Topic: Economy

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Summary: Taking into account Canada's commitment to maintain a sustainable and profitable economic sector for the foreseeable future, along with the imposing limits of Canada's existing transportation systems, this proposal introduces a new system possibility to take Canada into the future; a TransCanada Hyperloop - which would allow for fast, efficient environmentally respectful transportation and lead to ease of movement of family members, students, professionals, labourers and service providers, as well as fresh and high demand goods across the country.
1. INTRODUCTION & BACKGROUND

Canada would not have the economic, social or political profile it does today without its infrastructure. These physical and organizational structures or facilities serve as a framework for the country’s basic operation while also promoting exchange of information, service and product. Though one of the largest and most vast nations in the world, Canada’s population density is one of the lowest. As a result, transportation of goods and movement of people between regions is a limiting factor to Canada’s economic growth and future.

In the 19th and early 20th centuries, infrastructure projects focusing on transportation such as the Canadian National Railway, the Trans-Canada Airway, the St. Lawrence Seaway, and the Trans-Canada Trail were major investments made by the Canadian government and private sectors to ensure short term economic survival and long-term sustainability. Now, the demand for a faster and cheaper mode of transportation is needed to help drive the Canadian economy into the future. The current transportation networks have become too expensive, begun to produce unacceptable levels of carbon emissions or have reached their capacity. If policy makers do not address this concern, Canada’s economic growth will be stifled as the ability for people, goods and services to move across the country efficiently is increasingly limited.
Canada of the future requires a new transportation system that will provide people with the flexibility to work in higher density, industry focused areas while living wherever they want or can. The needed system would mitigate some of the impact of the resulting urban sprawl by reducing the use of high carbon footprint modes of transportation. Furthermore, today’s commonly long commute times must be reduced in order to cut down wasted commuting times and improving overall economic efficiency. This need for labour efficiency to grow our economy is also ever increasing given the ongoing reduction in Canada’s birth rates. While immigration fills part of this gap by increasing the pool of trained and trainable workers, labour efficiency maximized by a sustainable and reliable transportation system can fill a great deal of the gap as well.

Taking into account Canada’s commitment to maintain a sustainable and profitable economic sector for the foreseeable future, along with the imposing limits of Canada’s existing transportation systems, a new system must be introduced. The right system would allow for fast, efficient environmentally friendly transportation and lead to ease of movement of family members, students, professionals, labourers and service providers; as well as fresh and high demand goods across our country; therefore, the right system to take Canada into the future is a Hyperloop system.
2. THE PROBLEM

The four main modes of transportation currently used to move people and goods through Canada are rail, air, water and roadway. Our railway, airway, seaway, highway and trail systems link Canadians to one another, both economically and culturally. They enable shipments of goods, travel for business and personal needs and connect Canadians to one another. However, railway trains cannot get faster using the existing infrastructure. Railways were built to enable travel of a certain speed and based on the existing geometry of the tracks, they already travel at their maximum speeds;\(^5\) Commercial aircrafts are limited to existing speeds due to aerodynamics;\(^6\) and Canada cannot make the space needed to build addition roadways into cities.\(^7\)

These limitations are problematic due to Canada’s growing population by way of immigration and Canada’s growing economic activity. Looking to the future, the Government of Canada has introduced a multi-year immigration levels plan that will grow the number of permanent residents welcomed yearly.\(^8\) Research leading up to this plan, shows that immigration spurs innovation and economic growth (while also supporting diverse and inclusive communities). Immigrants account for approximately 50% of all science, technology, engineering and math degree-holders in Canada. They also have a higher rate of entrepreneurship than their Canadian-born counterparts.\(^9\) The goal of this plan is to attract workers to support an
innovative economy, while also reuniting families (which reinforces Canada’s
desired reputation as a global leader in refugee protection). Increasing the labour
pool benefits Canada beyond simple job creation; it also attracts investment and
trade ties to Canada. All of this will help generate innovation.

With this influx of people, the government must consider (and plan for) settlement
and integration. Accommodation will need to be made regarding education,
healthcare and housing. The workforces best suited to these newcomers may not
match up with financial constraints or family priorities. Housing in high density
major cities is very expensive and prohibitive to newcomers on a budget while more
distant cities are much more cost effective. It will be imperative that where people
can live and where they must work be connected in a manageable way. Today, a
person’s residence and workplace are largely defined by transportation options.
They are confined by the limitations of the available transport systems; financial and
time expense are major considerations. If one’s family is, for example, in Thunder
Bay but the job market is in Toronto, one has decisions to make. The distance is too
far to travel daily and the expense of keeping two domiciles and/or flying back and
forth is limiting. Other considerations are schooling or skill training necessary for
employability or healthcare required for pre-existing or developing conditions.
Transportation systems connect family members to one another, employees to
employers, and supply of goods and services with demand.
As already explained, Canada’s current transportation systems are limited and therefore, limiting. For Canada to grow and innovate, so must the transportation systems that so vitally connect all the stakeholders. Plans must be made to move beyond these limitations, accounting for and accommodating Canada’s vision for sustainability.
3. HISTORICAL CONTEXT

A review of Canada's infrastructural investments shows that moving people, goods and services from market to market safely and expediently has been a major economic focus for the public, private and government sectors since the origins of the country. Though the scope and parameters have been different, the main objective of sustaining and growing Canada’s economic successes has been the same. Considerations for Canada's infrastructural needs have focused on the stakeholders; business, citizens and the politicians. Also consistent is Canada’s commitment to plan for the future by making changes that incorporate evolving options and demands rather than only reinvest in maintaining or re-envisioning pre-existing systems.

One of the earliest such examples of Canada’s infrastructure investments is the creation of the Canadian National Railway.\(^{1011}\) This project undertaken in 1918, ensured transport connections between cities across the country. In general, rail transport is dependable (least affected by weather compared to other methods of transportation), organized (with fixed routes and schedules), suitable for bulky and heavy goods (including livestock), and is considered a cheap form of transport (most of the related costs are fixed). The railways also provide employment opportunities for both skilled and unskilled labourers. The CN Railway came to be because people were no longer content with private corporation ownership of rail
transport. Privately owned railways were crumbling under the burden of their debt; Canada seized the opportunity to form a crown corporation and buy these privately-owned railways, keeping all of Canada united. Allowing the failure of these small railway companies to occur would have meant that continuity of the railway would be broken, meaning that the idea of a single, efficient method to move goods across the country would not have existed. To this day, railways are still a primary link for distant and remote communities across our country. Having said that, the railway system is not perfect. Maintaining the railway system requires a huge capital outlay; the costs of construction, maintenance and overhead expenses are very high compared to other modes of transport. Whether rail traffic is up or down, those costs do not change. For ideal economic operation, the railway must be used to its capacity; under-utilization (which is currently the case in most regions) leads to a loss to the economy. Schedules and routes cannot really be customized to suit individual customers or markets and because it is tied to a track system, it relies on secondary modes of transportation to get the people and goods to their actual destinations. Intermediate loading or unloading involves more cost, more wear and tear and wastes time. Transport of dangerous goods has led to extended costs. There have been several railway accidents, most recently the disaster at Lac Magentic\textsuperscript{12} where an unsecured train of Bakken region oil tankers slid down a hill, derailed and exploded killing 47 people and destroying 30 downtown buildings remind us how dangerous this method of transporting goods can be. When
constructing a new method of transportation, our innovation must extend not only to the safety of the people using the system, but also to the safety of those nearby.

Building on their success with the Canadian National Railway, the government of Canada had the foresight to recognize that air transportation was going to revolutionize the world. Not wanting to be left behind in 1932, the government set out to create the TransCanada Airway. This was another massive infrastructure project that not only involved forming an airline, but also building the airports and infrastructure that would support that airline. Canada recognized that it must control its own destiny in transportation to remain a global economic leader. Unlike rail transport, air transport is not affected by topographic barriers such as mountains, rivers or valleys. It is faster than rail travel making it more expedient in general, and specifically making it more ideal for transport of perishable goods. An airway is also strategically beneficial, as it can be used for internal and external security. With unemployment running at all time highs as a result of the Great Depression, the Canadian government committed to the construction of airports, runways, control towers and all of the other critical components of civil aviation that we still rely on today. This network has been maintained and expanded and today, both people and goods are transported across Canada (as well as in and out of Canada) using it. Without this aviation network we would be unable to support small and distant communities throughout our country. There are many remote
communities that are inaccessible by road or rail. Air transport allows these communities access to necessary goods (like groceries) and services (like doctors) that they would otherwise be cut off from. All of this said, creating state of the art, globally competitive aviation facilities require huge administrative and financial investment. The cost of airplanes, construction and maintenance of airports and of necessary control mechanism needs major capital expenditure, much of which is unloaded onto those travelling. Canada is now running out of space to expand airports. With more and more people and goods utilizing this mode of transportation, more and more infrastructure was required in order to keep it efficient.

As Canada’s economy continued to grow beyond the Great Depression years, it became necessary for Canada to open itself up to International markets. With all of the raw materials accessible in Canada and so much demand around the world, there was great difficulty in efficiently bringing our resources to market. In 1954 construction of the St. Lawrence Seaway began. The purpose of this Seaway was to connect the Atlantic Ocean (and Atlantic shipping routes) to the heart of Canada’s manufacturing and mining. Today the Seaway is an economic success with 30-40 Billion tons of materials travelling along the Seaway each year. During the initial phases of the project it became clear that forming a bi-lateral agreement between Canada and the US was very difficult. As a result, a project which was
originally intended for the 1930s was delayed over 20 years until terms could be worked out between the two countries.

The construction of the Trans Canada Trail began in 1982 with the hope and expectation that it would be ready by 1992 to celebrate Canada’s 125th anniversary. Instead, construction of the project is still ongoing today. There are now almost 500 individual trails that make up the Trans Canada Trail, making it one of the world’s biggest networks of trail. Once fully connected, the Trans Canada Trail will be almost 24,000 kilometres from the Atlantic to the Pacific to the Arctic Ocean and will run through every province and every territory. The trail was designed to be an environmental feature that would allow anyone who wanted to cross Canada without the use of a motor vehicle to do so without using public roads. Those behind its creation intended for it to be aspirational; “They wanted to encourage physical activity, showcase our history, preserve Canada’s cultural and natural heritages, promote tourism and stimulate regional economies.” While the goals of this project were more politically than economically motivated, its success has been held back by the fact that it was not critical infrastructure. Over the years, all levels of government have shown their commitment to the project, providing funding and also passing legislation whenever needed. Ultimately, the trail has remained primarily a community based project. Its purpose, however, remains recreational; Ways to maximize it for economic gain have not been realized.
4. CURRENT POLICIES

The current Federal government has a $186 billion infrastructure plan which aims “to build the cities of the 21st century and provide communities across the country the tools to prosper and innovate.”\(^\text{17}\) The government has identified five infrastructure priorities: public transit infrastructure, green infrastructure, social infrastructure, trade and transportation infrastructure and finally, rural and northern communities’ infrastructure.\(^\text{18}\)

In order to maintain these 5 sectors of infrastructure, the government has created Canada’s Infrastructure Bank (CIB) to manage the infrastructure debt.\(^\text{19}\) Though a Crown corporation and accountable to the government (through the Minister of Infrastructure and Communities), the CIB is governed by an independent Board of Governors who set the policy direction and investment priorities. This infrastructure debt is defined as the amount of money necessary to maintain and improve all of Canada’s infrastructure to the level necessary to keep our economy running and growing. The CIB will oversee investments into new provincial, municipal, territorial projects which they identify as contributors to Canada’s long-term economic growth with a focus on the creation of jobs. It is the aim of the Bank to match Federal dollars with private sector and institutional dollars to build “new revenue generating infrastructure projects that are in the public interest.”\(^\text{20}\) Janice Fukakusa, the CIB’s Chairwoman of the Board explained that “governments cannot build and plan all the
infrastructure we need using public-sector balance sheets alone, it’s just not sustainable… Working closely with the private sector in all facets of (infrastructure) project planning, development and execution can bring efficiencies and more innovation into public infrastructure.” The specifics of this relationship (e.g. decision-making protocols, interest payment levels and rates of return) are vague and undefined leading to much skepticism regarding what possible changes the CIB could affect moving forward with respect to reducing infrastructure debt and growing infrastructure projects that will lead Canada into the future.

The current policy commitment to specifically transportation infrastructure focuses on patching aging systems. The Liberal government’s “Invest in Canada” plan ensures that transportation infrastructure systems will be maintained and accessible to serve Canadians’ transport needs. The Honourable Marc Garneau, Federal Minister of Transport, reiterates this in his Minister’s Message introducing the Transport in Canada 2016 Comprehensive Report; “The Government of Canada… aims to create a safe, secure, green and integrated transportation system that supports trade and economic growth, a cleaner environment and the wellbeing of all Canadians.” The plan does not focus on growth or innovation for the future, but instead focuses resources on efficiency, sustainability and safety.
The scope of current policy is flawed. It may help alleviate the economic limitations of Canada’s current transportation networks but will not solve the problem of lost productivity resulting from underdeveloped infrastructure for the long term. Patching a limited system does not meet Canada’s needs from an economy-supporting transportation system moving into the future when supply and demand will increase and change. The Federal Conservative Party would prefer to see even less money invested than the Liberals are currently planning to spend. Those who are determined to spend less, invest less and risk less are those who also would have argued against the establishment of the railway, airway, seaway and trail that have brought Canada’s economy to where it is today. The question remains, will those who are determined to spend less also be those who keep Canada from reaching its aspirations for growth and economic leadership in the future.
5. ALTERNATIVE SOLUTIONS

Canada is not the only country facing challenges looking to the future. Governments around the globe are exploring different ways to not only remain sustainable but to prosper in the face of population growth from immigration, increasing commute times and lost productivity. There appear to be three main ways that are actualizing or in the least, are being seriously discussed; expansion or modification of current infrastructure, curbing of immigration and economy, and the introduction of High Speed Rail.

Current practice in the United States of America is similar to Canada’s current approach of maintaining and only mildly improving already existing infrastructure. This is argued to be the cheapest short-term solution and is only used because it is low cost and efficient. Repaving and maintaining existing roadways does not require expropriation of land or new environmental approvals. However, there are those who do not believe that this is any kind of solution at all, but rather just a Band-Aid over never healing (perhaps only worsening) issues. Those in favour of a more impactful approach argue that continuing to maintain old roads and infrastructure is wasteful when newer technologies that are expected to require less maintenance and have lower operating costs can be developed.
Another solution is to purposefully curb immigration and economic growth. This immigration practice is currently under discussion in the U.S. and in some countries across Europe. Austria, for example, has just established a government with a specific mandate to curb immigration. The main support behind this move stems from a fear of illegal immigrants from the Middle East coming through Austria and the related growing number of asylum claims being made. Theoretically, curbing immigration could reduce the need for expansion of infrastructure, at least in the short term; however, the long-term economic affect is unpredictable.

Investment in High Speed Rail solutions actively grows infrastructure options rather than simply maintain what already exists. This future-forward approach is in place throughout Asia and Europe in multiple forms, but not yet in any form in North America. This is a different approach to dealing with growing and changing supply and demand and decline in workforce numbers. Rather than just utilizing what infrastructure already existed and accepting its limitations, these countries looked past short-term survival and invested in systems that could move them beyond simple sustainability. High Speed Rail is defined as a rail system where trains can reach a minimum speed of 200 km/h. While primarily designed for passenger service, some rail lines support freight as well. These rail systems primarily use conventional rails and allow for high speeds by limiting the radiiuses of curves, thus allowing the trains to travel faster. Those who invested in these systems from their
inception did so because there was a need to far more rapidly move people across long distances. The benefits can be seen through the demand on these systems. Without them, countries like China would be unable to meet the ever-increasing demands for their goods. The main drawback to high speed rail lines is that retrofitting the track into existing cities is very difficult because of the need to limit the radius of curves or bends. For the train to be able to go around the curves and bends at high speed, the track must maintain a certain maximum curve radius that is unrealistic or at least, not ideal in high density areas.

It is for this reason, that the only way for Canada to ensure future economic growth, sustainable green transportation and increased productivity - as per the current government’s identified long-term goals - is to invest in a High Speed Rail system of its own. While a regular High Speed Rail system might be viable in some areas, to resolve the limited space in the high-density cities, tunneling and a Hyperloop system is a better solution. Such a system would serve both economic realities and aspirational goals such as being powered only by green energy, while integrating lessons learned from the planning, execution, and maintenance of the already established infrastructure investments such as CP Rail, TransCanada Airway, Saint Lawrence Seaway and TransCanada Trail.
6. THE POLICY RECOMMENDATION

Canada's Economic future depends on many factors; population growth, free and efficient trade and improving infrastructure.\textsuperscript{33} Today's decision makers arguably attempt to balance those factors with identified national goals and priorities such as infrastructure development and repair in the context of balancing budgets and not overburdening taxpayers. To be justifiable, infrastructure investments must take into account and balance (as much as possible) these challenges of today with these goals of tomorrow. Investment in a fifth mode of transportation, specifically a Hyperloop system, that would span Canada from coast to coast must, therefore, be considered.

As identified earlier, the limits of the four traditional modes of transportation stem from the fact that they are already limited geographically. Adding lanes to highways, width to waterway, capacity to airways and tracks to railways all have prohibitive costs and are limited in their ability to relieve the existing bottlenecks. Hyperloop systems were first publicly introduced by visionary Elon Musk in 2012.\textsuperscript{34} The proposal jointly developed by Tesla and SpaceX was a theoretical proposition of a vacuum tube passenger or freight train between Los Angeles and the San Francisco Bay Area. The main benefits of this new mode of transportation is that it provides a greener version of transportation that moves faster than flight and is powered by green energy with a minimal carbon footprint.\textsuperscript{35} There are also disadvantages
specific to the concept (rather than the specific form). At this point in the development there are several technical hurdles that have not been resolved. Specifically, how to accelerate the train from 0-100km/h before it can move to its magnetic levitation phase of transport; how to draw and maintain the vacuum in an efficient manner; how to load people and/or goods for shipment; as well as how to collect the people and goods in advance of shipment. Since the introduction of this idea of a fifth form of transportation, countries around the world have considered the concept in different forms varying in pod design, method of acceleration and deceleration, and safety systems. Proponents of these projects assert that they will accomplish on their own, what the other four pre-existing modes of transportation cannot. The use of tunnels eliminates the need for additional land, the speed bridges the gap between aircraft and trains, and the system is powered by solar cells collecting energy along the network. Building this type of system will improve infrastructure, enable trade and allow for population growth without the potential of further productivity losses from inefficient transportation.

Hyperloop One and Transpod are two companies that have already brought the technology beyond the stage of conceptualization and are both building prototypes for testing. Proposals for short distance lines have been explored with public and private sector support. In Canada these include Calgary to Edmonton and Toronto -
Ottawa – Montreal. Many Canadian universities have established teams of policy and technology visionaries who have entered proposals in Hyperloop contests. The goal of these contests is to be able to test and demonstrate progress in Hyperloop development as well as form the foundation for innovation and idea sharing.

The economic benefits to the short lines are that they can link other forms of transportation. In response to this specific policy proposal, Paul Johnson, the Director of Hamilton’s Light Rail Trail initiative, commented that connecting cities with already efficient transit is a sensible strategy because it would be impractical to transport people to communities where they would end up stranded without local options. Mr. Johnson also added that congestion in the Toronto-Hamilton area is projected to cost the economy around $6 Billion annually by 2031, so increasing transportation options would be beneficial. Thierry Boitier of Transpod Canada, also responding to this specific policy proposal, contributes that by building the transnational network up from local networks (i.e. Windsor-Toronto-Montreal, Saskatoon-Regina-Winnipeg and Vancouver-Calgary-Edmonton) it also becomes possible to manage the project more economically. Each local network can then be interconnected in the future to expand the Hyperloop system across Canada.

There is also an additional benefit from creating these networks pointed out by Mr. Boitier; These new networks can serve as new utility corridors for hydro & fibre-optic networks across Canada.
The benefits of linking the short lines and creating a transnational line are both, economic and social. The main benefit is cost reductions. Changing modes of transportation enroute is more expensive than staying on one mode for the entire trip. Consider a truck travelling across Canada. The cost of getting onto a Hyperloop in Montreal to get off at Windsor and then drive to the next Hyperloop station to go through the process of getting into a pod again would be prohibitive. By linking those networks so that the truck only gets onto and off of the line once, costs can be reduced.

Furthermore, by considering the costs of the short lines, it is possible to guesstimate overall costs for a transnational line. It is estimated that the Helsinki to Stockholm line will cost 19 billion euros. From Los Angeles to the Bay Area, it is estimated that is will cost $11.5 million US per mile for a total of $6 billion. Based on these estimations, the Halifax to Vancouver line – which runs a total of 3,834.5 miles – will cost approximately $44 billion US. Elon Musk estimates that based on a per ride cost of $20, the Los Angeles to San Francisco line will be paid off in twenty years. With further research to establish ridership of the TransCanada line, a comparable cost analysis would be possible.
Graeme Klin, a Canadian Hyperloop visionary and Team Leader of Ryerson’s Hyperloop International Hyperloop Team, believes that socially the opportunity to link Canadians to each other in short times helps build community - not just locally, but across Canada. As people visit other regions and become connected with them, they will be more concerned about those regions in difficult times, and more supportive of further development in good times. Those social connections grow best from experiences people have in those regions, and removing the barriers to transportation will ultimately lead to those experiences.

There are also disadvantages to a transnational line. The most obvious being the cost of construction. This is why it is recommended that the lines be constructed regionally first. During regional construction there will be a steep learning curve. Lessons learned can then be used to mitigate the costs of building the system over long construction distances linking the regional systems. Additionally, the system must be air tight as it operates in a vacuum. Maintaining this vacuum could be very expensive, and it is unclear what would happen to the system in the event of a vacuum failure. Lastly, the idea of packetizing travel is novel, however it comes with the need for very sophisticated management systems. Instead of following a limited number of trains on a line, hundreds or even thousands of pods could be travelling at any given moment. A problem on one pod could disable the entire system.
Canada needs to invest in, and develop a system will enable economic growth by overcoming transportation bottlenecks; a system that will bring Canadians closer together by bridging the vast distances across our country and ultimately enable Canada’s economic and cultural growth. Based on the research, the right system to accomplish these goals is the TransCanada Hyperloop System.
7. TERTIARY BENEFITS

Beyond the economic benefits to investing in Canada’s infrastructure by creating a Trans Canada Hyperloop system, there are direct advantages to related areas of priority such as immigration, environment, and reserve/rural/fringe communities.

As already established, immigration is directly related to economic success\(^5\). People move to Canada for many reasons and the existence of this Hyperloop system will serve as another attraction. The project will attract professionals and labourers who can and want to contribute to the construction, maintenance and growth of the project. These will be people with a vision for the future. Whether skilled or unskilled, trained or trainable, labourers and professionals will be an necessity to making this system run safely and effectively. The additional benefits these types of people bring to the country will not be immediately obvious, but the types of innovators who would work on a project like this would not stop innovating once it was done. Other areas of industry will also benefit from the Hyperloop. As an example, the mining industry may be able to use the system for faster transportation of raw materials to refineries.

In order to establish sustainability, any new infrastructure project will need to be environmentally respectful\(^5\). Not only is Hyperloop technology run off of renewable energy, but it is also designed with a zero-carbon footprint. In order to build the
system, already established areas or naturally mature areas do not require upset. Because of the way the system runs, it can be built alongside already existing infrastructure or underground. It is true that some environment distress may be required in order to build the system, however, the distress will be short term and with proper planning, a minimum amount of damage (with pre-established plans for remedying that damage) can occur. Additionally, the Hyperloop will help reduce GHG emissions generated by airplanes, cargo trucks and diesel trains because they will be used more infrequently. The new system is about faster transport, but also greener transport. As the systems use increases and it ultimately replaces traditional modes of transportation, less people will need medical treatment for ailments such as asthma, emphysema, and potentially lung cancer. Furthermore, the reduction in fossil fuel based transportation will lead to a reduction in the human production of Carbon Dioxide. This may, in turn, lead to a reduction in the effects of climate change.

Linking rural and fringe communities to the urban core is also one of the greatest benefits of the transnational Hyperloop. People choose to live outside of big cities for various reasons whether it be cultural connection (e.g. on Reserve), history (e.g. their family has lived in that location for generations), or finances (e.g. affordability). Urban planning can become regional planning because Hyperloop would reduce travel time so substantially. People can begin to live where they want,
but work or seek service and product elsewhere. This will lead to more diversified
development and raise property value in the fringe communities which are close
enough to access a Hyperloop station (via a car, shuttle or city transport system
shuttle). If roads to the Arctic North ever materialize,\textsuperscript{55} accessibility to and from the
most remote areas of Canada’s North will also open up. This will allow people to
stay with their families or remain on reserve or in more remote locales while
pursuing education, employment and health care in previously hard to reach
destinations. Many First Nations are committed to the cultural and historical
connections that life on their reserve provides. Hyperloop will allow them to
maintain those connections while also giving them the ability to access the
amenities of big cities when desired or needed. Conversely, people who live off
reserve or in urban centres would now have quick and easy access to on reserve
culture or amenities and products offered only in fringe (and perhaps someday,
 extremely remote) communities.

\begin{quote}
A TransCanada Hyperloop system is capable of transporting personnel over large
distances. Such a transport system would provide a much-needed form of quick
transportation for the northwest passage policy. Infrastructure in the northern territories are
vastly undeveloped, roads for example in the north make up about 1\% of all Canadian roads.
Quick transportation for military personnel and equipment would contribute a huge effort for
resupplying the military in the northwest passage.
\end{quote}
The policies proposed in this paper, detailing the implementation of a hyperloop system in Canada, will also benefit the nation's medical research innovation. Improvements in infrastructure will contribute, not only economic growth, but promote discoveries in other fields of science. The innovative and technologically advanced nature of a hyperloop will establish Canada as a center for new technologies and attract research talent to the country. This would contribute to medical technology development and would influence greater funding for the sciences in Canada. Furthermore, the low-emission nature of the hyperloop, and its potential to replace fossil fuel powered vehicles would improve environmental factors such as air quality. Improvements of this type would benefit public health and reduce prevalence of diseases such as lung cancer.

Neil Lin

We are Kacie and Rachel, and the topic of our policy report is environmental conservation, emission control, and renewable energy Canada. We have reviewed the policy idea to implement a hyperloop in Canada, and believe that this would be very beneficial to Canadian emission rates. The creation of a hyperloop would lower the number of cars on the road. This in turn lowers emissions, which is one of our main policy proposals (as we are planning on banning diesel engine car production and consumption). This plan would aid in this transition. Additionally, the faster transportation would cause less traffic on the streets. The faster an emission producing car can get to their destination, the less carbon dioxide would be released into the atmosphere, which contributes to preventing temperature increase in Canada.

Kacie Phillipo and Rachel Reid
8. SUMMATION AND CONCLUSION

Looking back through Canada’s history, economic success was dependent on the transportation networks provided by the railway, seaway, airway and road/trailways. To sustain the economic standing accomplished over the past 150 years, Canada will depend on the connectivity of people, goods and services; A level of connectivity that cannot be accomplished with the current infrastructure due to limitations such as the environmental impact, the limited space to expand existing transportation networks and the cost of expanding those networks, considering the diminishing returns from those investments.

With existing options unable to serve the nation’s needs, the government must invest in a new approach. Clive Chan, Technical Director for University of Waterloo’s Hyperloop design competition team, “Waterloop,” compares the connectivity potential of Hyperloop to that achieved by the Internet: “If you think more broadly, you can imagine the possibilities it creates in terms of connecting people. The internet allowed instant information movement, and Hyperloop is now creating almost instant physical movement over long distance.” Drawing on this comparison, it is possible to see how a transnational Hyperloop system will provide Canada with the level of connectivity required for the economy to prosper through (and beyond) the 21st Century. Drawing on the evidence, it is possible to see how such an investment is not a choice but a necessity and that it is Hyperloop technology that fills that necessity.
BIBLIOGRAPHY


Boitier, Thierry. ‘Re:Feedback Appreciated,’ Personal Email. December 20, 2017


Chan, Clive. ‘Re:A Follow Up Question,’ Personal Email. December 1, 2017


http://www.telegraph.co.uk/news/2017/12/10/eu-leaders-want-offer-theresa-may-deal-control-immigration-stop/.


Klim, Graeme. Personal Interview with Zane Ogus via Skype. November 30, 2017


Nikolaev, Ruslan. ‘Re:Feedback appreciated,’ Personal Email, November 27, 2017.


“Satellite Cities Are Everywhere, And They Might Save Our Urban Future.”


3. Ibid.


6. Ibid.

7. Ibid.


18. Ibid.

19. Ibid.

20. Ibid.


24. Ibid.


36. Ibid.

37. Ibid.


41. Ibid.
42. For more information about the Hyperloop One contest see - https://hyperloop-one.com/global-challenge -- And for examples of the participating Canadian teams see - https://teamwaterloop.ca/, http://www.ryersonhyperloop.ca/, https://paradigmhyperloop.com/ (McMaster University had a team but do not have a related website)
45. Ibid.


