



THE SCHOOL OF PUBLIC POLICY PUBLICATIONS

SPP Research Paper

VOLUME 13:25 | OCTOBER 2020

CANADIAN NORTHERN CORRIDOR SPECIAL SERIES

FINANCING AND FUNDING APPROACHES FOR ESTABLISHMENT, GOVERNANCE AND REGULATORY OVERSIGHT OF THE CANADIAN NORTHERN CORRIDOR

ANTHONY E. BOARDMAN, MARK A. MOORE
AND AIDAN R. VINING

<http://dx.doi.org/10.11575/sppp.v13i0.69445>

FOREWORD

THE CANADIAN NORTHERN CORRIDOR RESEARCH PROGRAM PAPER SERIES

This paper is part of a special series in The School of Public Policy Publications, examining the potential for economic corridors in Canada. This paper is an output of the Canadian Northern Corridor Research Program.

The Canadian Northern Corridor Research Program at The School of Public Policy, University of Calgary is the leading platform for providing information and analysis necessary to establish the feasibility and desirability of a network of multi-modal rights-of-way across middle and northern Canada. Endorsed by the Senate of Canada, this work responds to the Council of the Federation's July 2019 call for informed discussion of pan-Canadian economic corridors as a key input to strengthening growth across Canada and "a strong, sustainable and environmentally responsible economy." This Research Program will help all Canadians benefit from improved infrastructure development in Canada.

This paper "Financing and Funding Approaches for Establishment, Governance and Regulatory Oversight of the Canadian Northern Corridor" falls under the Funding and Financing Dimensions theme of the program's eight research themes:

- Strategic and Trade Dimensions
- Funding and Financing Dimensions
- Legal and Regulatory Dimensions
- Organization and Governance
- Geography and Engineering
- Economic Outcomes
- Social Benefits and Costs
- Environmental Impacts

All publications can be found at <https://www.canadiancorridor.ca/the-research-program/research-publications/>.

Dr. Jennifer Winter
Program Director, Canadian Northern Corridor Research Program

FINANCING AND FUNDING APPROACHES FOR ESTABLISHMENT, GOVERNANCE AND REGULATORY OVERSIGHT OF THE CANADIAN NORTHERN CORRIDOR

Anthony E. Boardman, Mark A. Moore and Aidan R. Vining

KEY MESSAGES

- The federal government or a consortium of governments should constitute an “assembler” that assembles the land rights and grants use rights to infrastructure providers.
- This assembler would be financed by government(s) through debt, taxes, or by reducing other spending. If multiple governments participate in assembling the corridor, each government’s share of financing should be agreed upon ex ante.
- The assembler could be funded by auctioning corridor access to infrastructure providers, if the latter can earn sufficient profits, or by value captured through property, sales, corporate or personal income taxes or resource royalties.
- Assembler funding could come from charges to end users. These charges could be per period access fees or based on usage. We recommend the former, especially in the absence of congestion.
- Financing of private infrastructure is possible if there are sufficient anticipated profits. Potential sources of financing include private corporations, public pension funds, private equity and public-private partnerships (PPPs).
- Funding of infrastructure may be from charges imposed on end users or from government.
- All infrastructure projects will be natural monopolies and will be regulated to reduce inefficiency. Regulation will be best performed by existing sectoral regulators, which can be funded as they are now.
- PPPs can be funded through availability payments or shadow tolls from government or through usage charges (usually tolls). We do not recommend the use of PPPs due to their higher cost of finance and their reluctance to assume revenue risk. Nevertheless, we recognize that they may be more politically palatable than government provision and funding, and sometimes they are the only feasible option.
- The international evidence provides no novel sources of financing or funding.

SUMMARY

The Canadian Northern Corridor (CNC) is a proposed multimodal, multijurisdictional corridor. It is a highly complex, long-term infrastructure project. Such projects often fail to get implemented, but the limited evidence suggests that they can get built when a single entity (a national government or a supranational organization) assembles the rights of way and provides corridor access to various infrastructure providers. This entity, which we refer to as the “assembler,” has to (1) assemble the required rights of way from all those currently holding the property rights; and (2) decide on the allocation of, at least, usage property rights to different kinds of infrastructure providers (and ultimately users of that infrastructure). For the CNC, the assembler could be the federal government or a consortium that also includes subnational levels of government. Because First Nations and other Indigenous groups in Canada have constitutional (or at least quasi-constitutional) status, they might also have a role in a consortium.

Financing of the assembler will inevitably come from government(s) through higher taxes, reduced government spending or the sale of government bonds. If the assembler is composed of multiple governments, the division of the financing will need to be negotiated and will have contracting costs.

Once the corridor (or at least some part of it) has been assembled, infrastructure provision of the various modes on a variety of routes may proceed, subject to the availability of infrastructure financing. Ultimately, both the assembler and the infrastructure providers will require funding to pay back the financiers. Funding for the assembler could be raised directly from the infrastructure providers, in the form of fees paid for access to the corridor. It could also be raised through charges to end users. Or, it could be funded from general government revenues. Funding will also come, at least in part, from greater government revenues captured from the increased economic activity, which result from the provision of new infrastructure services. These may be in the form of property taxes, sales taxes, income taxes, or resource royalties, all of which will increase if the infrastructure leads to increased economic activity. Intergovernmental negotiations will probably be required in order to reach an agreement on a revenue sharing formula.

Infrastructure on the corridor could be provided by private, for-profit firms, public-private partnerships (PPPs) or state-owned enterprises (SOEs). Private firms, including PPPs, will only be willing to provide infrastructure if they can earn at least a normal rate of return on their equity. They may obtain financing from private sources, from public or private pension funds, or some combination of these. SOEs would be government financed.

The willingness of private sector infrastructure providers to pay access fees for the right to build on the corridor depends on their expected economic profits.* These, *inter alia*, depend on expected regulation. All of the providers will be natural monopolies and, therefore, providers' prices to end users will likely be regulated. We do, however, consider the possibility that providers' prices will be unregulated and set at profit-maximizing levels. In that case, well-designed auctions may allow the assembler to capture all the potential economic profits as access fees charged to providers. However, the monopoly prices charged to end users may result in inefficiently low levels of infrastructure use. If prices are to be regulated, we argue that existing sectoral regulators can perform this role most effectively. If prices are set such that the providers expect to earn only a normal rate of return on their equity (zero economic profits), then they will not be willing to pay any access fees to the assembler. In this case, funding will have to come from user charges or government, or some combination of both.

Any type of provider may be funded by charges to end users or by government. User charges could vary with infrastructure use or could be per period access fees that must be paid before any consumption of infrastructure service, or both (i.e., two-part pricing). If the social marginal cost of service provision is zero (e.g., uncongested road use), then the usage charge should be set to zero. However, if the social marginal cost is positive (e.g., oil pipelines), then usage charges should reflect these marginal costs.

We argue that PPPs may not be the best providers of infrastructure. Private costs of capital will be higher than the rates on government debt, due to inefficient risk bearing. PPPs also come with very high contracting costs, which in turn can reduce the number of bidders and lead to excess returns that must ultimately be paid by users and governments. There is little evidence that PPPs are more economically efficient than traditional government procurement, especially if the latter uses fixed-price contracting. Nevertheless, they may prove to be the only feasible option.

Our survey of the literature on existing corridor proposals and other large infrastructure projects leads us to conclude that the assembler is almost always a government or a combination of governments. Financing of the assembler is provided by government or is obtained from multilateral development banks. There have been many proposals for other assemblers, but only a few seem to be actually progressing. Those few cases are spearheaded by a particular government for geopolitical reasons, such as China's Belt and Road Initiative.

* Economic profits differ from accounting profits. Economic profits equal revenues minus all opportunity costs. Opportunity costs include all explicit costs and a normal rate of return on equity (accounting profits divided by equity) for the owners. A normal rate of return is equal to what the owners could expect to earn by investing their equity in alternative projects with similar risk. If owners earn a normal rate of return on equity, then their economic profit is zero.

1. INTRODUCTION

The proposed Canadian Northern Corridor (CNC) would be a multijurisdictional corridor spanning the Near North of Canada from east to west across provinces, with branches to the Far North. This corridor would be multimodal, providing rights of way for a range of infrastructure, such as roads, railways, pipelines, telecommunications and electricity transmission.¹ Because this corridor would be both multijurisdictional and multimodal, it raises complex financing and funding issues.

The CNC requires financing in order to assemble the rights of way. Subsequently, financing is required to build and operate the various infrastructure components. Once an infrastructure component has been built and services provided to end users, most financiers want to be paid back and hope to earn a return. Funders are those who ultimately pay for the assembly of the corridor and for the infrastructure components that will be built upon it. This paper addresses the question: Which national or international financing and funding models are relevant to corridor infrastructure projects, and which might be adopted by the CNC? Our answer to this question includes an examination of evidence from both national and international case studies. This research is part of the larger Canadian Northern Corridor Research Program of the School of Public Policy at the University of Calgary (Sulzenko and Fellows 2016; canadiancorridor.ca).

The rest of the paper is organized as follows: Section 2 presents a simple model of a multimodal corridor that identifies the relevant entities and their relationships. Section 3 summarizes key findings from national and international case studies on corridor financing and funding. Section 4 discusses the role of an assembler and its ownership and goals. Section 5 argues that the federal government or some government consortium will probably finance the assembler. Section 6 evaluates alternative assembler funding mechanisms, such as access fees charged to infrastructure builder/operators, charges to end users, and a variety of taxation mechanisms. Section 7 outlines the functions of the corridor's infrastructure providers. Section 8 considers means of financing infrastructure providers, including government financing, PPPs, private equity, government loan guarantees to private investors and public pension funds. Section 9 discusses the funding of the infrastructure providers. The options are government funding or user charges. Section 10 briefly examines funding of the regulatory bodies. Section 11 contains a brief conclusion and some suggestions for future research.

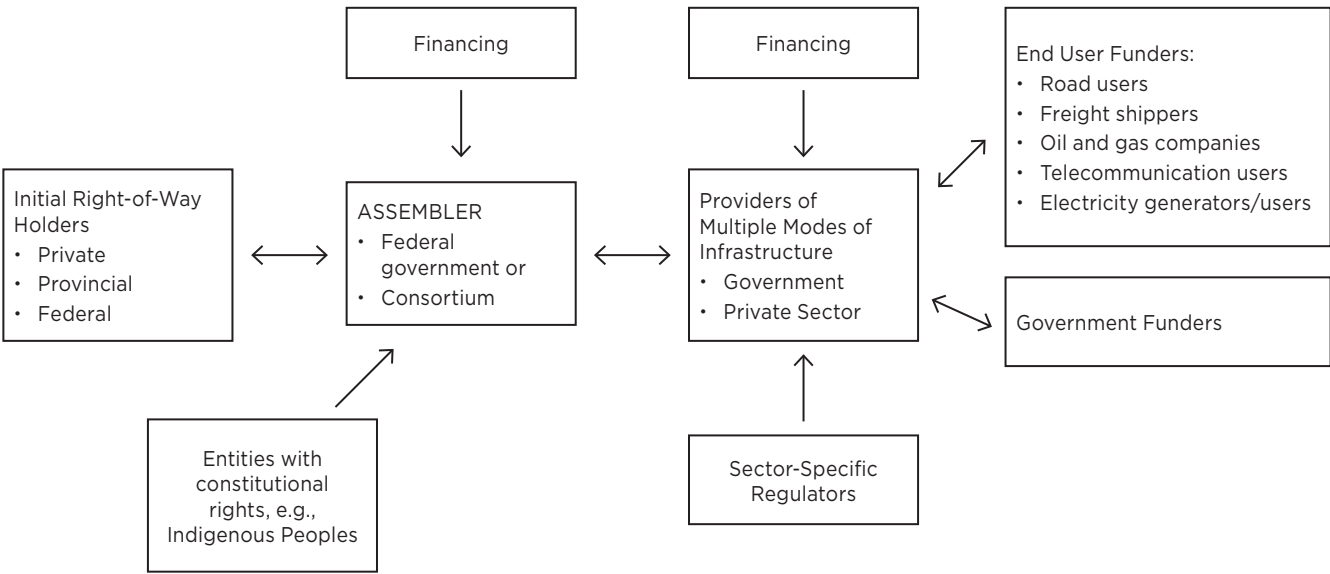
¹

The term multimodal is used in freight forwarding to describe the sequential movement of the same goods from one mode to another. In this paper, we use the term to refer to the existence of more than one infrastructure mode on the same part of a corridor.

2. A MULTIMODAL CORRIDOR MODEL

Many distinct agents are involved in the development and use of a multimodal corridor. These include: (1) the assembler of the rights of way, (2) the initial holders of these rights of way, (3) financiers of the assembler, (4) infrastructure providers (builders or operators), (5) financiers of the infrastructure, (6) users of the infrastructure, (7) regulators, and (8) the ultimate funders of the assembler, the infrastructure, and the regulators. Figure 1 presents a model of a multimodal corridor that shows the relationships among these agents.

Figure 1: A Platform Model of a Multimodal Corridor



The key agent in this process is one that intermediates between the initial property right holders of the eventual rights of way and the infrastructure providers. We label this entity as the assembler. It must serve two essential functions. The first function is the assembly of property rights through purchase, gifting or some form of compensated or uncompensated expropriation. The second function is the subsequent assignment of these property rights to infrastructure providers through sale, gifting or some other contractual arrangement.

Infrastructure providers consist of organizations that will build or operate specific segments of the infrastructure from, and to, various points along the corridor. The corridor would also be multimodal. Thus, the CNC would be multijurisdictional, multimodal and multiroute.

3. CORRIDOR FINANCING AND FUNDING: CASE STUDY FINDINGS

To obtain some insight into how the CNC might be financed and funded, we examine many case studies of unijurisdictional and multijurisdictional corridors. We do not study urban infrastructure or public works projects, because their characteristics are quite different than those of corridors. Specifically, such projects are almost always unijurisdictional and unimodal. Furthermore, they are more likely to be sustainable through various forms of user charges, and therefore financing and funding are more straightforward.

Useful information on funding and financing corridors is sparse. For example, in a review of European mega corridors, Priemus and Zonneveld (2003) find virtually no discussion about financing and funding, except for very broad statements about the need for coordination at the end. Table 1 summarizes the multijurisdictional cases that do provide some funding and financing information. Appendix 1 provides more details on these and other case studies.

Table 1: Summary of Case Studies: Characteristics of Corridor, and Assembler and Provider Financing and Funding

	CORRIDORS					
	St. Lawrence	INSTC	SGP	Chunnel	LAPSSET	TEN-T
Corridor:						
- Jurisdiction	International	International	Multijurisdictional	International	International	International
- Modes	Unimodal-seaway	Multimodal-Railways, Roads, Shipping	Multimodal-All-weather highway, plus energy and communications	Unimodal-rail tunnel	Multimodal-ports, railways, roads, pipelines	Multimodal-airports, railways, roads, water infrastructure
Assembler:						
- Assembly	US & Canadian governments	India, Iran and Russian governments	NWT government	British and French governments	Federal governments	EU Organizations
- Financing	Federal governments	Federal governments	Federal and NWT governments	Federal governments	Probably federal governments	CEF (EU)
Infrastructure Provider:						
- Construction	Private	Not clear	None yet	Private	Probably private	Probably private
- Financing	Federal governments	Federal governments	None yet	PPP with institutional placements, public share offers, syndicated bank loans	Federal governments, development banks, EU and private sector equity and infrastructure bonds	EU Organizations, Federal Governments, EIB (i.e. EU) loans, private sector
- Operator	Government	Not clear	None yet	Private consortium	Unclear	
- Funding	Federal governments and user fees	Probably some user fees	Variety of taxes and royalties	User fees	Probably user fees	Probably user fees

Key: St. Lawrence = St. Lawrence Seaway, SGP = The Slave Geological Province Corridor Project, Chunnel = The Channel Tunnel, LAPSSET = The Lamu-Southern Sudan-Ethiopia Transport Corridor, TEN-T = Trans-European Transport Network, NWT = Northwest Territories, CEF = Connecting Europe Facility, EIB = European Investment Bank, EU = European Union, INSTC = International North-South Transport Corridor.

In these studies, government or government organizations are always the assembler. Furthermore, governments always finance the assembler. As far as we know, private firms always build the infrastructure. Governments or government organizations provide the financing, with the exception of the Channel Tunnel (Chunnel). That project is a PPP, with financing provided by the consortium members, and by institutional placements, public share offerings, and syndicated bank loans. Multijurisdictional corridor projects in Australia, including the \$9.3 billion (Australian) Melbourne-Brisbane Inland Rail Project and the approximately \$600 million (Australian) sealed highway from Laverton in Western Australia to Winton in Queensland, receive significant government monies (presumably to finance the infrastructure).

We were usually unable to determine the identity of the operator of the infrastructure. User fees fund most projects, predominately in the form of usage fees (tolls). Where these fees are insufficient to cover operating costs, the government may provide additional funding. The Slave Geological Province Corridor Project (SGP) expects some government value capture through various taxes and royalties.

Overall, there do not seem to be any novel methods of financing or funding that can be gleaned from national or international case studies.

4. ASSEMBLER ROLE, OWNERSHIP AND APPROPRIATE GOALS

In all infrastructure projects, private sector providers must acquire or obtain the necessary rights of way for a project. In the case of some unimodal and intrajurisdictional corridors, holders of the rights of way are able to contract directly with a specific infrastructure provider. Even then, a government may be a necessary participant to threaten expropriation.

However, in a multijurisdictional, multimodal corridor, there are likely to be many different kinds of property right holders.² As shown in Figure 1, these include private property owners, various government entities, and Indigenous Peoples. Some of the existing property rights have a constitutional or quasi-constitutional basis, but most others do not. Also, the property right holders can be in different jurisdictions, with governments that have constitutional, quasi-constitutional or regulatory authority over the property right holders. A large, multijurisdictional corridor is considerably more complex from an assembly perspective than one that traverses a single jurisdiction, such as a province.

Given these complexities, a single organization (hereafter the assembler) would have a significant cost advantage over multiple (competing) entities (Priemus and Zonneveld 2003). First, the assembler would have a cost advantage in acquiring and assembling the necessary property rights, based on economies that it would enjoy in negotiating

²

A multijurisdictional corridor may either be international or, in a federated nation, interstate or interprovincial.

with a large number of initial property right holders. A single acquirer would also be able to benefit from learning efficiencies as it acquires information about the reservation prices of property right sellers. Second, the assembler would have the same kinds of cost advantages in negotiating with potential infrastructure providers. In sum, a single assembler would have lower transaction costs. One can think of the assembler as an intermediary (or platform provider) of a two-sided market (Rysman 2009). The assembler lowers the cost that initial property right holders would face if they tried to negotiate with a number of potential providers of different types of infrastructure (Sulzenko and Fellows 2016).³ The Callide Infrastructure Corridor State Development Area (SDA) in Queensland, Australia, which is a multi-user corridor for underground gas pipelines, illustrates this point.⁴ The initial land assembly, including negotiation with private land owners, was accomplished by the SDA. Without the coordination and development of a common corridor, gas pipeline companies would have had to individually negotiate easements with multiple landholders.

In principle, a private consortium could assemble the property rights. However, this is unlikely for the CNC. First, the costs of negotiating consortium governance, corridor route, financing contributions, and the division of funding received would be prohibitively high. Second, the consortium would lack the power of expropriation. Third, it would lack the existing communication and regulatory framework available to government. Fourth, private investors have a lower willingness to trade off current for future societal consumption than the government does or should have (i.e., a higher discount rate).⁵ In addition, government is better placed to take into account overall social goals, including reduced congestion on southern corridors, and to increase the value of other transport networks that connect to the corridor (Rothengatter 2017).

The two most likely entities to create and operate the assembler are either the federal government or a consortium of federal, provincial and territorial governments. Indeed, government or governments were the assemblers in all of our case studies. The Northern Corridor Economic Region (NCER) in Malaysia provides some evidence that a multigovernmental consortium is often more successful for projects that affect multiple jurisdictions (states). Responsibility for implementing the corridor was given to the Northern Corridor Implementation Authority (NCIA). Athukorala and Narayanan (2018) argue the NCIA has not met its expectations, because it does not have enough authority and operational flexibility: it is hampered because it is basically a federal institution, with the states having only limited roles. They suggest that the states should have official stakes in the planning and operations of the NCIA. Because Indigenous groups in Canada have constitutional or at least quasi-constitutional status, they might also have a role in a consortium. For the remainder of this paper, we will assume that

³ Alternatively, one can think of the assembler as a solution to a missing markets or coordination failure.

⁴ <https://www.dsdmip.qld.gov.au/coordinator-general/state-development-areas/current/callide-infrastructure-corridor-state-development-area.html>. Accessed April 30, 2020.

⁵ This higher private discount rate is due, *inter alia*, to the private sector's higher cost of risk (Moore, Boardman and Vining 2013a; 2013b; 2017a; 2017b). See discussion below.

Indigenous groups might be part of any assembler, whether the federal government acts alone or in concert with other governments.

Some property rights, such as in the case of Crown land, may be transferred to the assembler at no or minimal cost. However, property rights held by private individuals in urban areas would have to be acquired. The assembler could purchase a fee simple interest for some of these rights or could lease some fraction of them.⁶ The costs associated with acquiring these rights from multiple, diverse holders are likely to be high and progress may be slow. The Trans Mountain Pipeline illustrates some of the potential problems. Its former owner, Kinder Morgan, proposed to twin the pipeline, which runs from Alberta to the coast of British Columbia. The National Energy Board approved the project in 2013, but there were objections by environmentalists and First Nations. In May 2018, the federal government announced its intention to buy the pipeline from Kinder Morgan. In effect, the federal government is the only organization capable of conducting the necessary negotiations and completing the project.

Given that government is most likely to form and control the assembler, it is important to consider its goals. This paper assumes that the primary goals of government should be economic efficiency and equity.⁷ There are several dimensions to equity that might be salient. These include regional differences in incomes, access to education and health services, and consideration of the North's higher ratio of Indigenous residents. While economic efficiency and equity are the appropriate goals, most governments have other concerns, such as re-election. Instrumental goals might include minimizing government deficits and debt, avoiding tax increases, or rewarding political supporters.

5. FINANCING THE ASSEMBLER

The assembler must finance the assembly of rights of way along the corridor. If this entity is owned and controlled by the federal government, it may obtain financing by reducing expenditure elsewhere, increasing current government taxes, or borrowing through the sale of government bonds. The latter will increase the government budget deficit or reduce its surplus. This implies higher future government taxation in order to service and retire the added debt.

If multiple governments (including provincial governments and the territories) own and control the entity, then non-federal governments might provide co-financing, especially provincial governments affected by the corridor. This may involve protracted, multiparty negotiations, with high transaction costs. Each entity will have an incentive

⁶ In the Anglo-American common law tradition, the fractionalization of property rights that is most relevant to corridor policy is embodied in the common and statutory law of easements. In the common law, the right-of-way easement is most pertinent to thinking about corridor property rights. Furthermore, the state has the right to exercise expropriation or eminent domain. In the United States, this power is subject to the fair-compensation requirement laid out in the Fifth Amendment of the U.S. Constitution (Heftman 2002). In Canada, there is no such requirement.

⁷ For a comprehensive discussion of economic efficiency as a normative goal, see Boardman et al. (2018).

to attempt to allow other governments to pay and an incentive to free ride on other governments' contributions, which can result in a coordination failure. The failure to establish a national financial security regulator in Canada illustrates this problem (Fine 2018). Nevertheless, it is possible to imagine that financing might be obtained from federal, provincial and territorial governments. Indeed, most of the assemblers described in the case studies in Table 1 were financed either by multiple governments or by the EU.

6. FUNDING THE ASSEMBLER

Assuming that the initial financing of the assembler is available, it must then determine how to provide builders of the infrastructure with access to the corridor. This will involve determining how to regulate the providers of the infrastructure services. It will also involve deciding how to obtain funding for the assembler. These decisions affect both the financing of the infrastructure and its funding, as well as the funding of the assembler.

The initial financing of the assembler could be paid back or funded in a number of ways. One is to charge access fees to infrastructure-service providers for the right to build and provide infrastructure on the corridor. Another is to charge the end users. These user charges could be in the form of an access fee, which is a fixed amount paid to purchase the right to consume any amount of service. Alternatively, it could be a usage fee, charged per unit of service consumed. Or, it could involve both (i.e., two-part pricing). The government could also fund the corridor with tax revenues. We discuss each option in turn. The feasibility and desirability of some of these options will depend on the regulation of the infrastructure-service provision.

INFRASTRUCTURE PROVIDER ACCESS FEES

Provider access fees could be charged, once and for all, upfront, or could be charged per period, typically annually. The ability to obtain such fees depends on the expected economic profits of the infrastructure providers.⁸ These, in turn, depend on the providers' costs, the demands for the infrastructure services, and the regulation of the prices charged to end users.⁹

The infrastructure-service providers of each mode will be natural monopolies on any route in the corridor. That is, it will be cheaper for one entity to provide all the service (on that mode on one route) than to have two or more entities build separate

⁸ Economic profits differ from accounting profits. Economic profits equal revenues minus all opportunity costs. Opportunity costs include all explicit costs and a normal return on equity (accounting profits divided by equity) for the owners. A normal return is equal to what the owners could expect to earn by investing in alternative projects with similar risk. If owners earn a normal return on equity, then their economic profit is zero.

⁹ As we will discuss later, they also depend on the providers' fears that a future government may change the regulated infrastructure-service prices after the infrastructure is built and many of the costs are non-recoverable (i.e., sunk).

parallel infrastructures, with each producing a fraction of the total output of services demanded. This is because the design and construction of the infrastructure—such as a transmission grid, pipeline, road, fibre optic cable network, or railway—requires very large, upfront and non-recoverable investments in lumpy or indivisible inputs. Once built, the marginal (i.e., incremental) cost of providing one more unit—e.g., one more barrel of oil, phone call, or tonne of freight—is very small or even zero. Therefore, the average cost per unit of service will decrease as infrastructure-service output increases.

These natural monopolies will not face any intramodal competition along the corridor, although there may be other limited forms of competition. For example, there may be intermodal competition between rail transport and truck transport along the same routes. Or, some users may be able to choose between using existing routes and the new corridor routes.

Given the monopoly power of each provider, one would expect providers to attempt to maximize profits by using a two-part pricing schedule (Oi 1971; Feldstein 1972; Schmalensee 1981). These involve charging the end users an access fee every period in order to obtain the right to consume any amount of the service, and then a usage charge proportional to consumption of the services (e.g., per megawatt-hour of electricity, or per tonne-kilometre of freight carried by rail). Of course, either the access fee or the usage charge could be zero.

If the assembler wanted to obtain the maximum possible provider access fees, it could enable the monopoly providers to maximize their profits by allowing unregulated pricing. Consider a natural monopolist provider that can anticipate the demand for its services, its operating costs, and the fixed (and sunk) costs of the initial investment. The provider could then estimate its potential economic profits and thus the maximum it would be willing to pay per period for access to the corridor. The assembler could attempt to capture this amount by charging a provider an access fee equal to that amount, if it knew what it was.

If there were more than one potential provider interested in building and operating the same infrastructure, then, in principle, the assembler could hold an auction for access. Depending on how well the auction is designed, the assembler may be able to extract almost all of the expected economic profits. However, firms may attempt to collude. There will inevitably be some gaming that will reduce the number of bids. For example, only one company might bid on each segment. In this case, there would be a single seller and a single buyer, with the outcome depending on each one's relative bargaining skills. There are other concerns with holding auctions, such as the "winner's curse."¹⁰ Further, the infrastructure providers might reasonably fear that political pressure on the current or a future government will lead to interventions, such as future regulation that would reduce their prices and profits. This is particularly problematic, because

¹⁰ That is, the winning bidder may be the most optimistic about future profits, and hence may bid more than the expected value of the contract, resulting in negative economic profits; see Thaler (1988).

infrastructure investment is almost completely non-recoverable. Such fears will lead to lower bids at auction.

If the funds raised by auctioning access to unregulated natural monopolists exceed the costs of creating the CNC, then there is a clear economic efficiency case for the corridor. Depending on each provider's pricing scheme, the infrastructure services might be provided in inefficiently small amounts. Economic efficiency requires that usage charges (prices) for the services be set at marginal costs, so that anyone who is willing and able to pay enough to just cover the incremental cost of providing one more unit of the service may consume it, assuming no externalities.¹¹ An unregulated monopolist that employs only usage charges would reduce output below the economically efficient level in order to maximize its own profits. With two-part pricing, usage charges may be set closer to marginal costs.

Because unregulated pricing may lead to economically inefficient or inequitable outcomes, infrastructure-service providers' prices are likely to be regulated. There could be a new, cross-sectoral regulatory regime if that were part of the assembler's mandate. However, given that considerable regulatory expertise currently resides in existing sector-specific federal regulators, we expect that these regulators will also regulate the providers on the CNC.

Regulation of some natural monopolies can be structured to allow them to earn only a specified rate of return on their investments.¹² If each provider expects price regulation to result in a return that is just equal to what they could earn on their next best alternative investment, this would leave them with zero expected economic profits. A provider that anticipates such regulation will not be willing to pay anything for access to the corridor. If providers are regulated such that they expect to earn some economic profits, they will have some willingness to pay for access.

END USER CHARGES

If infrastructure providers are regulated such that their expected economic profits are zero, so that funding by charging access fees to infrastructure providers is not an option, an alternative is to fund the assembler by charging the end users of the

¹¹

A negative externality is a cost imposed on others that the externality generator does not bear; e.g., pollution. A positive externality is a benefit created for others for which the generator is not rewarded; e.g., immunization against infectious disease. Our discussion in this section ignores any potential externalities. In order to obtain economically efficient outcomes, social marginal benefit should equal social marginal cost. These may differ from private benefits and costs to the extent that there are externalities. For example, to the extent that building roads or railways in the northern corridor reduces congestion and local pollution in existing southern routes, this will produce extra benefits that may not be captured by infrastructure providers. Thus, it might be efficient for a regulator to set prices for infrastructure services on the CNC that are below private marginal costs. This would generally require government subsidies if the provider was a for-profit firm, which would exacerbate the funding problem.

¹²

There is an extensive literature on different methods of price regulation of natural monopolies and their effects on economic efficiency (see, e.g., Rogerson 1992). Here, we are chiefly concerned with the impact of such regulation on anticipated economic profits and, hence, on the providers' willingness to pay the assembler for access to the CNC.

services.¹³ End users could be charged per period for access to the infrastructure services, or they could be charged per unit of the services consumed (e.g., per megawatt-hour of electricity or per tonne-kilometre of freight carried by rail). Swiss motorway stickers are an example of an end user access fee. Vehicles and trailers pay this fee once a year for use of motorways and dual carriageways.¹⁴ The distance-related heavy vehicle fee (HVF) is an example of a usage charge. This toll was enabled by an agreement between Switzerland and the EU that came into force in 2002 (Brunner 2013).¹⁵

Usage charges that effectively raise prices above marginal costs will generally lead to economically inefficient outcomes (absent externalities). If, instead, the assembler is funded via end user access fees, then services can be priced close to marginal costs (Friedman and Weare 1993). Such two-part tariffs could produce an economically efficient outcome and help fund the corridor.¹⁶

For some infrastructure modes, such as roads, the marginal (social) cost of an extra user is close to zero once the road has been built and if it is uncongested. Thus, the economically efficient usage charge (toll) for end users is zero. However, users could still be charged a per period access fee for road use, as in the Swiss motorway sticker example.

TAXES AND VALUE CAPTURE

Taxes are an important source of assembler financing. Taxes can also be thought of as a source of assembler funding when infrastructure provision leads to greater economic activity that is taxed. This is known as value capture (Batt 2001; Connolly and Wall 2016; Chapman 2017). It may be accomplished by direct taxation of individual and corporate incomes, indirect sales taxes, royalties on extracted resources, or property taxes. Land values often increase at the end points of new transportation corridors. They may also increase on land containing valuable natural resources that become less costly to transport. Different taxes will accrue to different levels of government. With multiple jurisdictions and groups sharing unevenly in these benefits, it is not clear to

¹³ Many analysts argue that easily identifiable infrastructure users should pay directly for congestible services (Boardman and Lave 1977; Bazel and Mintz 2014; Bird and Slack 2017).

¹⁴ Source: <https://www.ch.ch/en/swiss-motorway-sticker/>. Accessed April 30, 2020. It currently costs 40 Swiss francs (about \$58.50 CAD).

¹⁵ The agreement allows Switzerland to charge a distance-related heavy-vehicle fee (HVF) for vehicles exceeding 3.5 tonnes. By limiting the increase in heavy vehicles on the road, this toll encourages the shipment of freight by rail and lowers environmental costs. These environmental costs are a negative externality, so the usage charge may lead to more efficient use of the roads. Two-thirds of the net revenue goes to the federal government and one-third goes to the cantons. The success of the HVF toll is due to Switzerland's strategic position located between the manufacturing centres of northern Europe and the industrial economies of Italy, France and Spain. Source: <https://www.are.admin.ch/are/en/home/transport-and-infrastructure/data/distance-related-heavy-vehicle-fee--hvf-.html>. Accessed April 30, 2020.

¹⁶ The outcome will be economically efficient if the access fee is set low enough so that every potential user chooses to pay it and to consume the service at the regulated price. However, there may be some departure from efficiency if the access fee is set too high and excludes some users.

what extent they could provide funding for the assembler. As with the financing, one would expect protracted and difficult intergovernmental negotiations on this point.

FUNDING THE ASSEMBLER: SUMMARY

In practice, almost any combination of these funding mechanisms can, and have, been imagined. In Table 2, we summarize the various alternatives and evaluate them by the usual public policy analytical criteria: ability to raise revenues, economic efficiency, regional equity, and the level of expected transaction costs.

Table 2: A Summary Comparison of Alternative Methods of Funding the Assembler

Funding Method	Evaluation Criteria			
	Assembler Revenue	Economic Efficiency	Regional Equity	Transaction Costs
Access Fees				
- Unregulated	High potential to extract monopoly rent	Efficiency losses	Infrastructure users pay high prices	Relatively low, excluding cost of auction
- Regulated	None	Potentially efficient	Users would pay lower prices	Usual cost of regulation
User Fees				
- Access fee	Some variable revenue, depends on level of user charge(s) and demand	Good unless set so high as to exclude many users	Unclear. Users pay access charges.	Relatively low administrative cost
- Usage fee (toll)	Some variable revenue, depends on level of user charge(s) and demand	Efficiency losses	Infrastructure users pay high prices	Relatively low administrative cost
Taxation				
- Property	Limited potential	Yes, because land is not mobile	Yes because those who benefit more, pay more	Administrative cost low, but multi-jurisdictional issues
- Royalties	Variable: depends on size of resource deposit and mineral prices	Can be good if well designed	Reasonable	Administrative cost low, but multi-jurisdictional issues
- Sales taxes	Limited potential	Efficiency losses	Regressive	Administrative cost low, but multi-jurisdictional issues
- Income Tax	Limited potential	Depends-not unreasonable	Can be progressive	Administrative cost low, but multi-jurisdictional issues

7. INFRASTRUCTURE PROVIDERS: FUNCTION

Infrastructure providers negotiate with the assembler for use of the rights of way. They also decide which organizations will build the infrastructure, and who will finance and operate it. Many providers will be private, for-profit firms, such as railways, pipelines and telecommunications companies. Alternatively, they could be state-owned enterprises (SOEs), known in Canada as Crown Corporations. Examples of SOEs include the Canada Infrastructure Bank and now the Trans Mountain Pipeline. Provincial Crown Corporations own and operate electricity transmission and, in some

cases, provide electricity generation (and distribution). Infrastructure providers might be mixed public-private enterprises, such as the Waneta Expansion Limited Partnership hydroelectric power project (Boardman and Moore 2020). Roads are almost always designed and constructed by private firms, but are owned, operated and maintained by the public sector. In some situations, providers may be government agencies who may or may not use PPPs to partially finance, build and operate the infrastructure.

Once for-profit infrastructure providers are assured of rights of way on the CNC, they will typically provide the financing, manage the construction, and operate and maintain the infrastructure. If an industry regulator requires that access to the infrastructure be made available to any potential service provider at reasonable rates, then competition in service provision may be possible (e.g., in electricity generation and distribution, telecommunications and, in some cases, railways). Alternatively, the regulator may allow monopoly service provision. In that case, it will likely regulate end user service prices.

8. INFRASTRUCTURE PROVIDERS: FINANCING

GOVERNMENT FINANCING

Much infrastructure is financed by government. As in the case of financing the assembler, government funds can be obtained by reducing expenditures, raising taxes or borrowing. Roads and highways in the corridor could be financed and delivered by government using traditional government contracting, or could be financed and delivered by a PPP. Traditional government contracting may take many forms. Cost-plus contracts can and often do result in high cost overruns, especially on large, complex projects. Fixed-price, design/build contracts are usually preferable, although they may be difficult and time-consuming to enforce (Flyvbjerg, Bruzelius and Rothengatter 2003).

PPPs

Many roads, bridges and highways in Canada and other countries have been financed and constructed using PPPs (Boardman, Siemiatycki and Vining 2016). However, PPPs finance a relatively small proportion of public capital investment: about six per cent in the U.K. over the last 20 years (National Audit Office 2018) and about 10 per cent in Australia (PWC 2017). A PPP is a long-term contract between a government agency and a consortium of private-sector firms. For this paper, a PPP is a long-term contract in which a private-sector entity provides some financing and makes significant contributions to the design, build, operation or maintenance elements of a project for a specified period, typically 20 to 30 years.¹⁷ During this period, the PPP owns the

¹⁷ The extent to which the private sector operates the facility varies enormously. For many roads, there is no operation. For hospitals and schools, the PPP might provide some services, such as laundry and catering; however, the public sector usually retains responsibility for core services, such as medical and educational services.

infrastructure. At the end of the contract period, ownership of the assets is usually transferred to government.

In exchange for performing the contracted activities, the private consortium either: (1) receives an agreed periodic fee from government (an availability payment); (2) obtains payments from government that vary with usage (shadow tolls); or (3) collects tolls directly from end users. In principle, these revenues (i.e., funding) cover the private sector's costs (including a risk premium), plus a profit margin.

The primary theoretical justification for PPPs is that for-profit owners have a greater incentive to hold down costs and improve quality, as compared to government managers. For design/build contracts, however, traditional procurement under fixed-price contracting provides similar incentives. The PPP consortium may also lower lifetime infrastructure costs, if it accounts for the effects of its design/build on operation and maintenance costs. Proponents of PPPs often argue that there is efficient risk transfer in a PPP; that is, risk is transferred to the organization best able to control it. This is simply a variation of the first argument. However, as noted, a fixed-price design/build contract transfers the risk of cost overruns in construction just as effectively. In early PPP projects, the private sector took on the risk that demand might be lower than expected. This resulted in numerous PPP failures. Thus, for the last decade or more, PPP consortiums have been unwilling to take on risks that arise from fluctuations in demand and usage (Vining and Boardman 2008a). Despite some risk transfer in a PPP, governments ultimately retain the risk if a project fails (Vining and Boardman 2008b).

There are many arguments against PPPs. First, PPP proponents argue that PPPs offer better value for money. However, many value for money analyses are performed incorrectly (Boardman and Hellowell 2017). Indeed, PPP costs are often higher than government provision (Petersen 2019). One reason is that there are often few bidders on any particular contract. PPP contracts are also likely to have high transaction costs (Vining and Boardman 2008a). And, if economic externalities or other concerns are important government goals, the PPP contract may not provide any incentives for the private-sector agent to focus on these.

Another important argument against the use of PPPs is that the private sector pays higher rates to borrow than governments do. Some authors argue that the difference in the cost of capital reflects unpriced default risk in the government rate, because government can raise taxes or print money in order to avoid default (Klein 1997; Engel, Fischer and Galetovic 2014). While there may be some unpriced default risk in government borrowing rates, there are at least three reasons why Canadian government borrowing rates are still lower than private rates.

First, by funding a project, a government can spread the project risk (the variation in possible project outcomes around the expected outcome, due to project-specific risk factors) over all taxpayers (Arrow and Lind 1970). The risk that any single individual

faces is vanishingly small with a large enough population. And, as individual taxpayers obtain their consumption from a highly diversified portfolio of public and private sources, adding one more project does not significantly increase the riskiness of their consumption. While private investors can also diversify their investments, it is often the case that (at least initially) PPP ownership is highly concentrated. Indeed, the argument that PPP owners may achieve lower operating costs through better monitoring of managers is predicated on the assumption that they have enough ownership concentration for this monitoring to be worth their while. Thus, it is likely that PPP owners do face project-specific risk and require higher returns as compensation. The fact that PPPs are often refinanced after the construction phase is evidence that project-specific risk increases private-sector financing costs of design/build, as is the tendency for initial PPP owners to attempt to sell their ownership shares in order to diversify their investments (Makovšek and Moszoro 2018). Second, the social cost of bankruptcy is greater for a PPP than for government-owned infrastructure, since the government (by definition) cannot go into receivership. The expected costs of any PPP bankruptcy will be manifested in a higher cost of private financing. Third, a PPP financier is likely to require ex ante compensation to compensate for the political risk that government may engage in opportunistic behaviour ex post (Vining, Boardman and Poschmann 2005). Government might attempt to renegotiate the PPP contract, or even completely expropriate the infrastructure.

We conclude that the government does face a lower cost of borrowing due to a lower social cost of risk in financing infrastructure. Critics of government provision point out that government financing has an additional (hidden) social cost component, because the taxes required to finance the project create distortions. Income taxes, for example, lead to reduced labour supply and associated losses of production. Consequently, the social cost of raising a dollar of government revenue exceeds one dollar (Dahlby 2008). Evidence suggests that raising a dollar of income tax revenue costs society around \$1.20 (Boardman et al. 2020). However, in most PPPs the government makes availability payments to the private sector during the contract period of about 30 years. These payments must provide the private investors with at least a normal rate of return. Since that rate exceeds the rate at which the government discounts the future, the present value of these future government payments will exceed the present value of the upfront financing cost of government provision. Consideration of the additional social cost of taxation will thus further increase the cost of a PPP relative to government provision. PPPs should only be used if cost-benefit analysis indicates that it is a superior method of infrastructure financing and provision, taking into consideration all costs and benefits (Boardman and Vining 2012).

Despite the limitations of PPPs, governments continue to use them for a number of reasons. They avoid upfront government financing costs and shift government funding costs to the future. This avoids increases in current government taxes and reduces borrowing requirements, while delivering more immediate benefits to the users. PPPs reduce the political risk for governments of unsuccessful projects, as they are more likely to be seen as delivering projects on time and within budget.

However, governments often pay more for PPPs to assure this outcome.^{18,19} Another political benefit of PPPs is that private-finance debt is off balance sheet in government accounts. Thus, the financial situation of government appears to be better than it actually is—an example of fiscal illusion (Boardman and Vining 2012). Furthermore, governments (or government departments) have more budget flexibility and spending power in the short term, but their flexibility is constrained in the long term. PPPs also provide financial benefits to aligned interest groups, such as law firms, investment banks and large construction firms and consultants. If the project involves user fees, such as tolls, the PPP option creates greater distance between toll-paying voters and government, reducing the political risk of any toll increases. In practice, a major reason why governments use PPPs is that, for government departments, they are the only feasible option (National Audit Office 2018).

PRIVATE EQUITY

Private equity has partially financed some very large infrastructure projects, such as the Suez Canal (Baer 1956). Currently, many infrastructure projects are financed with private equity, including pipelines and telecommunications projects. Small private equity investors can buy shares of these companies. Typically, PPP consortiums receive equity finance from their members; that is, firms that are directly engaged in infrastructure design/build, operation or maintenance. Sometimes, however, private equity holders do participate directly at the initial financing stage, for example in the Chunnel, which we discuss in the appendix. Gemson, Gautami and Rajan (2012) discuss the potential use of private equity for financing infrastructure projects. They argue that private equity investors prefer projects that are already in operation and so have less revenue risk, such as with the privatization of existing assets, rather than financing greenfield projects.

GOVERNMENT LOAN GUARANTEES

Governments could encourage private financing of infrastructure provision by providing loan guarantees to private lenders. While this would lower the private finance costs, with or without a PPP, it would create a moral hazard problem, as the borrower would be insured against default. This would encourage excessive risk taking by the infrastructure provider, with taxpayers having to bail out any failed ventures. It may also encourage overdesign (Rothengatter 2019).

¹⁸ Edwards et al. (2004) conclude that the U.K. Highways Agency paid a construction-cost premium of 25 per cent for its first four PPP road projects to ensure that they were built on time and within budget. Similarly, in their examination of European road project PPPs undertaken between 1990 and 2005, Blanc-Brude, Goldsmith, and Vällilä (2009) conclude that ex ante construction prices were approximately 24 per cent higher than for traditionally procured roads. They find that this is roughly equivalent to the ex post cost overruns for traditionally procured projects.

¹⁹ In B.C., for example, the Golden Ears Bridge final construction cost was \$808 million, while the initial cost estimate was \$600 million; the Canada Line's initial cost estimate was \$1.35 billion, while the PPP contract was signed for \$2.1 billion; the William Bennett Bridge in Kelowna was announced as a \$100-million project, but the contracted cost was \$144 million (Boardman, Siemiatycki and Vining 2016).

PUBLIC PENSION PLAN INVESTMENT

Canadian public pension plans invest a substantial proportion of their assets in infrastructure as a class.²⁰ Many invest 10 per cent or more of their portfolios in infrastructure. They do this on a direct basis, using internal investment teams. Australian superannuation funds also have significant infrastructure portfolios. U.S. pension fund infrastructure allocations have been much smaller. For the 25 largest U.S. public pension systems, the average is below one per cent of assets (Lipshitz and Walter 2019, 103).

Pension plans may invest in infrastructure in a variety of ways, including direct or collaborative investments, or through closed- or open-end infrastructure funds. Pension plans are potentially a well-matched source of finance, because infrastructure with user charges can provide a steady, long-term cash flow with which to pay retirees. Infrastructure investment may also allow better diversification of pension portfolios (Lipshitz and Walter 2019, 80–81). However, pension plans may be reluctant to invest without predictable cash flows. This may require some kind of government-guaranteed cash flow, such as availability payments to a PPP. Pension funds do not want to bear design/build construction risk. Once the design/build portion of a PPP is complete, construction and engineering firms wish to end their financial exposure. Both sides can gain if pension funds assume the construction and engineering firms' PPP equity at the end of the construction phase.

Public pension plans may focus solely on maximizing long-run returns for their members, or they may have additional goals.²¹ They may also be subject to political influence. This might lead them to account for externalities, which private financiers will ignore. However, it could also result in pressure to divert funds to undesirable projects for political reasons.

COMBINED PUBLIC-PRIVATE FINANCING

In practice, infrastructure projects may have multiple sources of financing, both public and private. Typically, PPPs are financed by a combination of debt and private-sector equity. The government may provide loan guarantees or other sources of financing. In 2017, Canada established the Canada Infrastructure Bank, a Crown Corporation. Its mandate is to finance and attempt to obtain co-financing from private-sector and institutional investors for infrastructure projects. The focus is on projects that can

²⁰ Della Croce (2012, 13) refers to the large Canadian pension plans as “some of most experienced infrastructure investors in the world.”

²¹ In 2005, Article 4 of the Caisse de Dépôt et Placement du Québec's founding statute was amended to make the institution's mandate explicit: “4.1. The mission of the Fund is to receive moneys on deposit as provided by law and manage them with a view to achieving optimal return on capital within the framework of depositors' investment policies while at the same time contributing to Québec's economic development.” <http://legisquebec.gouv.qc.ca/en/ShowDoc/cs/C-2>. Accessed April 30, 2020.

generate revenues from user charges and that are economically efficient. It may use loans, equity or loan guarantees.²²

9. INFRASTRUCTURE PROVIDERS: FUNDING

In all infrastructure investment, funding comes from users or government. Everything discussed above with respect to funding of the assembler applies here. Railways generate revenue from users, but the amount collected may be insufficient to cover the construction or operating costs. In this situation, the assembler can waive or reduce the fees for granting (or transferring) the rights of way to the railways. Furthermore, it can grant the railways land tenures, similar to those for Canada's first transcontinental railway, built 1881-85. Of course, providing a railway with free land would first require the assembler to obtain the land rights. Government might subsidize construction or operating costs. Railways are state-owned in many countries, and this is a possibility for some railway routes on the corridor.

Government funding usually comes from increased taxation or reduced spending. The other funding possibility is the sale of a government-financed infrastructure asset, that is, privatization. Privatization is frequently used in the U.S. as a way of raising government revenue (Boardman and Vining 2010). Typically, the asset sold has been in operation for some time and has a steady cash flow from tolls (e.g., the Chicago Skyway). Government-owned infrastructure on the CNC will be new and have no proven revenue stream, at least initially, and so is unlikely to be privatized.

Because government has a lower cost of capital, an asset with a revenue stream is worth more to government (and society) than to the private sector. Thus, the present value of the future tolls is worth more to government. In general, users are not in favour of such privatization, because they quite reasonably anticipate that the new private owner will raise tolls. In some circumstances (e.g., the B.C. government's proposed privatization of the Coquihalla Highway), the political outcry leads the government owner to back down, remove the tolls and abandon any thought of privatization.

10. FUNDING REGULATORY BODIES

Some new infrastructure projects require new regulatory bodies. One example is the Anglo-French Intergovernmental Commission, which regulates the construction and operation of the Channel Tunnel and monitors Eurotunnel's compliance with the concession agreement. A new regulatory body was appropriate, because this was a completely new, multijurisdictional service operating in a unique environment.

For the proposed CNC, it is unclear whether there need be any new regulatory bodies or whether the assembler need have any new regulatory powers. Granting of such

²² <https://cib-bic.ca/en/about-us/mission-and-mandate/>. Accessed April 30, 2020.

powers to the assembler would require parliamentary approval, which would delay provision of the infrastructure. If the assembler were given regulatory responsibilities, they would probably overlap with those of other authorities, which could lead to regulatory redundancy and interagency conflicts, delaying the approval process.

It is more likely that existing regulatory bodies would continue to have jurisdiction and, if so, they would be funded in the usual way. For example, the Canada Energy Regulator (CER) is funded through a cost-recovery formula. Regulated firms (interprovincial and international oil, gas and electric utilities) are charged an annual fee to cover CER operations. This fee, in turn, is added as an allowable expense for the purposes of calculating their cost of service, which is then reflected in the regulated prices. Effectively, end users fund the regulator.

11. CONCLUSIONS AND AREAS OF FUTURE RESEARCH

This paper examines national and international methods of financing and funding for the CNC assembler and the infrastructure providers. All multimodal infrastructure projects for which we could find evidence are multijurisdictional, and there are few of these. The limited evidence shows that they usually get built when one national or supranational entity is prepared to finance corridor assembly. In the Canadian context, we think that the CNC assembler would either be a federal government entity, or it would involve federal, provincial and territorial governments. In addition, Indigenous groups with constitutional or quasi-constitutional rights might be parties. All the evidence suggests that the assembler would be government-financed. If it is only federal, then the federal government must provide all the financing. If it involves multiple governments, then financing shares and funding formulas will need to be negotiated in advance.

Once the assembler obtains rights of way, government, private investors or some combination of both can provide infrastructure finance and funding. The private sector is often a strong promoter of infrastructure projects. However, private-sector financing and funding of the infrastructure are possible only where there is sufficient anticipated demand and revenues. The infrastructure providers could be fully private, regulated or unregulated firms, or PPPs. However, there is a reluctance among private investors who participate in a PPP to take on demand risk (as illustrated by our discussion of Highway 407 in the appendix). Projects that start out as PPPs often end up being government-financed, such as the Highway 407 project and the Port Mann Bridge in Vancouver.

The evidence indicates that large infrastructure projects nearly always involve governments on some level. For some projects in the EU, there are a bewildering array of government agencies involved. Private entities can provide equity and loan financing.

Canada has used all of the potential sources of funding of infrastructure projects discussed in the paper. There do not appear to be any novel international funding examples.

Some potential areas for future research are:

- How to give various governments and Indigenous groups sufficient incentives to contribute to the CNC assembly. This might entail research on how to obtain revelation of each entity's true willingness to pay for the corridor, and solutions to free-riding problems. This could draw upon the theory of multilateral organizations (Hoffmann 2003), the theory of public-goods contributions (Poteete, Janssen and Ostrom 2010), and strategies to deter free-riding (Heitzig, Lessmann and Zou 2011) and how to best achieve intergovernmental agreements in the context of infrastructure planning (Edwards 2007).
- How to design auctions of the rights to build and provide infrastructure on the CNC. Auction design theory would be relevant here (McAfee and McMillan 1987; Klemperer 2004). More research is required to refine and apply these ideas as a means of funding CNC assembly.
- Property rights are divisible into specific kinds of use and are always fractionalized to some degree (Scott 2008; Vining and Weimer 2016). Further research is needed on how to optimally fractionalize property rights on the CNC; i.e., how to create an economically efficient and equitable legal framework in order to facilitate easements in the CNC, and transactions between property right holders, the assembler and infrastructure providers.

REFERENCES

- Arrow, Kenneth J., and Robert C. Lind. 1970. "Uncertainty and the evaluation of public investment decisions." *American Economic Review* 60(3): 364-378.
- Athukorala, Premachandra, and Suresh Narayanan. 2018, "Economic corridors and regional development: The Malaysian experience." *World Development* 106: 1-14.
- Baer, Werner. 1956. "The promoting and the financing of the Suez Canal." *The Business History Review* 30(4): 361-381.
- Batt, H. William. 2001. "Value capture as a policy tool in transportation economics: An exploration in public finance in the tradition of Henry George." *American Journal of Economics and Sociology* 60(1): 195-228.
- Bazel, Philip, and Jack Mintz. 2014. "The free ride is over: Why cities, and citizens, must start paying for much-needed infrastructure." *SPP Research Paper* 7-14.
- Bird, Richard M., and Enid Slack, eds. 2017. *Financing Infrastructure: Who Should Pay?* McGill-Queen's Press-MQUP.
- Blanc-Brude, Frederic, Hugh Goldsmith, and Timo Vällilä. 2009. "A comparison of construction contract prices for traditionally procured roads and public-private partnerships." *Review of Industrial Organization* 35(1-2): 9-40.
- Boardman, Anthony E., David H. Greenberg, Aidan R. Vining, and David L. Weimer. 2018. *Cost-Benefit Analysis: Concepts and Practice*, 5th edition. New York: Cambridge University Press.
- Boardman, Anthony E., David H. Greenberg, Aidan R. Vining, and David L. Weimer. 2020. "Efficiency without apology: Consideration of the marginal excess tax burden and distributional impacts in benefit-cost analysis." *Journal of Benefit-Cost Analysis* (forthcoming).
- Boardman, Anthony E., and Mark Hellowell. 2017. "A comparative analysis and evaluation of specialist PPP units' methodologies for conducting value for money appraisals." *Journal of Comparative Policy Analysis* 19(3): 191-206.
- Boardman, Anthony E., and Lester B. Lave. 1977. "Highway congestion and congestion tolls." *Journal of Urban Economics* 4(3): 340-359.
- Boardman, Anthony E., and Mark A. Moore. 2020. "Hybrid organizations providing local government services: Local government mixed enterprises." In *A Handbook on Hybrid Organisations*, edited by David Billis and Colin Rochester, 66-81. London: Edward Elgar Publishing Limited.

- Boardman, Anthony E., Matti Siemiatycki and Aidan R. Vining. 2016. "The theory and evidence concerning public-private partnerships in Canada and elsewhere." *SPP Briefing Paper 9*: 12.
- Boardman, Anthony E., and Aidan R. Vining. 2010. "P3s in North America: Renting the money (in Canada), selling the roads (in the USA)." In *International Handbook on Public-Private Partnerships*, edited by G.A. Hodge, C. Greve, and A.E. Boardman, 354-398. Cheltenham, U.K.: Edward Elgar.
- Boardman, Anthony E., and Aidan R. Vining. 2012. "The political economy of public-private partnerships and analysis of their social value." *Annals of Public and Cooperative Economics* 83(2): 117-141.
- Boase, Joan Price. 1999. "Beyond government? The appeal of public-private partnerships." *Canadian Public Administration* 43(1): 75-92.
- Brunner, Hans-Peter. 2013. "What is economic corridor development and what can it achieve in Asia's subregions?" ADB Working Paper Series on Regional Economic Integration, No. 117, Asian Development Bank (ADB), Manila. Accessed April 30, 2020. <http://hdl.handle.net/11540/2308>
- Castlereagh Associates. 2019. "The INSTC, transregional connectivity and geopolitics." Available at <https://castlereagh.net/the-instc-transregional-connectivity-and-geopolitics/>. Accessed April 30, 2019.
- Chapman, Jeffery. 2017. "Value capture taxation as an infrastructure funding technique." *Public Works Management and Policy* 22(1): 31 -37.
- Connolly, Ciaran, and Anthony Wall. 2016. "Value capture: A valid means of funding PPPs?" *Financial Accountability and Management* 32(2): 157-178.
- Dahlby, Bev 2008. *The Marginal Cost of Public Funds: Theory and Application*. Cambridge, Mass.: The MIT Press.
- Della Croce, Raffaele. 2012. "Trends in large pension fund investment in infrastructure." OECD Working Papers on Finance, Insurance and Private Pensions No.29. OECD Publishing: Paris.
- Edwards, Pam, Jean Shaoul, Anne Stafford and Lorna Arblaster. 2004. *Evaluating the Operation of PFI in Roads and Hospitals*. London: Certified Accountants Educational Trust.
- Edwards, Torry L. 2007. "Sustainable intergovernmental agreements: A case study of civil infrastructure design and regional cooperation." *Public Works Management and Policy* 12(1): 370-377.

- Engel, Eduardo, Ronald Fischer, and Alexander Galetovic. 2014. "Risk and public-private partnerships." *CESifo DICE Report* 12(3): 3-7.
- European Commission, Innovation and Networks Executive Agency. 2019. "The Connecting Europe Facility: Five years supporting European infrastructure." EC: Brussels. Accessed April 30, 2020. https://ec.europa.eu/inea/sites/inea/files/cefpub/cef_implementation_brochure_web_final.pdf
- Feldstein, Martin S. 1972. "Equity and efficiency in public sector pricing: The optimal two-part tariff." *The Quarterly Journal of Economics*: 176-187.
- Fine, Sean. 2018. "Supreme Court endorses legislation creating national securities regulator." *The Globe and Mail*, November 29.
- Flyvbjerg, Bent, Nils Bruzelius, and Werner Rothengatter. 2003. *Megaprojects and Risk: An Anatomy of Ambition*. Cambridge, U.K.: Cambridge University Press.
- Friedman, Lee S., and Christopher Weare. 1993. "The two-part tariff, practically speaking." *Utilities Policy* 3(1): 62-80.
- Fung, Kwok-Chiu, Alicia Garcia-Herrero, and Francis Ng. 2012. "Foreign direct investment in financing regional infrastructure." In *Infrastructure for Asian Connectivity*, edited by Biswa Nath Bhattacharyay, Masahiro Kawai, and Rajat M. Nag, 402-483. Cheltenham, U.K.: Edward Elgar Publishing Limited.
- Gemson, Josephine, K. V. Gautami, and A. Thillai Rajan. 2012. "Impact of private equity investments in infrastructure projects." *Utilities Policy* 21: 59-65.
- Goldsmith, Hugh, and Patrick Boeuf. 2019. "Digging beneath the iron triangle: the Chunnel with 2020 hindsight." *Journal of Mega Infrastructure and Sustainable Development* 1(1): 79-93.
- Gourvish, T. 2006. *The Official History of Britain and the Channel Tunnel*. London: Routledge.
- Heftman, Jeffery M. 2002. "Railroad right-of-way easements, utility apportionments, and shifting technological realities." *University of Illinois Law Review* 202: 1401-1426.
- Heitzig, Jobst, Kai Lessmann, and Yong Zou. 2011. "Self-enforcing strategies to deter free-riding in the climate change mitigation game and other repeated public good games." *Proceedings of the National Academy of Sciences* 108(38): 15739-15744.
- Hoffmann, Stanley. 2003. "World governance: Beyond utopia." *Daedalus* 132(1): 27-35.
- Klein, Michael. 1997. "The risk premium for evaluating public projects." *Oxford Review of Economic Policy* 13(4): 29-42.

- Klemperer, Paul. 2004. *Auctions: Theory and Practice*. Princeton, N.J.: Princeton University Press.
- LAPSSET Corridor Development Authority. 2015. *Investment Prospectus*. Accessed April 30, 2020. <https://drive.google.com/file/d/0B7w3900K6lYnNI8xZ1VidWM2NVE/view>.
- Leandro, Francisco Jose. 2018a. "Combining the 'belt' with the roads at the heart of Europe: Geopolitics of the BBSP Corridor." *Megatrend Review* 15(3): 207-224.
- Leandro, Francisco Jose. 2018b. "The OBOR global geopolitical drive: The Chinese access security strategy." In *The Belt and Road Initiative: Law, Economics and Politics*, edited by Julien Chaisse and Jedrzej Gorski, 83-106. Leiden: Brill Nijhoff.
- Lipshitz, Clive, and Ingo Walter. 2019. *Bridging the Gaps: Public Pension Funds and Infrastructure Finance*. New York: NYU Stern Global Institute for Advanced Study.
- Makovšek, Dejan, and Marian Moszoro. 2018. "Risk pricing inefficiency in public-private partnerships." *Transport Reviews* 38(3): 298-321.
- Manthorpe, Jonathan. 2019. *Claws of the Panda: Beijing's Campaign of Influence and Intimidation in Canada*. Toronto: Cormorant Books.
- Marshall, Tim. 2014. "The European Union and major infrastructure policies: The reforms of the trans-European networks programmes and the implications for spatial planning." *European Planning Studies* 22(7): 1484-1506.
- McAfee, R. Preston, and John McMillan. 1987. "Auctions and bidding." *Journal of Economic Literature* 25(2): 699-738.
- Mendoza, E., M. Gold, P. Cater, and J. Parmar. 1999. "The sale of Highway 407 express toll route: A case study." *Journal of Project Finance* 5(3): 5-14.
- Moore, Mark A., Anthony E. Boardman, and Aidan R. Vining. 2013a. "More appropriate discounting: The rate of social time preference and the value of the social discount rate." *Journal of Benefit-Cost Analysis* 4(1): 1-16.
- Moore, Mark A., Anthony E. Boardman, and Aidan R. Vining. 2013b. "The choice of the social discount rate and the opportunity cost of public funds." *Journal of Benefit-Cost Analysis* 4(3): 401-409.
- Moore, Mark A., Anthony E. Boardman, and Aidan R. Vining. 2017a. "Risk in public sector project appraisal - It mostly does not matter!" *Public Works Management and Policy* 22(4): 301-321.

- Moore, Mark A., Anthony E. Boardman, and Aidan R. Vining. 2017b. "Analyzing risk in PPP provision of utility services: A social welfare perspective." *Utilities Policy* 48: 210-218.
- Mylvaganam, Chandran, and Sanford Borins. 2004. *If You Build It: Business, Government and Ontario's Electronic Highway*. Toronto: University Centre for Public Management.
- National Academies of Sciences, Engineering, and Medicine. 2011. *Reinventing the Urban Interstate: A New Paradigm for Multimodal Corridors*. Washington, D.C.: The National Academies Press.
- National Audit Office. 2018. "Report by the Comptroller and Auditor General: PF1 and PF2." HC 718. London: National Audit Office.
- Oi, Walter Y. 1971. "A Disneyland dilemma: Two-part tariffs for a Mickey Mouse monopoly." *The Quarterly Journal of Economics* 85(1): 77-96.
- Petersen, Ole. 2019. "Evaluating the costs, quality, and value for money of infrastructure public-private partnerships: A systematic literature review." *Annals of Public and Cooperative Economics* 90(2): 227-244.
- Poteete, Amy R., Marco A. Janssen, and Elinor Ostrom. 2010. *Working Together: Collective Action, the Commons, and Multiple Methods in Practice*. Princeton, N.J.: Princeton University Press.
- Priemus, Hugo, and Wil Zonneveld. 2003 "What are corridors and what are the issues? Introduction to special issue: The governance of corridors." *Journal of Transport Geography* 11(3): 167-177.
- PWC. 2017. "Reimagining Public Private Partnerships." Accessed April 30, 2020. <https://www.pwc.com.au/legal/assets/reimagining-ppps-oct17.pdf>,
- Rogerson, William P. 1992. "Optimal depreciation schedules for regulated utilities." *Journal of Regulatory Economics* 4(1): 5-33.
- Rothengatter, Werner. 2017. "Wider economic impacts of transport infrastructure investments: Relevant or negligible?" *Transport Policy* 59: 124-133.
- Rothengatter, Werner. 2019. "Megaprojects in transportation networks." *Transport Policy* 75: A1-A15.
- Rysman, Marc. 2009. "The economics of two-sided markets." *Journal of Economic Perspectives* 23(3): 125-43.

- Schmalansee, Richard. 1981. "Monopolistic two-part pricing arrangements." *The Bell Journal of Economics*: 12(2): 445-466.
- Scott, Anthony. *The Evolution of Resource Property Rights*. Oxford University Press, 2008.
- Sulzenko, Andrei, and G. Kent Fellows. 2016. "Planning for infrastructure to realize Canada's potential: The corridor concept." *SPP Publications* 9.
- Thaler, Richard H. 1988. "Anomalies: The winner's curse." *Journal of Economic Perspectives* 2(1): 191-202.
- Vining, Aidan R., and Anthony E. Boardman. 2008a. "Public-private partnerships in Canada: Theory and evidence." *Canadian Public Administration* 51(1): 9-44.
- Vining, Aidan R., and Anthony E. Boardman. 2008b. "Public-private partnerships: Eight rules for governments." *Public Works Management and Policy* 13(2): 149-161.
- Vining, Aidan R., Anthony E. Boardman, and Finn Poschmann. 2005. "Public-private partnerships in the U.S. and Canada: There are no 'free lunches'." *Journal of Comparative Policy Analysis* 7(3): 199-220.
- Vining, Aidan R., and David L. Weimer. 2016. "The challenge of fractionalized property rights in public-private hybrid organizations: The good, the bad, and the ugly." *Regulation and Governance* 10(2): 161-178.
- Williamson, Oliver. 1985. *The Economic Institutions of Capitalism*. New York: The Free Press.

APPENDIX: CASE STUDIES OF LARGE INFRASTRUCTURE PROJECTS

This appendix contains more detailed information about the projects summarized in Table 1, as well as some other informative projects, with a focus on financing and funding. We begin with examples of Canadian unimodal infrastructure projects: Highway 407 and the St. Lawrence Seaway. Then we consider multijurisdictional corridors. We discuss The International North-South Transport Corridor (INSTC), which is unimodal. Then, we focus on multimodal and multijurisdictional corridors, specifically: The Slave Geological Province Corridor Project, the Channel Tunnel, the Lamu-Southern Sudan-Ethiopia Transport Corridor (LAPSSET), Trans-European Networks (TENs), the Greater Mekong Subregion Program (GMS), and the Chinese Belt and Road Initiative.

Highway 407 Express Toll Route (407 ETR). Highway 407 ETR is part of Ontario Highway 407 (aka King's Highway 407), which is now a controlled-access, 151 kilometre highway that crosses the north side of metropolitan Toronto. The original request for proposals (RFP) was announced in the fall of 1993, when the province of Ontario was emerging from a recession that had left it in an extremely weak financial position (Mylvaganam and Borins 2004). This RFP proposed a PPP under which the province would be responsible for land assembly and related costs, while the private partner would provide financing, guarantee a maximum construction price and operate the highway. It would be funded from toll revenues, but neither traffic levels nor toll revenues were guaranteed. In the responses to the RFP, it became clear that credible private partners were unwilling to assume the financing risks in addition to construction and operating risks. Eventually, the province assumed the financing. One consortium was allocated the contract for construction and highway maintenance, while the other was contracted to manage the toll system. This removal of financial risk fundamentally transformed the nature of the project. The private partner was now tendering a fixed-price construction project (Vining, Boardman and Poschmann 2005).

The province retained the operational risk during the first 18 months of the highway's operation. However, in 1999, the province sold the operating concession to a Canadian-Spanish-Australian consortium called 407 International Inc. for \$3.1 billion (Mendoza et al. 1999). This was, in effect, a privatization, although the concession term was for 99 years, after which ownership of the asset would revert to the government. Tolls were not regulated and have been raised many times, over objections from users. One justification used by the consortium to justify higher tolls was to reduce congestion.

Despite the fact that this project was, in effect, a government fixed-price contract and the highway was ultimately privatized, the Canadian Council for Public-Private Partnerships regarded it as a success and awarded it a gold medal. However, those who focus on the lack of risk transfer, such as Boase (1999), regard it as a failure.

St. Lawrence Seaway. This seaway is a system of locks, canals and channels that link the Great Lakes and the St. Lawrence River with the Atlantic Ocean. It was jointly financed by the U.S. and Canadian governments, with over 70 per cent of the funds paid by Canada. These governments financed the assembly of the property rights that

they did not already own. Some of these rights were acquired through expropriation and required resettling entire communities. The governments also financed construction of the locks and other capital expenditures. Under the original financial arrangements, there were insufficient funds to repay the capital debt, interest and operating costs. In 1977, a change in legislation converted Canadian Seaway Authority debt into equity held by the government, but required that tolls cover all operating and maintenance costs, which they now do.²³ However, both federal governments still contribute to major capital expenditures.²⁴ The success of this project depends largely on users' willingness to pay the tolls.

The International North-South Transport Corridor (INSTC).²⁵ This multimodal, multinational corridor, which would consist of a network of railways, roads and shipping routes, is intended to link Russia to the Persian Gulf and the Indian Ocean, from St. Petersburg to Mumbai. Consequently, freight would not have to go through the Suez Canal, resulting in a reduction in travel time from 60 to 39 days. The three founding members were India, Iran and Russia. The project started almost 20 years ago, but is still not finished. While only 160 kilometres of rail track remains to be laid from Rasht to Astara in northern Iran, commitment seems to be waning. Geopolitical problems among member states have put the project's future in doubt. Only 10 per cent of the capacity at the port at Chabahar has been installed and India has slashed its spending commitment to Chabahar from \$22 million to \$6.5 million. Part of the reason may be renewed U.S. sanctions on Iran. India is also focusing more effort on reducing Chinese influence in the Indian Ocean and on strengthening ties with countries belonging to the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation.

The Slave Geological Province Corridor Project. This project is a proposed 413 kilometre, two-lane transportation, hydro-electric transmission and communications infrastructure corridor that would link areas of mineral potential in the Northwest Territories to points south, and ultimately a deep-water port in Nunavut. In August 2019, the government of the Northwest Territories and the federal government announced that they were investing \$40 million to support regulatory reviews and planning studies.²⁶ It appears that funding was to come from value captured through direct taxation of persons, corporate taxes, indirect taxation and mineral royalties. We could find no evidence that direct financing or funding would come from the private sector.

The Channel Tunnel (The Chunnel). The Chunnel was the one of the largest infrastructure projects in the world. It is a unimodal rail tunnel that goes between England and France. The contract was structured as a PPP: the private sector would finance, design, build and operate the tunnel, and it would be funded by user

²³ <https://www.thecanadianencyclopedia.ca/en/article/st-lawrence-seaway>. Accessed April 30, 2020.

²⁴ <https://greatlakes-seaway.com/en/>. Accessed April 30, 2020.

²⁵ This analysis is based on Castlereagh Associates (2019).

²⁶ <https://www.inf.gov.nt.ca/en/SGP>. Accessed April 30, 2020.

charges. The English Channel Tunnel Group (CTG) and the French France Manche S.A (F-M) formed the CTG/F-M Group. Both of these organizations consisted of banks and construction companies. CTG/F-M bid for and won the contract. Initially, Eurotunnel, the original project organizer, was a wholly owned subsidiary of CTG/F-M. However, after the group won the contract, Eurotunnel absorbed CTG/F-M and took responsibility for financing and delivering the contract. It signed a design/build contract with the construction companies, who had put up the initial equity finance and were effectively in control. This contract was not fixed-price and was not date-certain. Thus, there was little in the contract to ensure that the project would be delivered on time or on budget. Eurotunnel had to finance it. Initial private financing came from private institutional placements, a public share offer, and syndicated bank loans. Once the tunnel was operating, users were expected to fund it. Eurotunnel faced all of the demand risk and much of the construction-cost risk.

The project incurred many construction delays and cost overruns, some were due to enhanced safety, security, and environmental demands. These problems, in turn, led to the need for more financing, and there were further rights issues to raise equity in 1990 and 1994, during construction. The actual cost overruns were over 100 per cent of the forecast costs (Gourvish 2006). Another major problem was optimistic usage estimates. Initial passenger use (about 2.9 million per year) was far less than anticipated (about 15.9 million). For freight trains, the actual use (1.3 million gross tonnes) was far less than anticipated (7.2 million gross tonnes). In 1995, the first full year of operation, the unexpected shortfall in revenues became evident and Eurotunnel was in financial difficulty. It posted huge losses and suspended debt payments. In 1998, it was restructured, thereby reducing its debt and financial charges. But this was not sufficient and there was a second restructuring in 2007. The initial investors lost most of their equity, although they got free travel privileges (at least for a while), as did the banks that provided the initial loans. However, unlike many PPPs, Eurotunnel received very little money from any government source in the form of subsidies, grants or loans. Currently, it is making money and paying dividends. Goldsmith and Boeuf (2019) argue that while the tunnel does not show up well according to traditional evaluation criteria, it has delivered real economic benefits and has been an important agent of change.

The Lamu-Southern Sudan-Ethiopia Transport (LAPSSET) Corridor. This corridor is a proposed multimodal corridor from Lamu in Kenya to South Sudan, Ethiopia, and Uganda (LAPSSET Corridor Development Authority 2015). The proposal consists of a port at Lamu; railroads to Juba and Addis Ababa; roads and oil pipelines to South Sudan and Ethiopia; an oil refinery; an electricity transmission line; three airports; and three resorts. The expected cost is on the order of US\$24.5 billion. Most of the financing appears to be coming from the government of Kenya and development banks, particularly the African Development Bank, but there is also EU money. The Development Bank of South Africa provided some construction financing. The Kenyan government welcomes participation by the private sector through equity and infrastructure bonds. For example, the first three berths of the Lamu port are being financed by the government of Kenya; the remaining 29 berths will be financed by

private-sector investors, according to the investment prospectus. It is unclear how much progress has been made, other than the port at Lamu.

Trans-European Networks (TENs). TENs consists of three networks: transport (TEN-T), energy and communications. The EU created the networks with the intention of creating an internal market and reinforcing economic and social cohesion. The TEN-T, for example, is a planned network of roads, railways, airports and water infrastructure. The backbone for the TEN-T network consists of nine core pan-European corridors. Financing for the TEN-T comes primarily from grants from the Connecting Europe Facility (CEF), which is intended to promote growth, jobs and competitiveness through targeted infrastructure investments. The CEF plans to allocate about 24.2 billion euros to the TEN-T. Infrastructure financing comes from the private sector and from European Investment Bank loans, where necessary, with budget guarantees provided by the CEF and the European Fund for Strategic Investment. There is little available information about funding.²⁷ Presumably, some funding will come from user fees.

The Brenner Base Tunnel is a major infrastructure project of the TEN-T. It is part of the Scandinavian-Mediterranean corridor, one of the nine core pan-European corridors. Financing of this infrastructure is being shared approximately 50-50 between the EU and the two connected countries, Austria and Italy.²⁸ Construction contracts appear to be traditional fixed-price design/build procurement with a consortium of private-sector construction and engineering firms. The 18-kilometre Fehmarnbelt immersed tunnel road and rail link between Germany and Denmark is another planned component of the Scandinavian-Mediterranean corridor. It also appears to be government financed, with traditional government procurement. For both tunnels, one may infer that passenger or freight user fees could provide some of the funding, but no details on ultimate funding sources are available.²⁹

The Greater Mekong Subregion (GMS) Program. This program consists of many investments in many economic sectors, designed to create more trade and development among China, Vietnam, Laos, Cambodia, Myanmar and Thailand (Kwok-Chiu, Garcia-Herrero and Ng 2012; Brunner 2013). The transportation infrastructure appears to be mainly roads, with some port development. The three corridors are the East-West Economic Corridor, running from Da Nang, Vietnam to Myanmar; the North-South Economic Corridor, from Kuming, China to Bangkok; and the Southern Economic Corridor, in the southern regions of Thailand, Cambodia and Vietnam. The program was launched in 1992. The Asian Development Bank is the coordinator of the US\$26.5 billion budget. While there has been some private financing (e.g., some of the 30 per

²⁷ For a recent discussion of the TENs, see Marshall (2014).

²⁸ "Brenner Base Tunnel: A masterpiece of engineering in Europe." *Tunnel Business Magazine*, April 22, 2019, <https://tunnelingonline.com/brenner-base-tunnel/>. Accessed April 30, 2020.

²⁹ Patrick Reynolds, "Fehmarn Link mega-project contract awards," *TunnelTalk*, March 8, 2016, <https://www.tunneltalk.com/Denmark-Germany-08Mar2016-Fehmarnbelt-immersed-link-contract-awards.php>. Accessed April 30, 2020.

cent equity financing and about half of the 70 per cent debt financing of the Nam Theun Hydropower project in Laos), private finance in infrastructure has been limited by the huge sunk costs, long payback periods, political risks and transaction costs of multijurisdictional negotiations. As a result, from 2009–11, over 70 per cent of financing came from the Asian Development Bank and national governments; PPPs accounted for only about three per cent of financing (Kwok-Chiu, Garcia-Herrero and Ng 2012, 430: Table 11. A7). There is no evidence available on funding.

Belt and Road Initiative (BRI). This initiative is one of the largest infrastructure projects in history. It will involve over 100 countries and will cost trillions of dollars. This initiative consists of a network of corridors, such as the China-Myanmar-Bangladesh-India Economic Corridor and the China-Mongolia-Russia Economic Corridor. Most of the financing comes from the Chinese government directly, or through loans from Chinese state-owned banks. Some financing comes from the Asian Infrastructure Investment Bank, in which China holds almost 30 per cent of the voting rights. Many other countries provide some financing for infrastructure projects in their jurisdictions.

The stated objectives of the BRI refer to addressing an infrastructure gap, as well as benefits from a unified large market, cultural exchange and integration, mutual understanding and trust. Leandro (2018b) offers a geopolitical explanation for the BRI that combines historical facts, geographical characteristics and the quest for security. He argues that the initiative is a “natural result of the combination of Chinese vital interests, lessons learnt from its history, a careful identification of the highest long-term political goals, and a vision of the future in which China plays a leading role in the international relations arena” (Leandro 2018b, 84). In another paper, he argues that the BRI has “the potential to connect Chinese and European markets and production centers, but also to economically tie the European Union, Eastern European Countries, China, the Association of Southeast Asian Nations, the Eurasian Economic Union and perhaps other economic communities in Africa and South America together” (Leandro 2018a, 220). More specifically, he anticipates completion of the Budapest-Belgrade-Skope-Athens (BBSA, sometimes referred to BBSP, replacing Athens with Pireas) corridor, a China-Central and Eastern Europe “hallmark” project of the BRI, to result in rapprochement between the European Union and China.

Others view the BRI as a form of neocolonialism, and there is some evidence of debt-trap diplomacy.³⁰ For example, the Chinese government lent Sri Lanka most of the money to build the Hambantota Port (aka the Magampura Mahinda Rajapaksa Port). The port was owned by the government of Sri Lanka and operated by the Sri Lanka Ports Authority. However, it incurred heavy operational losses and the Sri Lankan government was unable to service the debt. In a debt-for-equity swap, 70 per cent of the port was leased to China for 99 years in 2017. In exchange, the Sri Lankan

³⁰ These concerns have been expressed about COSCO’s 51 per cent ownership of the Piraeus Port Authority (Manthorpe 2019).

government received US\$1.4 billion that it will use to pay off the debt to China.³¹ The port's strategic location and subsequent ownership spurred concern over China's growing economic footprint in the Indian Ocean and speculation that it could be used as a naval base. Proponents of the BRI dismiss such concerns and attribute poor financial performance to inexperienced management.

³¹ https://en.wikipedia.org/wiki/Belt_and_Road_Initiative, https://en.wikipedia.org/wiki/Magampura_Mahinda_Rajapaksa_Port. Accessed April 30, 2020.

About the Authors

Anthony (Tony) Boardman is Professor Emeritus in the Sauder School of Business, University of British Columbia. Tony's research interests are in the areas of cost-benefit analysis, privatization, and public-private partnerships. He has published extensively in many leading academic and practitioner journals, and is a co-author of *Medical Isotope Production Without Highly Enriched Uranium* and *Cost-Benefit Analysis: Concepts and Practice*. He also co-edited the *International Handbook on Public-Private Partnerships*. He has won a number of awards including the Alan Blizzard Award. He serves on the editorial board of the *Journal of Global Operations and Strategic Outsourcing*. Tony has been a consultant to many leading public sector and private sector organisations, and has served on the Board of the Institute for Health System Transformation and Sustainability and the Patented Medicine Prices Review Board.

Mark A. Moore (PhD, Columbia University, Economics) is a Senior Lecturer for Simon Fraser University's Beedie School of Business. He has taught economics at Columbia University, Colgate University and the University of British Columbia. Mark has prepared research reports for the Frontier Centre for Public Policy and the Inter-American Development Bank, and has consulted for the Qikiqtani Inuit Association. His current research is on policy options for governments and Indigenous groups attempting to share in the profits of non-renewable resource firms. He has published several works on the theory and estimation of the appropriate social discount rate, and on the treatment of risk, for use in cost-benefit analysis. He has also published an award-winning paper on the privatization of Canadian National, a welfare analysis of the Canada-US softwood lumber dispute, and studies on mixed (public-private) enterprise.

Aidan Vining is the emeritus CNABS Professor of Business and Government Relations, Simon Fraser University in Vancouver, Canada. He holds a Ph.D. from the Goldman School of Public Policy at the University of California, Berkeley. Aidan has authored over a hundred articles in peer-reviewed journals including the *Journal of Public Administration Research and Theory (JPART)*, the *Journal of Policy Analysis and Management (JPAM)*, and the *Annals of Public and Co-operative Economics*. His work is widely cited (over 13,000 Google Scholar cites). He is a winner of the John Vanderkamp prize (Canadian Economics Association) and the J.E. Hodgetts Award (Institute of Public Administration of Canada). He co-authors *Policy Analysis; Concepts and Practice* (6th Edition, Routledge, 2018) and *Cost-Benefit Analysis: Concepts and Practice* (5th Edition., Cambridge University Press, 2018.)

ABOUT THE SCHOOL OF PUBLIC POLICY

The School of Public Policy has become the flagship school of its kind in Canada by providing a practical, global and focused perspective on public policy analysis and practice in areas of energy and environmental policy, international policy and economic and social policy that is unique in Canada.

The mission of The School of Public Policy is to strengthen Canada's public service, institutions and economic performance for the betterment of our families, communities and country. We do this by:

- *Building capacity in Government* through the formal training of public servants in degree and non-degree programs, giving the people charged with making public policy work for Canada the hands-on expertise to represent our vital interests both here and abroad;
- *Improving Public Policy Discourse outside Government* through executive and strategic assessment programs, building a stronger understanding of what makes public policy work for those outside of the public sector and helps everyday Canadians make informed decisions on the politics that will shape their futures;
- *Providing a Global Perspective on Public Policy Research* through international collaborations, education, and community outreach programs, bringing global best practices to bear on Canadian public policy, resulting in decisions that benefit all people for the long term, not a few people for the short term.

The School of Public Policy relies on industry experts and practitioners, as well as academics, to conduct research in their areas of expertise. Using experts and practitioners is what makes our research especially relevant and applicable. Authors may produce research in an area which they have a personal or professional stake. That is why The School subjects all Research Papers to a double anonymous peer review. Then, once reviewers comments have been reflected, the work is reviewed again by one of our Scientific Directors to ensure the accuracy and validity of analysis and data.

The School of Public Policy

University of Calgary, Downtown Campus
906 8th Avenue S.W., 5th Floor
Calgary, Alberta T2P 1H9
Phone: 403 210 3802

DISTRIBUTION

Our publications are available online at www.policyschool.ca.

DISCLAIMER

The opinions expressed in these publications are the authors' alone and therefore do not necessarily reflect the opinions of the supporters, staff, or boards of The School of Public Policy.

COPYRIGHT

Copyright © Boardman, Moore and Vining 2020. This is an open-access paper distributed under the terms of the Creative Commons license [CC BY-NC 4.0](https://creativecommons.org/licenses/by-nc/4.0/), which allows non-commercial sharing and redistribution so long as the original author and publisher are credited.

ISSN

ISSN 2560-8312 The School of Public Policy Publications (Print)
ISSN 2560-8320 The School of Public Policy Publications (Online)

DATE OF ISSUE

October 2020

MEDIA INQUIRIES AND INFORMATION

For media inquiries, please contact Morten Paulsen at 403-220-2540. Our web site, www.policyschool.ca, contains more information about The School's events, publications, and staff.

DEVELOPMENT

For information about contributing to The School of Public Policy, please contact Catherine Scheers by telephone at 403-210-6213 or by e-mail at catherine.scheers@ucalgary.ca.

RECENT PUBLICATIONS BY THE SCHOOL OF PUBLIC POLICY

CROSS-CANADA INFRASTRUCTURE CORRIDOR, THE RIGHTS OF INDIGENOUS PEOPLES AND 'MEANINGFUL CONSULTATION'

<https://www.policyschool.ca/wp-content/uploads/2020/10/CNC-Indigenous-Wright-final.pdf>

David V. Wright | October 2020

SOCIAL POLICY TRENDS: INCOME INEQUALITY AND LOW BIRTH WEIGHTS, 1979-2017

<https://www.policyschool.ca/wp-content/uploads/2020/10/v2-Social-Policy-Trends-Birth-Weights.pdf>

Ron Kneebone | October 2020

CANADIAN KNOWLEDGE AND ATTITUDES ABOUT DEFENCE AND SECURITY ISSUES

<https://www.policyschool.ca/wp-content/uploads/2020/10/Report-Survey-on-Civil-Military-Relations.pdf>

October 2020

ECONOMIC POLICY TRENDS: THE GENDERED IMPLICATIONS OF AN INFRASTRUCTURE FOCUSED RECOVERY: ISSUES AND POLICY THOUGHTS

<https://www.policyschool.ca/wp-content/uploads/2020/09/EPT-Gender-Implications-2.pdf>

Anna Cameron, Vanessa Morin and Lindsay Tedds | October 2020

TAX POLICY TRENDS: IMPLICATIONS OF A BIDEN WIN FOR U.S. CORPORATE TAX POLICY AND COMPETITIVENESS - U.S. COMPETITIVENESS TO DECLINE

<https://www.policyschool.ca/wp-content/uploads/2020/09/final-Tax-Trends-US-Corporate-Tax-Mintz-Bazel.pdf>

Jack Mintz and Philip Bazel | September 2020

SOCIAL POLICY TRENDS: UNDER PRESSURE: THE ADEQUACY OF SOCIAL ASSISTANCE INCOME

<https://www.policyschool.ca/wp-content/uploads/2020/09/FINAL-SPT-Sept-Kneebone.pdf>

Ron Kneebone | September 2020

COMPREHENSIVE DENTAL CARE IN CANADA: THE CHOICE BETWEEN DENTICAID AND DENTICARE

https://www.policyschool.ca/wp-content/uploads/2020/09/Final_Comprehensive-Dental-Care-Lange.pdf

Thomas Christopher Lange | September 2020

STARTING FROM SCRATCH: A MICRO-COSTING ANALYSIS FOR PUBLIC DENTAL CARE IN CANADA

<https://www.policyschool.ca/wp-content/uploads/2020/09/Micro-Costing-Dental-Care-Lange.pdf>

Thomas Christopher Lange | September 2020

SOCIAL POLICY TRENDS: EMERGENCY HOMELESS SHELTER BEDS AND THE COST OF HOUSING IN 50 CANADIAN CITIES

<https://www.policyschool.ca/wp-content/uploads/2020/08/Social-Policy-Trends-Shelter-Beds-vs-Rent-Ratios-August-2020.pdf>

Margarita Wilkins and Ron Kneebone | August 2020

FAMILY FARMERS TO FOREIGN FIELDHANDS: CONSOLIDATION OF CANADIAN AGRICULTURE AND THE TEMPORARY FOREIGN WORKER PROGRAM

<https://www.policyschool.ca/wp-content/uploads/2020/08/Family-Farmers-Falconer.pdf>

Robert Falconer | August 2020

MANDATORY MASK BYLAWS: CONSIDERATION BEYOND EXEMPTION FOR PERSONS WITH DISABILITIES

<https://www.policyschool.ca/wp-content/uploads/2020/08/Mask-Bylaws-Kohek-Seth-Edwards-Zwicker.pdf>

Jessica Kohek, Ash Seth, Meaghan Edwards and Jennifer D. Zwicker | August 2020

CANADA'S HISTORICAL SEARCH FOR TRADE MARKETS

<https://www.policyschool.ca/wp-content/uploads/2020/08/Canadian-Trade-Markets-Bercuson.pdf>

David J. Bercuson | August 2020

SOCIAL POLICY TRENDS: COVID-19 AND REFUGEES IN UGANDA

<https://www.policyschool.ca/wp-content/uploads/2020/07/Social-Policy-Trends-Uganda-July-2020.pdf>

Anthony Byamukama | July 2020