices

Appendix 1

Country Comparison

The G7

The G7 is a group of seven of the wealthiest global economies: Canada, France, Germany, Italy, Japan, the United Kingdom (UK), and the United States of America (USA). There are a number of metrics that led to the construction of the G7, the main metric being a calculation of relative wealth per capita. It is this metric that would tend to exclude China and India, with considerable national wealth and economies growing at pace, but with large populations that 'dilute' the wealth per capita metric. Politics also has a role to play, as seen from the brief participation of Russia in 1998 followed by its exclusion in 2014 after the annexation of Crimea.

The G7 does not have the power to pass laws, it is not a formal and legal federation of nations, but it does come together to create the conditions for greater cooperation between the participant nations as has been seen in recent G7 supported funding for global health initiatives.

Non-G7 Comparators

In addition to the G7, this report also compares some of the policies and performance of Australia, Singapore, South Korea, and Spain. This is a comparative analysis and the role of e.g., Australia at the inception of this project had some synergies with Canada that the project team considered needed further exploration. Its size, population density, population distribution, and geographic challenges offer some similarities with those of Canada and make it an interesting comparison country. Singapore and South Korea are both highly innovative nations, with Singapore clearly concentrated in an urban demographic. Finally, it was useful to include an additional EU nation to compare with the G7 performance from France, Germany, and Italy. Spain was included having had notable success in the development of its national broadband infrastructure in the expectation that the investment in this infrastructure would have some complimentary use-cases that would be useful from a climate action and digital perspective.

The EU

The European Union (EU) is not directly reviewed in this paper, but as France, Germany, Italy, and Spain are EU members they are subject to the EU wide policies for climate action and are regulated under centralised commissions for industrial sectors including telecommunications.

Similarly, the net-zero GHGe target of a 55% reduction by 2030 against the 1990 baseline is an EU wide target and does not consider an individual member-state's own historic performance to date.

Comparative Overview[25]

Solutions for climate change and opportunities for digital solutions are highly dependent on geography. They are dependent on the density of population centres and the spread of the population across national territories. Current digital solutions rely on fixed and wireless infrastructure which has high cost and performance dependencies based on distance. Larger distances mean higher costs, more equipment, higher power consumption and larger GHGe footprints. Significant costs to service small, dispersed populations drive inefficiencies in the infrastructure solution.

Similarly, topology plays an important role in the dispersal of populations and the ability to service the resulting communities with infrastructure.

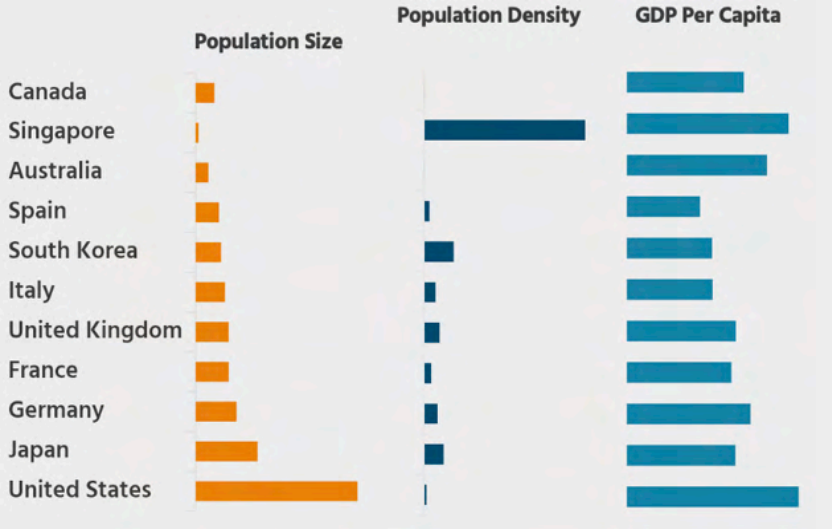


Figure 1 – Key comparator country characteristics (relative to Canada) (Source FarrPoint)

Whilst the populations of each of the comparator countries, as set out in ***Figure 1*** are similar to Canada – with the exception of Singapore and USA – their geographic distribution varies significantly. In Canada, whilst 82% of the population lives in an urban setting, the overall population density is only 4 per km^2, similar to that of Australia (3 per km^2). This is vastly different to the city state of Singapore where the figure is 7,953 per km^2. This means digital/ physical connectivity must be considered differently given that the distances infrastructure has to cross varies so widely.

All the comparator countries have relatively high levels of GDP per capita; there is some variation – ranging from $27k in Spain to $64k in USA, with Canada in the middle at $43k, close to the majority of the comparator countries.

High Level Economic Sectors

Over the last century the majority of developed economies have transitioned from an economic profile focused on manufacturing and production, to a focus on services. There is, however, some variation across the comparators.

The economies of South Korea (39%), Germany (31%) and Japan (30%) still have a relatively high proportion of manufacturing activity – based around electronics and shipbuilding in Korea, automotive and mechanical engineering in Germany, and electronics and automotive sectors in Japan.

The economies of the US (80%), the UK (79%) and France (79%) are based around service orientated sectors, in particular banking and finance, and professional services. For most of the comparator countries, agriculture makes up only 1 or 2 percent of the economy, in Australia and Spain it makes up slightly more at 4 and 3 percent respectively.

Contribution to GHGe

Whilst the Paris Agreement[26] is a legally binding international treaty, the direct methodologies, reporting requirements aside, are in the gift of individual countries. There is a clear demarcation between the role that emerging economies will play versus the mature global economies, of which the G7 are at the forefront.

Production, reduction, and abatements in GHGe are specific to the economies of the G7 and other countries and their requirements to develop their social and economic ambitions. The Paris Agreement makes it clear that countries can no longer deliver such ambitions at a cost to the climate. A net-zero GHGe is the first and most clearly defined step in a road to reversing the impact of anthropogenic climate change.

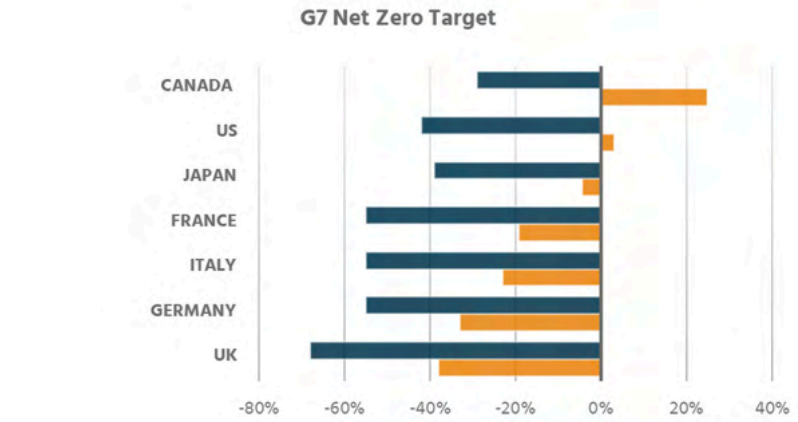
Nationally Determined Contributions (NDCs)

NDCs are the plans submitted by individual countries that set out how they will reduce their emissions and articulate their plans for adaption methodologies to deal with the impact of climate change[27]. As they are self-determined plans, the NDCs are then assessed to evaluate whether they are sufficient to meet the requirements of the Paris Agreement. Canada's recent 2021 submission[28] sets out how Canada plans to reduce its emissions to c. 45% below a 2015 baseline by 2030. This marks a significant improvement.

NDCs are also a clear policy review area for digital solutions.

Performance against net-zero GHGe targets

Figure 2 summarises the performance of the G7 countries GHGe emissions against the 1990 baseline.



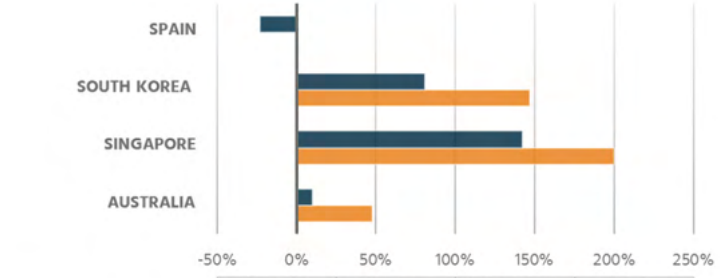
	UK	Germany	Italy	France	Japan	US	Canada
2030 target against the 1990 baseline	-68%	-55%	-55%	-55%	-39%	-42%	-29%
Current perfomance against 1990 baseline	-38%	-33%	-23%	-19%	-5%	3%	25%

Figure 2 - G7 Performance against net-zero GHGe targets (Source: FarrPoint)

Canada is the worst performing nation of the G7 in terms of its reduction in GHGe based on the 1990 baseline, its targets for 2030, and its planning for the 2050 goal – although it should be noted the 2021 NDC will help improve Canada's standing. There is an inherent climate contradiction that sees Canada having the most renewable sources of electricity in the G7 as a result of its hydropower

capabilities, but significant (c.26% of total GHGe) counteracting emissions from the production of gas and oil.

For the non-G7 countries considered in this report, the outlook is significantly worse. The measures contained in ***Figure 3*** however, do not tell the full story. One of the key issues in the net-zero GHGe plan is the role of mature, versus emerging economies. The 1990 baseline makes perfect sense for mature economies, but for those emerging in the East the baseline is a distorting factor.



	Australia	Singapore	South Korea	Spain
2030 target against the 1990 baseline	10%	142%	81%	-23%
Current perfomance against 1990 baseline	48%	200%	147%	

Figure 3 – Non G7 countries (Source: FarrPoint)

It is no surprise that the economies of South Korea and Singapore have seen rapid increases in emissions since 1990 as their economies have grown significantly. More worrying will be their ability to take control of their emissions to achieve net-zero GHGe in this century. Singapore has a plan targeted at net-zero GHGe by 2060, and South Korea has set 2050 as a goal.

Australia formally agreed a 2050 target for net-zero GHGe on 26th October 2021, days before the COP26 summit. Although Spain should default to the EU-wide target for 2050 net-zero and the EU-wide 55% reduction target for 2030, as detailed in ***Figure 3***, the Spanish government is suggesting[29] that a 23% reduction by 2030 is more realistic. Spain's average reduction in GHGe between 2005 and 2019 has outpaced the EU average by reducing GHGe by 27%[30], but it does not have published figures for its current performance against the 1990 baseline.

Relative Connectivity

Country	Mean download speed (Mbps)	Broadband Penetration	Mobile devices (% of population*)
Japan	96.36	97%	159%
United States	94.42	90%	107%
France	85.96	91%	103%
Canada	**79.96**	**94%**	**98%**
United Kingdom	51.48	96%	99%
Italy	36.69	84%	129%
Singapore	97.61	90%	146%
Spain	89.59	93%	116%
Republic of Korea	61.72	97%	118%
Australia	40.50	88%	127%

*The number of mobile devices often exceeds one per person, and so notional percentage of the population with access to a mobile device reflects this whilst also inferring that coverage may be less than 100%.

Table 1 – Speed and Availability (Source: FarrPoint)

The purpose of ***Table 1*** is to determine both the availability of infrastructure and the average speed of connection as a way to

measure the quality of the infrastructure deployed. The number of mobile devices does not reflect the percentage of the landmass where a sufficiently robust mobile signal is available and is included for reference to determine the digital capability of a nation more broadly. Moreover, there is no consistency in the way in which global connectivity metrics are reported.

For Canada it is clear that, nationally, it is well positioned to take advantage of its digital infrastructure to affect climate action through changes in digital policy.

This paper has reported that there is a lack of evidence of any form of specific digital policies by national governments to tackle climate change, but from ***Table 1*** the countries of the G7 have national infrastructure sufficient to develop digital solutions. That countries do not have defined and centralised policies for digital's role does not mean that there is no evidence of climate action being developed or enhanced by digital solutions.

Japan and Australia, for example, are developing citizen specific policies for climate adaptation and GHGe reduction. In Japan, the role of the individual is at the heart of their policies to tackle climate change. Through the use of technology, it is expected that there will be a national shift from valuing possessions to valuing the function of 'a thing', and so reducing the need, and the social cache, of ownership[31]. This sharing and function orientated economic shift will be underpinned by a digital policy shift to promote the use of, for example, mobility as a service (MaaS) solutions which in turn will make the case for the proliferation of electric vehicle charging points, and enhancements to an already class leading 5G wireless infrastructure rollout to support it.

In Australia, digital solutions are citizen, rather than industry centric. Data, artificial intelligence (AI) and digital devices are being used to support the work of the world's first outdoor living laboratory: the Australian Integrated Multimodal EcoSystem (AIMES). Here a climate policy is wholly dependent on the ability of digital to deliver the data and analytics required to make the best use of the sensor data collected within this learning environment to work and report in real time.

For France, Germany, Italy and Spain, the EU model is central to all policy development, although there are also national bodies with a role to play. There are no specific digital climate policies developed by the EU Commission or BEREC[32], the EU regulatory body for electronic communications. However, there is a coordinated and EU wide programme for the switch-off of copper networks which will have an impact on climate with the removal and reuse of a material that has a significant sourcing GHGe cost, and the reduction in the energy consumption of the copper networks. This will have a coincident benefit when considered alongside the need to reduce energy consumption and limit GHGe along the material value chain.

More widely the EU is promoting a green digital transformation, but to date the policies from this programme have looked at greening the digital economy, rather than looking at how those solutions can be used to green the EU.

Beyond this industry greening approach we have an example in France where the focus appears to be in developing policies to improve data collection. They want to better understand the GHGe cost of digital solutions as part of the programme for a green transition. This is a view supported by the French thinktank, *The Shift Project* mentioned earlier. Across Europe the recognition that digital can offer solutions to climate change is being recognised, but as with a recent interview[33] with German Minister for the Environment, it has not translated into actionable policies, or policies that look much beyond the greening of the industry itself.

In North America, the USA has only recently returned to the table on climate change issues, and so it is not surprising that there are no developed policies linking the role for digital and climate

change. However, this appears to be changing and a recent opinion piece[34] linked the need for digital innovation as a tool for climate action. For Canada, it is telling that the flagship report, **Canada's Net Zero Future: Finding our way in the global transition**, makes no mention of digital, and yet it is perceived as a comprehensive national strategy document.

End Notes

[1] The United Nations 'Paris Agreement' - 2015

[2] Source: SMARTer2030 report, GeSI, 2018 and articles produced by the World Economic Forum and other sources referenced throughout.

[3] The reduction of 120 megatonnes GHGe is set against a 1990 baseline of 565 megatonnes GHGe. Source: GHGe Canada . However this figure is based on an average global reduction. When applied to Canada this percentage reduction could be higher and within a range of 25-30%

[4] Source: A Healthy Environment and a Healthy Economy

[5] Source: CICC report

[6] G7: 'The Group of 7' of the most advanced global economies.

[7] Source: A Healthy Environment and a Healthy Economy

[8] Source: CICC report

[9] Source: https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/net-zero-emissions-2050.html

[10] INCA – Independent Networks Cooperative Association, 'Net Zero Event' – 30th Sept 2021

[11] Found out: https://www.techuk.org/who-we-are/our-partners/uk-spectrum-policy-forum.html

[12] Found at: https://www.itu.int/rec/T-REC-L.1470-202001-I/en

[13] EU Commission press release Dec. 2020

[14] Mobile Net Zero - State of the Industry on Climate Action

[15] Found at: https://www.ipcc.ch

[16] Source: SMARTer2030 report, GeSI, 2018

[17] Source: Toronto Start - article

[18] IEA, Global Energy Review: CO2 Emissions in 2020

[19] It should also be noted that GHGe reductions tend to be compared to GHGe from the 1990 baseline in line with the Paris agreement.

[20] GHGe report: Canadian Environmental Sustainability Indicators

[21] Source: WEF Article

[22] Additional sources: Accenture Report; IPCC Global Response; WWF paper

[23] Source: The Shift Project

[24] Source: Towards digital sobriety

[25] Sources: Demographic, geographic and economic indicators from The World Bank, emissions data from United Nations Climate Change, climate change target information from Climate Action Tracker

[26] Link to The Paris Agreement

[27] As set out in Article 4, paragraph 2 of the Paris Agreement.

[28] Source: Canada 2021 NDC

[29] Source: https://www.climatechangenews.com/2020/05/18/spain-unveils-climate-law-cut-emissions-net-zero-2050/

[30] Source: EU Parliament: Climate Action in Spain

[31] Japan's response to the Issues of Climate Change: An Innovative Transition Towards a Zero-Carbon and Resilient Society

[32] Body of European Regulators for Electronic Communications

[33] Source: Sustainability should be 'underlying principle' of digital policy: German minister

[34] Source: Digitalization will unleash America's climate competitiveness

FarrPoint

Get in touch

farrpoint.com

contact@farrpoint.com

NOVA SCOTIA, CANADA

1300-1969
Upper Water Street, Halifax
Nova Scotia, Canada
NS B3J 3R

+19025001414

EDINBURGH

Exchange Place 2
5 Semple Street
Edinburgh
EH3 8BL

+44 (0)131 202 6018

LONDON

1st Floor
99 Bishopgate
London
EC2M 3XD

+44 (0)203 693 7310

MANCHESTER

3 Hardman Square
Spinningfields
Manchester
M3 3EB

+44 (0)161 669 5821

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This paper produced for TELUS by ***FarrPoint*** is a step towards opening the debate in Canada on the role digital should play in national and regional climate plans and to argue for changes in, and the speed of, the deployment of infrastructure to further enable efficiencies across the many economic and environmentally assessed sectors nationally and globally.