What Could An Environmental Assessment For A Hyperloop Look Like?

James Jarrett, WSP[1]

Introduction

Companies across the world are investing in the research and development of hyperloop technologies. This paper specifically addresses a hyperloop within the framework of Canada's future transportation system. In this context, information relating to the endeavours of Virgin Hyperloop One and TransPod is perhaps most relevant, as these two companies outwardly appear to have prioritized a Canadian route. Given the nascent status of this industry, the body of literature is relatively small. This paper approaches a hyperloop from a regulatory perspective, with respect to potential Environmental Assessment (EA) requirements. It assumes that a hyperloop will be demonstrated to be technically feasible, and that the political and social will exist to create favourable conditions for its implementation in Canada. These are assumptions that will need to be proven or otherwise, but which exceed the scope of this paper.

Selecting a Canadian hyperloop route

In September 2017, the *Hyperloop One Global Challenge* announced ten finalists, including HyperCan's proposed route from Toronto to Montreal via Ottawa. This route would have a total journey time of 39 minutes connecting urban areas comprising 25% of Canada's population (Virgin Hyperloop One, 2017). This followed the July 2017 release of an initial order of magnitude analysis by TransPod which provides preliminary capital costs for a hyperloop between Toronto and Windsor (TransPod, 2017). Based upon a review of TransPod's proposed routes, the Toronto to Windsor segment would form part of a longer corridor connecting Chicago to Washington D.C. via Toronto, Ottawa, Montreal and other major east coast cities (TransPod, n.d.). A future Canadian hyperloop therefore appears to include a Toronto-Montreal axis, which forms an assumption of this paper.

Hyperloop as an infrastructure type

A hyperloop has been described as "a new mode of transportation that moves freight and people quickly…from origin to destination" (Virgin Hyperloop One, n.d.). This is supported by TransPod's assertion that a hyperloop system would include "passenger and cargo vehicles" (Janzen, 2017). Transporting people and goods by vehicle between an origin and destination applies to most traditional transportation systems and so a hyperloop may clearly be identified as a mode of transportation. While making this distinction may seem banal, it is important to confirm so other infrastructure types which fall under different legislative frameworks may be ruled out. For example, based on the visualizations presented by Virgin Hyperloop One and TransPod, one may consider a hyperloop to somewhat resemble a pipeline; infrastructure with different regulatory requirements to a transportation system. The specific function of a hyperloop to include freight suggests that it cannot be placed into the subset of a transit system, which would typically imply the sole movement of passengers. While high-speed rail (HSR) may seem a comparable mode given the shared purpose to provide a fast mode of transportation over longer distances, both Virgin Hyperloop One and TransPod explicitly seek to distinguish a hyperloop from HSR, primarily on the basis of relative speed, convenience, environmental impact, and cost. A hyperloop is perceived to be "two to three times faster", "on demand and direct" and "environmentally friendly"

[1] Presented at the 53rd Annual Meetings of the *Canadian Transportation Research Forum*, June 3-6, 2018 at Gatineau, Quebec

(Virgin Hyperloop One, n.d.), while also being "50 per cent less than the projected cost of HSR" in the context of implementation on the Toronto to Windsor corridor (TransPod, 2017). Hyperloop may therefore be considered a unique mode of transportation and this forms an assumption of this paper.

From environmental assessment to impact assessment

The environment in which this discussion takes place is fluid – not only in relation to an emerging technology, but also the regulatory framework within which a hyperloop would be situated. Even since submitting the abstract for this paper, the federal government has sought to enact a new *Impact Assessment Act* in Bill C-69 which would change existing federal EA legislation (Parliament of Canada, 2018) and is discussed in further detail herein. Furthermore, the Mid-Ohio Regional Planning Commission (MORPC) recently released a Request for Proposals (RFP) for an Environmental Impact Statement (EIS) for a portion of the Chicago-Columbus-Pittsburgh corridor to study both hyperloop and HSR technologies (MORPC, 2018). This is the first time multiple transportation technologies including a hyperloop have been studied in the same EIS. By the time Canada advances to this phase of analysis, it is likely that applicable legislation will have changed and there may also be evidence for how a hyperloop has been assessed in other jurisdictions for guidance.

In Ontario, the Class EA process was established to address "routine projects that have predictable and manageable environmental effects" (Ontario Ministry of the Environment and Climate Change (MOECC), n.d.). However, a hyperloop has never been implemented and so it is not possible to determine from the outset that its potential environmental effects would be predictable and manageable, rendering the Class EA process inappropriate. The Transit Project Assessment Process (TPAP) may also be ruled out as this "only applies to dedicated facilities or services that are used exclusively for transit" (Ontario MOECC, 2014), which does not align with the premise that a hyperloop would provide for freight. The Individual EA process is also available at the provincial level in Ontario and is reserved for "large-scale, complex projects with the potential for significant environmental effects" (Ontario MOECC, n.d.). At a high level, a hyperloop satisfies these key criteria. It is also the preferred approach of the Ontario Ministry of Transportation (MTO) for advancing the initial planning phase of HSR for the segment between Kitchener-Waterloo and London. However, the proposed hyperloop route will not be exclusively located in Ontario if Montreal is to be a terminus. This places into question the validity of only following a provincial EA process in isolation, which would also include the requirements of Quebec's *Environment Quality Act* and *Regulation respecting environmental impact assessment review*.

The federal EA process mandated in the *Canadian Environmental Assessment Act* (CEAA 2012) would seem to be a viable approach for a hyperloop. It provides for the evaluation of major projects and would allow for cross-provincial interests to be coordinated. Under CEAA 2012, the *Regulations Designating Physical Activities* (also known as the "Project List") prescribe the types of projects that may require a federal EA. As expected, the Project List does not currently identify a hyperloop. However, the Minister of the Environment and Climate Change (the Minister) has the option to designate the project if it is considered that it may cause adverse environmental effects or public concerns related to those effects. In the case of a hyperloop, this would seem to be a reasonable initial determination. CEAA 2012 also allows for a joint review panel agreement to be established to coordinate the requirements of the federal and provincial EA processes under a single process. This approach could be followed for a hyperloop. Practical examples of EA studies involving multiple provinces are relatively infrequent but have occurred with respect to proposed pipeline projects such as the Northern Gateway pipeline which was to span British Columbia and Alberta (Government of Canada, n.d.) but was ultimately dismissed.

The opportunity exists through Bill C-69 to consider how the federal process may adapt to better address emerging technologies such as a hyperloop. While Bill C-69 does not specifically address how the Project List will change, the process for revising the Project List will move to a criteria-based approach, which

first establishes whether the project affects areas of federal jurisdiction related to the environment, and then characterizes the nature of this based on factors including magnitude, geographic extent, timing, frequency, duration, and reversibility (Government of Canada, n.d.). It is feasible to assume that a hyperloop could be added to the Project List. This would be a very progressive step, requiring an explicit confirmation at the federal level that a hyperloop forms a key part of Canada's future transportation system. It is unclear at this point whether this is the case, so a more likely interim scenario may be for the Minister to continue to exercise the option to designate projects which are not on the Project List. Bill C-69 also continues to provide for cooperation between jurisdictions and the joint establishment of a review panel under a "One project, one assessment" approach (Government of Canada, 2018). It is reasonable to assume that a hyperloop could proceed under such an agreement as it might today under CEAA 2012.

Under the proposed *Impact Assessment Act* (a clear move away from "environmental" assessment), there will be an emphasis on early planning and engagement through the introduction of a mandatory initial phase to consult with Indigenous communities, agencies, the public and other stakeholders. Through this phase, initial concerns over a hyperloop would be discussed, with the purpose of better addressing these in the project design. A lack of transparency in how feedback is incorporated into a project is one of the primary concerns raised with CEAA 2012, and will be particularly important with respect to new technology such as a hyperloop. There will also be greater focus on making decisions based on scientific evidence, including federal and independent reviews. In the context of a hyperloop, this seems particularly important as the potential impacts of a hyperloop are currently speculative. Bill C-69 also proposes to apply reduced timelines to complete certain activities. The early planning phase will be a maximum of 180 days, while the impact assessment phase led by the newly created *Impact Assessment Agency of Canada* will be reduced from 720 to 600 days assuming a review panel is required. The decision-making process would also be limited to 90 days where a Cabinet determination is required (Government of Canada, 2018). Crucially however, the impact statement prepared by the proponent would not have a maximum timeframe. These changes will therefore allow the proponent sufficient time to complete their impact assessment (which could take years), but at the same time help to facilitate the timely implementation of a hyperloop through a more predictable review schedule. The new impact assessment process will also broaden the scope to support both negative and positive impacts. The majority of EA studies today tend to focus primarily on the negative. An evaluation of a hyperloop will be encouraged to promote the positive, which is an advantage in helping to demonstrate the perceived benefits relating to economic, social and environmental factors.

Scoping an impact assessment

Any impact assessment process for infrastructure over 600 km long will require extensive environmental fieldwork and analysis. Appropriately scoping these studies would be a major component of the impact assessment itself. Broadly, from a natural environment perspective, the proposed Toronto-Montreal corridor would cross numerous terrestrial and aquatic ecosystems, likely including significant features such as Species at Risk (SAR) habitat, woodlands, wetlands and valleylands. The scale of these impacts and the required mitigation will need to be understood. The corridor would also traverse a diverse range of urban and rural landscapes, each with their own unique social, cultural and economic characteristics. In this regard, both the negative and positive impacts should be clearly identified and articulated as they relate to issues of land use, heritage, noise and vibration, visual and property impacts. At this early stage, thought has already been given to minimizing the potential negative impacts through design, with TransPod stating that by "building it on pylons, we can limit the need to acquire contiguous land by following alongside linear highway alignments" (TransPod, 2017). The scoping exercise will need to be flexible; likely taking tried and tested methodologies used for major EA studies but applying them to a completely new technology. Prospective hyperloop proponents may also follow the preliminary findings of the MORPC study to understand what may be required, albeit in a different regulatory context.

Perhaps the most rigorous aspect of the impact assessment would be the engagement program. This would require meaningful and respectful dialogue across countless Anglophone and Francophone communities, as well as with Indigenous communities, which is a primary focus under the proposed *Impact Assessment Act*. There would likely be hundreds of different stakeholder groups at the federal, provincial and municipal levels, including review agencies, municipalities, conservation authorities, and community interest groups. There are precedents for such large-scale engagement programs, namely EA studies for significant infrastructure projects such as pipelines or transmission lines, and future proponents may review these to understand the complexity of a potential engagement program.

Summary

The discussion on hyperloop will evolve over the coming years. The timeframe for the implementation of big ideas in transportation, even for existing modes such as HSR or subway, has often been shown to take decades in the Canadian context. During this period, much may change in the regulatory framework that may help or hinder the development of a hyperloop. In addition, questions of proponency, funding, and political and social acceptance will first need to be answered before an impact assessment can commence. This paper attempts to start the conversation by grounding the theoretical in the practical and advance what is undoubtedly an exciting opportunity in future mobility.

References

Government of Canada. (2018). *Better Rules for Major Project Reviews to Protect Canada's Environment and Grow the Economy*.

Government of Canada. (n.d.). *Consultation Paper on Approach to revising the Project List*. Retrieved from https://www.canada.ca/en/services/environment/conservation/assessments/environmental-reviews/environmental-assessment-processes/consultation-paper-approach.html

Government of Canada. (n.d.). *Enbridge Northern Gateway Project*. Retrieved from http://www.ceaa.gc.ca/050/details-eng.cfm?evaluation=21799

Janzen, R. (2017). TransPod Ultra-High-Speed Tube Transportation: Dynamics of Vehicles and Infrastructure. *X International Conference on Structural Dynamics, EURODYN 2017* (p. 9). Elsevier Ltd.

MORPC. (2018, February). *Request for Proposals Components of a Tier I Environmental Impact Statement (Tier I EIS) for the Chicago-Columbus-Pittsburgh Freight and Passenger Corridor for Hyperloop and High-Speed Rail Technologies.* Retrieved from http://www.morpc.org/wordpress/wp-content/uploads/2018/02/EIS-Components-for-Rail-Corridor-Request-for-Proposals-FINAL-1.pdf

Ontario Ministry of the Environment and Climate Change. (2014). *Ontario's Transit Project Assessment Process.* Queen's Printer for Ontario.

Ontario Ministry of the Environment and Climate Change. (n.d.). *Preparing environmental assessments*. Retrieved from https://www.ontario.ca/page/preparing-environmental-assessments#!%2F

Parliament of Canada. (2017, February 8). *Bill C-69 An Act to enact the Impact Assessment Act and the Canadian Energy Regulator Act, to amend the Navigation Protection Act and to make consequential amendments to other Acts.* Retrieved from http://www.parl.ca/DocumentViewer/en/42-1/bill/C-69/first-reading

TransPod. (2017). *Initial Order of Magnitude Analysis for TransPod Hyperloop System Infrastructure Preliminary Basis of Design.* Toronto: TransPod.

TransPod. (n.d.). *Routes*. Retrieved from http://transpodhyperloop.com/en/transpod-system/routes/

Virgin Hyperloop One. (2017, August 28). *Connecting 25% of Canada's Population with Hyperloop*. Retrieved from https://hyperloop-one.com/blog/connecting-25-canadas-population-hyperloop

Virgin Hyperloop One. (n.d.). *Facts & Frequently Asked Questions*. Retrieved from https://hyperloop-one.com/facts-frequently-asked-questions