



Innovation and Stakeholder Collaboration in West Coast Gateways: An Analysis of the Seaport and Freight Movement Industries

Report Prepared for the Asia Pacific Foundation of Canada

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Executive Summary

How do organizations and stakeholder dynamics contribute to the adoption of innovation in gateways?

We explore this question through a comparative assessment of the situation in two of North America's major West Coast Gateways – the port of Vancouver, British Columbia, and the twin ports of Los Angeles/ Long Beach (LA/LB), California. Our research approach consists of the identification and assessment of exemplary innovations drawn from the areas of policy, technology, and operations with an emphasis on those directly related to environmental considerations.

Innovation is one means by which actors seek to create and capture value. In a context where the product is a transportation service that is organized in the form of increasingly integrated logistics chains, innovation includes new technologies and processes for handling and moving cargo, but it also includes mechanisms for planning and policy making; as well as financing, implementing, upgrading, managing and operating infrastructure systems. And it also includes the seemingly every-day task of coordinating extremely complex flows of goods. A relatively new arena for competition on the basis of innovation within the seaport and freight sectors concerns environmental innovation.

The case studies of innovation each illustrate the diverse sources of demand for and supply of innovation. These sources may be highly localized, as in the case of the Truck Licensing System, or may be regional, covering the Puget Sound (e.g. ballast water), or even pan-coastal (e.g. enviroTruck) in their origin. There are examples of innovations promoted by lead firms, such as the ship-shore power demanded by Princess Cruise Lines, or by lead jurisdictions ranging from Alaska to southern California. What is common to all these innovations is the important role played by the mediators of innovation, both in their initial development and especially in their diffusion and adoption.

Our analytical framework thus recognizes that while there may be intense demand for and supply of innovation in gateways, the complexities and fragmentation of the logistics chain is such that successful innovation requires conscious attention to mediation. Examples of the mediating forces at work in the development, adoption and diffusion of innovation have been highlighted for both gateways examined in our research. Each of the following mediators of innovation can be found, typically in combination: information supports, stakeholder forums and engagement, technology transfer, adoption incentives and regulation, and formal and informal institutional arrangements.

Finding ourselves in the midst of a global recession, the approach to innovation must change. It is harder in this economic climate for mediators to do big things like coordinate new business processes requiring major equipment or infrastructure investments. Rather than capital intensive technology options, the emphasis is now on learning how to be more efficient, to become better managers of existing operations rather than searching for technological solutions. There is a need to focus on smaller, but not necessarily less effective interventions, such as training and education investments.

1 Gateways in the Global Era

The complexity of many of the most pressing issues we grapple with as a society has been increasing. The forces of economic, cultural and ecological globalization, networked communications, and management sophistication have exposed a myriad of interconnections that often serve to complicate local efforts to find innovative solutions to these challenges. Local actions are now subject to broader considerations; yet appropriate local responses to these challenges are more important than ever before.

In the context of “Building an Asia Pacific Gateway,” this inherent complexity has been identified by those engaged in the process as one of the key challenges. There is more to this challenge than just investing in the right infrastructure to ensure efficient movement of goods and people in and through a port and its surrounding community. There are interconnections in the gateway from many policy arenas – international trade and environmental sustainability - operating through many scales and jurisdictions – from the nation to the neighbourhood – and involving a range of actors including government, NGOs and the private sector. These elements interact against a backdrop of intense competitive pressures between gateways. Early this decade, booming economies and major increases in global trade made for competition that emphasized the capacity of gateways. However, in the recent economic downturn, capacity has given way to other sources of competitive pressure. Regardless of the lines along which gateways may compete in the future, unpacking the complex influences on gateway development remains a pressing challenge.

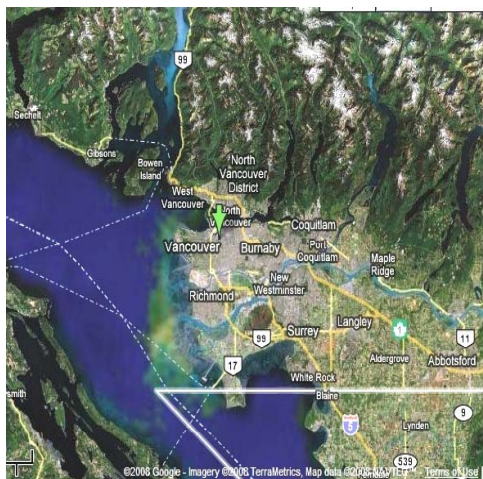


Figure 1: Vancouver Gateway

Source: Google Earth

Considering this description of complexity in the challenges of gateway evolution, two further points become clear and form the focus of this research. First, there is a crucial need for innovation in multiple arenas - innovative policies, regulations, technologies and operating practices. Second, there is a crucial need for real collaboration among stakeholders to create the right environment for the formulation and adoption of these innovations. Our interest lies at the intersection of the need for innovation and collaboration. In this report, we hypothesize that the density of actors and interactions in a gateway port city confers upon these places a special advantage in terms of innovation, especially environmental innovation. However, these advantages are mediated by the challenges of stakeholder collaboration. Our specific research question is:

How do organizations and stakeholder dynamics contribute to the adoption of innovation in gateways?

Our goal is to explore this question through a comparative assessment of the situation in two of North America's major West Coast Gateways – the port of Metro Vancouver, British Columbia (Figure 1), and the twin ports of Los Angeles/ Long Beach (LA/LB), California. While LA/LB and Vancouver compete for much of the same business, they also form part of the same system of ports along the West Coast of North America. As such, they are confronted by many of the same pressures and opportunities, including the need to compete effectively with Gulf Coast and East Coast ports while sustaining/improving quality of life in port communities. While they are exposed to many of the same innovations, stakeholders in both places confront different national and local institutional-legal contexts. Organizational response in one setting may provide valuable lessons for and about responses in the other.

Innovation is one means by which actors seek to create and capture value, but this concept has particular meanings in the seaports and freight industry context. In a context where the product is a transportation service that is organized in the form of increasingly integrated logistics chains, innovation includes new technologies and processes for handling and moving cargo, but it also includes mechanisms for planning and policy making, as well as financing, implementing, upgrading, managing and operating infrastructure systems. And it also includes the seemingly every-day task of coordinating extremely complex flows of goods. While this is a routine yet complex function under normal operating conditions, it is not routine when any sort of change or disruption occurs.

A relatively new arena for competition on the basis of innovation within the seaport and freight sectors concerns environmental innovation (Comtois and Slack, 2007). This response to changing regulations and public perceptions, as well as the threat of litigation, is prompting innovations targeted at the (local) mitigation of the negative externalities such as pollution and congestion.

Our research approach consists of the identification of exemplary innovations drawn from the areas of policy, technology and operations with an emphasis on those directly related to environmental considerations. Following this identification process, a content analysis of documents and **interviews with relevant stakeholder groups and key actors in Vancouver** form the core of our assessment.

Our report moves in the next section to describe innovation in gateways in more detail, ending with the presentation of a conceptual framework of the forces, actors and interrelationships associated with innovation and gateway logistics. Section Three reviews the key insights drawn from our interviews with stakeholders in Vancouver as well as our expert comparison with the innovation landscape in LA/LB. The implications of our findings are discussed in Section Four, and our report concludes with a view to the future of innovation in the Asia Pacific Gateway and Vancouver.

2 Understanding Innovation and Logistics in the Gateway

2.1 Introducing Innovation: demand, supply and mediation

In his 2006 book, *The Box*, Marc Levinson traces the story of the ocean shipping container, without doubt the most important innovation in the transportation industry in the past century. The *demand* for this innovation arose in the context of the post-WWII increase in economic activity and the transition from national to internationally oriented trade. But as Levinson makes clear, this innovation was not a single event, nor indeed does the box itself represent the totality of the innovation. The *supply* of this innovation can be traced to multiple influences including experiments with standardization by the military and entrepreneurs. Indeed, the physical container, while an effective way of protecting goods from the elements, is by itself not particularly revolutionary. The box became revolutionary when the matching of supply and demand led to its wide-scale adoption. This was only achieved when the container was combined with new ship designs, dedicated yard and terminal equipment, terminal leasing policies, changed labour practices, intermodal road and rail connections.

In other words, taking the box as an example of innovation in the transport sector, it is clear that this revolutionary innovation required both supply of, and demand for, innovations as well as an incremental series of connections to policy, regulation, business operations and other technologies. But how did these connections develop and what were the processes that drove the creation and widespread adoption of this innovation?

In identifying innovations and innovative organizations, we follow the definitions used in the 1999 Statistics Canada Survey of Innovation (which borrowed from the 1997 Oslo Manual of OECD/Eurostat), namely that **innovation includes new and improved products, services, or processes of production**. An innovative organization is “one that has offered a new or significantly improved product or introduced a new or significantly improved production/manufacturing process during the last three years.” This definition includes everything from radically new technologies to policies and education activities that support the adoption of systems that are developed elsewhere. Hence our examination of innovations in this research includes both new creation and diffusion/adoption.

Using this expansive definition of innovation, other researchers have identified a series of factors associated with the supply of and demand for innovation, including: competition, diversity, an identified problem, lead firms, customer demands, and partners for primary and applied research including governments and universities (see Porter, 1990; Camagni, 1991; Audretsch and Feldman, 1996). As in the case of the ocean shipping container described above, the presence of these supply and demand factors alone does not guarantee successful innovation. Mediating forces play a critical role in bridging innovation demand and supply. There is a need for a shared understanding among stakeholders in the innovation process (see Nooteboom, 2000; Malmberg and Maskell, 2006), and hence an obvious emphasis on the role of communication and persuasion. There also have to be the right conditions for the acceptance of innovation that go beyond the market: information and education are central to establishing these conditions. And, there is the importance of policy context and the ability to effectively try out innovations. These are but a few of the mediating forces that influence innovation (for a concise summary of the literature, see Onsrud and Pinto, 1991). The container as innovation has

been used here as but one example to explore the innovation process. A key question emerges; is there anything distinctive about innovation supply, demand and the mediating forces in Gateways?

2.2 Gateways and Innovation

2.2.1 Gateway Character: A Natural Place for Innovation?

Gateways are characterized as major urban centres that have evolved at the interface of transportation networks and systems of global commerce. Their populations are large, diverse and often densely located in proximity to the main port complex. They serve extensive hinterland regions while at the same time, connecting this region/local area with the broader global system. They contain the richest mixture of transportation systems and not surprisingly, are major points of transshipment for goods and people. International orientation is a hallmark of their diverse, local economy, which involves not only trade, but important transportation services – legal and insurance for example. They are important economic spaces, often exemplified by the presence of lead firms and head offices. Finally, they are marked by jurisdictional and regulatory complexity – reflecting on the scale and sheer volume of activity and the variety of sectors this too comes as no surprise.

Arguably, one would expect gateways to be places where you would find innovation in abundance. Their density of diverse people, international connections, volumes of activity and competitive pressures should see innovation flourish. Further, these factors would also be linked to many local gateway concerns – congestion, pollution, competition for land – that might further spur innovation. A case can thus be made that in gateways, the supply and demand for innovation are higher than in other centres.

2.2.2 Challenges to Innovation in the Gateway

The description above underscores an expectation for innovation in gateways. However, many of those factors are also influences that may work against innovation. Jurisdictional issues across all scales, competition (marketplace dynamics) within local sectors, variation in levels of innovation within industry segments, and changing fortunes of the global economy may all act as disincentives for innovation. There is also a potential lack of true local (municipal-regional) urban goods movement planning, which has historically tended to be piecemeal, crisis driven and litigious. Finally, there is also the “gateway conundrum” – the tension or disconnect between the national benefits of gateway logistics activity and the local costs – which may also work to counter the forces driving innovation.

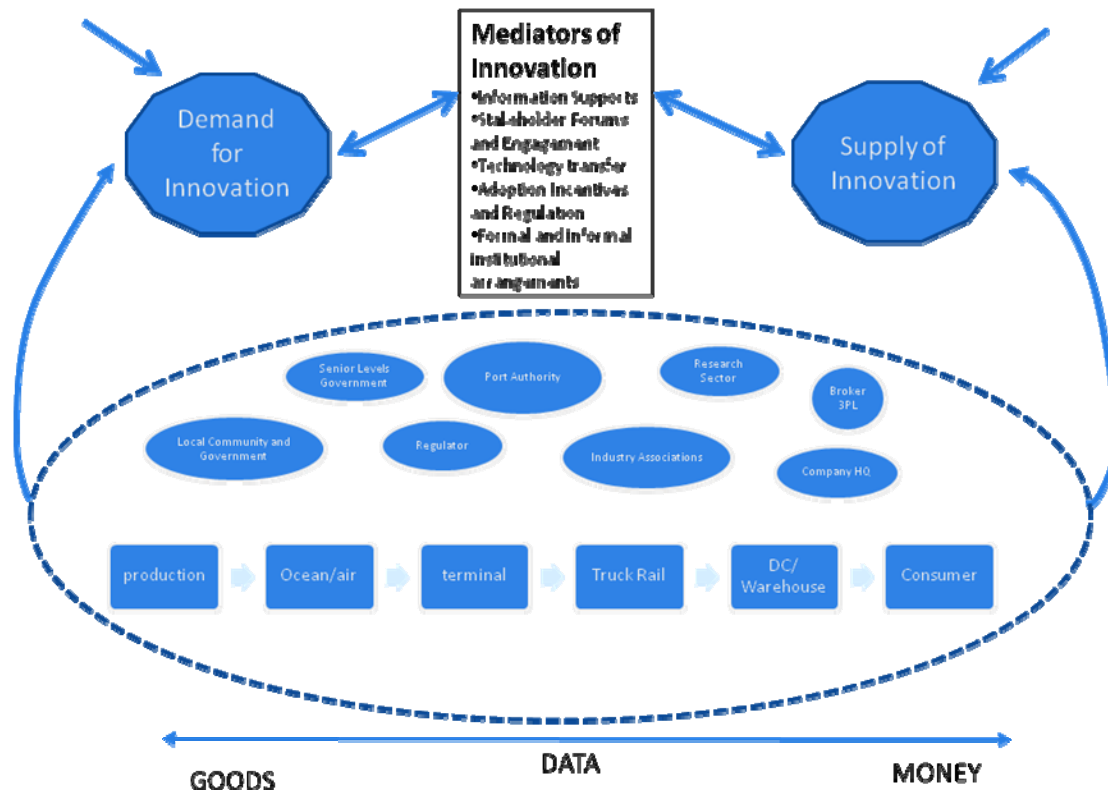
Just as was noted in the example of the container, there is an inherent complexity in examining the potential for innovation in gateways. In the following section, we present a conceptual framework which captures this complexity, providing a vehicle for unpacking the innovation process.

2.3 A Conceptual Framework of Innovation in Gateway Logistics

While there are always challenges impacting the demand for and supply of innovation in the gateway, this is generally a rich environment for new ideas. Instead, mediation forces, although not a panacea to ensure innovation, are arguably more critical as part of the innovation story in gateways. The framework below (Figure 2) captures this idea. Beginning at the bottom of the figure, the flows of goods, data and money are presented as the substance of the logistics supply chain which is directly

above it. The ovals represent the various groups that are active in the gateway, and associated with the logistics sector. The dashed oval surrounding these elements represents the context for innovation demand and supply in the gateway, exhibited in the connecting arrows. Demand and supply are also influenced by activities outside this gateway context (the incoming arrows at the top of the diagram) and of key importance is the role of mediating forces between the supply and demand for innovation.

Figure 2: A Conceptual Framework of Innovation in Gateway Logistics



The logistics chain can be deceptive; it often appears from the outside to be a tightly integrated set of activities involving the smooth handling of goods in exchange for information and finance. This picture does hold true for some of the connecting points along the chain, for example between some of the increasingly integrated ocean carriers and terminal operators, and between warehouses and long-distance trucking fleets managed by the same retail distributors. But the logistics chain is also highly complex and variegated. There are often gaps, or informational and market asymmetries. For example, the local tucking sector is notoriously competitive and fragmented. Hall and Jacobs (in press) have argued that both very close or tight organizational relationships and great fragmentation in the supply chain represent challenges for innovation in the maritime ports context. Too much proximity can crowd out new ideas and eliminate the competitive pressure to improve existing performance, while too little proximity undermines the relationships that are essential for risk-taking and collective action. So despite the intense supply and demand pressures for innovation in the gateway, there is no reason to assume that it will necessarily occur by itself. There is thus a great need for special attention to the role that organizations and stakeholder groups play as mediators of innovation, both within individual logistics chains, but also at the level of the gateway.

3 Vancouver's Story

Since 1886, when the Canadian Pacific Railway completed its transcontinental railroad, Vancouver has been Canada's gateway to Asia. Vancouver has also long been Asia's gateway to Canada; indeed many Chinese immigrants came to Canada to work on the construction of the CPR. Of the 2.1 million people living in Greater Vancouver in 2006, almost two-fifths described themselves as being of Asian origin. Today, Vancouver's gateway status enjoys recognition at all levels of government, and the port-logistics sector enjoys particular prominence in the federal government's "Asia-Pacific Gateway and Corridor Initiative."

In 1969, Vancouver overtook Montreal as Canada's largest port in terms of tonnage handled (Delgado, 2005: 148), an early indication of the eastward shift of the global economy. Today, Vancouver is Canada's largest port, handling more cargo by tonnage than any other Canadian port, and approximately half of all the containers handled at Canadian ports. Since the amalgamation of the three Lower Mainland port authorities in 2008, Port Metro Vancouver is now the third largest container port on the West Coast of North America after Los Angeles and Long Beach.

There is no doubt that Vancouver is an historic port-logistics gateway, sharing most of the general characteristics of gateways identified in the previous section. Yet, just because Vancouver shares these characteristics, it does not imply that it is automatically a locus for innovation. In this section, we report on our research among port-logistics innovators in the Vancouver gateway. We sought to identify whether there was any evidence of innovation and diffusion here, with a particular interest in innovations related to the environment. If indeed innovations are present, how did these occur and what were the mediating forces?

3.1 From Green Flags to Green Fleets

Although Vancouver is not often thought of as a leading centre of port-logistics innovation, we have nevertheless identified several important innovations. By exploring the processes which led to the development and adoption of a few of these innovations we intend to contribute to a more general understanding of the role of organizations and stakeholder dynamics as part of the mediating forces that influence the adoption of innovation in gateways.

We began with a comprehensive online and print media search for reports of innovations in the port-logistics industry, supplemented by informal discussions with key informants. We placed most emphasis on identifying those innovations related to the environment. In order to ensure that we identified a broad range of innovations we organized this search by industry or logistics chain sector, namely, (1) ocean carriers, (2) port authorities, (3) terminal operators, stevedores, (4) trucking, (5) rail, (6) warehousing, logistics parks, distribution centres and wholesalers, and (7) transportation services, including insurance, consultants, forwarders and brokers. From this search, we developed a list of approximately 30 recently implemented innovations.

We then classified the innovations on the list into three categories:

- (1) Process or operational innovations, which we defined as new or improved systems for managing the interaction between and within transportation modes in the logistics chain. An example of a process innovation in the Vancouver gateway is the rail service sharing agreement between CN and CPR, designed to improve railroad efficiency between Vancouver marine terminals and Boston Bar, some 200km inland.
- (2) Technological innovations, which we defined narrowly to include only new or improved machinery and equipment involved in the transportation and handling of goods. An example of a technological innovation in the Vancouver gateway is the use of biodiesel at Vanterm and Deltaport container terminals operated by TSI Terminal Systems Inc.
- (3) Policy innovations, which we defined as new or improved programs, plans, regulations, incentive schemes or pricing structures designed to achieve policy goals in the port-logistics sector. The amalgamation of the lower mainland port authorities is arguably the most significant recent policy innovation in the Vancouver gateway.

We then selected innovations in each of these three categories (Table 1), choosing ones that would involve or impact multiple stakeholders in order to allow for a richer exploration of the issues and challenges related to their adoption in a supply chain context. We then sought to conduct open-ended face-to-face interviews about the selected innovations with the goal of understanding the innovation process. In what follows, we report on six illustrative innovations.

Table 1: Innovations selected for study in the Vancouver Gateway

| Illustrative multi-sector innovations | | |
|--|-----------------------------------|-----------------------|
| Process /Operation Integration | Technological | Policy |
| Ship-shore power at Canada Place | enviroTruck, Green Fleets BC | Ballast water program |
| Truck Licensing System | Hybrid rail locomotives – Viterra | Harbour dues program |

3.2 Learning from the Innovators

The brief case study descriptions in this section each illustrate the diverse sources of demand and supply for innovation. These sources may be highly localized, as in the case of the Truck Licensing System, or may be regional, based in the Puget Sound (e.g. ballast water), or even pan-coastal (e.g. enviroTruck) in their origin. There are examples of innovations promoted by lead firms, such as the ship-shore power demanded by Princess Cruise Lines, or by lead jurisdictions ranging from Alaska to southern California. Common to all these innovations is the important role played by the mediators of innovation, both in their initial development and especially in their diffusion and adoption.

Ship-shore power: The first example of a process innovation is the ship-shore power at Canada Place. This innovation involves an approximately \$9million investment in installing the capacity for ships to use

shore-based electricity rather than run their diesel engines while berthed. The costs of this investment are being shared between the federal and provincial governments, Port Metro Vancouver and two cruise lines. The cruise lines themselves have made adaptations to their ships at their own expense. Adaptions were also required in the BC Hydro tariff structure. This example illustrates several general points about innovation and the role of stakeholder and organizational dynamics.

First, the importance of both lead firms and lead jurisdictions is central to understanding this innovation. Princess Cruise Lines, followed by its sister company Holland America, brought the idea of shore power to Vancouver after being prompted to reduce its air emissions at the popular cruise tourist site of Juneau, Alaska.

Second, the innovation involves multiple stakeholders, both within the logistics chain, and also more broadly. A key mediator of the innovation is the port authority, which in this instance acted as both a 'logistics chain' partner (since Port Metro Vancouver is the operator of the cruiseship terminal) and also a facilitator of relationships between the shipping lines, the power provider, the utilities commission and various government agencies. In particular, it is worth highlighting that BC Hydro, one of the most important partners in this innovation, stands outside the goods movement industry.

Third, the importance of long-term established relationships, mutual understanding and trust cannot be over-emphasised. In this instance, partners have committed to substantial investment in fixed capital with an understanding, but without a cast-iron guarantee, that they will continue to receive access to the retrofitted terminal facilities. While it is quite possible that a private terminal operator and an individual shipping line might have worked out a deal like this, it seems likely that the overlapping roles of the port authority as terminal operator, partial funder and facilitator was a factor in the success of the innovation. The role of the Northwest Cruise Ship Association in resolving berthing issues cooperatively was also noted.

Truck Licensing System: The second example of a process innovation is the Port's Truck Licensing System (TLS). The TLS has its origins in disputes involving owner-operator port truckers in 1999 and 2005. While compensation was a central focus of those disputes, it was recognized that a wider regulatory apparatus would help to stabilize the industry. As part of the resolution of those disputes, the port authorities of the lower mainland (and now Port Metro Vancouver) were required to establish a truck licensing system and dispute resolution program. These requirements have aided the goal of environmental innovation in two important ways.

First, the requirement to establish a licensing system has provided a mechanism whereby the Port has been able to impose stricter emission requirements on trucks that enter port land. Currently, the TLS requires that 1993 trucks and older without an approved age exemption are not allowed on port land, and trucks that are 10 years or older must pass an opacity test. By 2017, only 2010 or newer trucks will be allowed on port land. Whether the emissions standards are set at an appropriate level is the subject of some debate; however, it is the use of the TLS as a mechanism to achieve environmental improvements that constitutes a process innovation.

Second, the TLS is accompanied by a series of forums designed to promote information sharing. These include a monthly Container Stakeholder Committee, described by one port employee as providing him

with “my network to solve problems,” and a website known as the Pacific Gateway Portal. At the same time, the TLS illustrates one of the key impediments to the adoption of environmental innovations in general, and in the trucking sector in particular, namely the presence of unshared information systems. Efficiencies in container trucking could arguably be achieved if the reservation systems of the different terminal operators were standardized (the Port is working with terminal operators to achieve this), while the TLS might be more effective if Port officials could access Provincial truck licensing and enforcement data.

enviroTruck: The first example of a technological innovation also comes from the trucking sector. The *enviroTruck* program is a set of incentives that may be paid to a truck fleet to reduce emissions. Qualifying tractor-trailers must meet or exceed 2007 model year emissions standards, travel at reduced speeds and be fitted with a series of emissions-reducing add-on devices. Operators may choose from a list of approved add-on devices, with incentives linked to estimated emissions reductions. The program is run by Green Fleets BC, a partnership-based program led by the Fraser Basin Council and funded by the British Columbia Ministry of Environment as part of its Air Protection program. *enviroTruck* itself is a partnership between Green Fleets and the BC Trucking Association.

Several key points emerge. First, the program has attracted the most interest and participation from lead operators; in the trucking sector these are typically the larger fleets operating in the long-distance haulage market and fleets operated by government organizations. There has not been much success within the port trucking sector, beyond some idle-reduction programs. This seems to be related to the second characteristic of this program, namely that it is incentive-based. The program depends upon significant government funding to achieve improvements in environmental performance. Nevertheless, the market structure of the port trucking industry is such that many operators are unwilling to invest in capital equipment.

Third, the program involves several conscious steps to share information, including a requirement that fleets which receive funding from the program participate in a trade magazine interview. The program also includes a fleet managers’ network that meets quarterly. Fourth, this program also stresses the importance of education to the effective adoption of innovations. Workers need to be trained in how to make most effective use of the innovations, and indeed the program shows that improved driver practices alone can have very significant local environmental and safety benefits.

N-ViroMotive™ GenSet locomotive: The second technological innovation that we profile is the *N-ViroMotive™ GenSet locomotive* purchased by Viterra Inc., owner of the Cascadia and Pacifica grain terminals, with the assistance of Transport Canada’s Freight Technology Incentives Program. The new locomotive is powerful enough to pull 28 loaded grain cars at a time using only one engine, decreasing the number of trips required to completely unload a shipment. This reduces the externalities associated with terminal activity by allowing for fewer trips across a grade crossing at the terminal resulting in less disruption of traffic, improved fuel efficiency and reduced noise levels.

This innovation again illustrates the important role of government in providing incentives, and also of both government and the technology provider in providing an opportunity for experimentation and adoption. Viterra notes that Transport Canada staff assisted it through the process of applying for federal funding assistance, while the supplier provided technical information and allowed the company

to test a demonstration unit on-site before ordering. This is also an example of Southern California as a lead jurisdiction. Viterra noted that when they needed a replacement locomotive, they were influenced by initiatives undertaken in the Port of LA which they understood to have been very successful.

Mandatory ballast water exchange: The then-Vancouver Port Authority was the first in North America to implement a mandatory ballast water exchange program (BWEP) to prevent the spread of non-indigenous species. The program ran from 1997 to 2006, when it was superseded by national Ballast Water Control and Management Regulations that were modelled on the Vancouver program. Aspects of the BWEP illustrate general points about policy innovation in the Vancouver gateway. The initial demand for the BWEP came from the Boundary Bay Conservation Committee, a Delta BC-based environmental group committed to protecting the Fraser River Estuary ecosystem.

The Port worked with the Chamber of Shipping to design the program. Through its harbour patrol officers who were responsible for inspecting ships' logs and collecting ballast water for testing, the Port deepened its knowledge about the ships visiting the port. Apparently, the harbour patrol continues to conduct inspections despite the transfer of regulatory authority to Transport Canada in 2007.

The BWEP was also an international collaborative effort, setting the foundation for subsequent collaboration among ports in the Puget Sound. The Vancouver Port worked with state environmental officials in Washington, Oregon, Alaska, and later California, to create a single ballast water jurisdiction.

Harbour Dues Program and the Northwest Ports Clean Air Strategy: The Northwest Ports Clean Air Strategy of 2007, which aims to "reduce maritime, port-related emissions that affect air quality and climate change in the Pacific Northwest" (NWPCLAS, 2007) builds directly on the BWEP in several important ways. First, the Strategy is an international joint effort between the ports of Vancouver, Seattle and Tacoma, Environment Canada, the US Environmental Protection Agency and the Puget Sound Clean Air Agency. Second, the Chamber of Shipping was again a partner designing elements of the strategy, including the Harbour Dues Program which provides incentives for ships to reduce their in-port emissions. Third, the Boundary Bay Conservation Committee and other community-based organizations played a key role in demanding this policy innovation, using the Canadian and BC environmental assessment processes to exercise voice in response to Deltaport expansion plans.

However, unlike the earlier case, LA/LB served as a lead jurisdiction, stimulating both demand and ideas for innovation: according to one participant, "the public were saying, 'Why aren't you doing what LA-Long Beach is doing with the San Pedro Clean Air Action Plan?'" One element of the Strategy is the Harbour Dues Program (HDP), which is similar to the Port of Long Beach Green Flag program. The HDP provides discount harbour rates that are based on the air emission standard of the vessel. The differentiated rates, Basic, Bronze, Silver and Gold, are designed to provide a wide variety of technology and fuel options to vessels in order to promote and build awareness around a number of alternative emission reduction practices.

The Strategy includes emissions reductions targets for 2010 and 2015 over a 2005 baseline. In generating the baseline emissions estimates, the Port developed a powerful database tool that includes all equipment operated on port land. The database has been packaged in a way that will allow terminal operators, carriers and other actors to estimate their emissions in 2010 and 2015. This tool is an

example of a mediator of innovation; while it serves the direct goal of monitoring the Strategy, it also provides an invaluable tool for raising awareness of the need for, as well as proactively identifying opportunities for, improved environmental performance.

At the same time, it is by no means clear that the Strategy will achieve its emissions targets, and if a reduction is achieved, this may be more a result of reduced levels of port activity in the context of the global recession than because of some absolute (aggregate) or relative (intensity) improvement in emissions performance. For example, in its first year the HDP achieved about 50% compliance, and it is likely that this will fall in 2008/9 as carriers switch back to cheaper but dirtier bunker fuel. Similarly, port officials report that cargo shipping lines have yet to express interest in shore-based power systems, and it is unlikely that many will invest in some of the newer stack emissions reductions/scrubbing technologies in the current economic climate. Environmental innovation in the logistics chain is not easy, and the incentive-based programs appear especially challenged when firms are delaying investment in new equipment.

3.3 The Innovation Process Revisited

In this section we revisit the innovation framework to identify some of the common elements in successful innovations in the Vancouver gateway. The framework recognises that while there may be intense demand for and supply of innovation in gateways, the complexities and fragmentation of the logistics chain is such that successful innovation requires conscious attention to mediation.

There certainly are demands for innovation in the Vancouver gateway, especially in terms of environmental innovation. The pressures for innovation come from a diverse array of sources; the competitive pressure exerted by lead firms and jurisdictions, pressures brought by local communities and organizations, and governments responding to pressure through regulations and programs. Any actor in a gateway should expect these pressures; indeed, the intensity of pressures and demands for improved performance is one of the advantages of the gateway.

At the same time, there are some challenges to the effective innovation demand and supply in the Vancouver gateway. First, in the current economic climate, firms are becoming more concerned with external competition rather than responding to local pressure. Second, port facilities are highly dispersed geographically and the port prides itself on its diverse commodity base. This increases the complexity of the demands for innovation, while arguably rendering them less focused and directed. It should also be noted that large segments of the Vancouver freight gateway have monopoly dimensions, with lots of dedicated, single-client and single-purpose infrastructure. This market structure and consequent organizational fragmentation also reduces pressure for innovation. Third, while the Vancouver gateway is a large player in the Canadian and North American transportation systems, it lacks corporate head offices and lead firms in the maritime and logistics sector. Despite some important innovations within the Puget Sound region, this is not a lead jurisdiction in comparison to LA-Long Beach.

Instead, it is the Vancouver gateway's location within the West Coast port system and its relationships to key actors in that system that provides a vital source of innovations. These relationships often compensate for shortcomings in the supply of innovation within the Vancouver port-logistics sector.

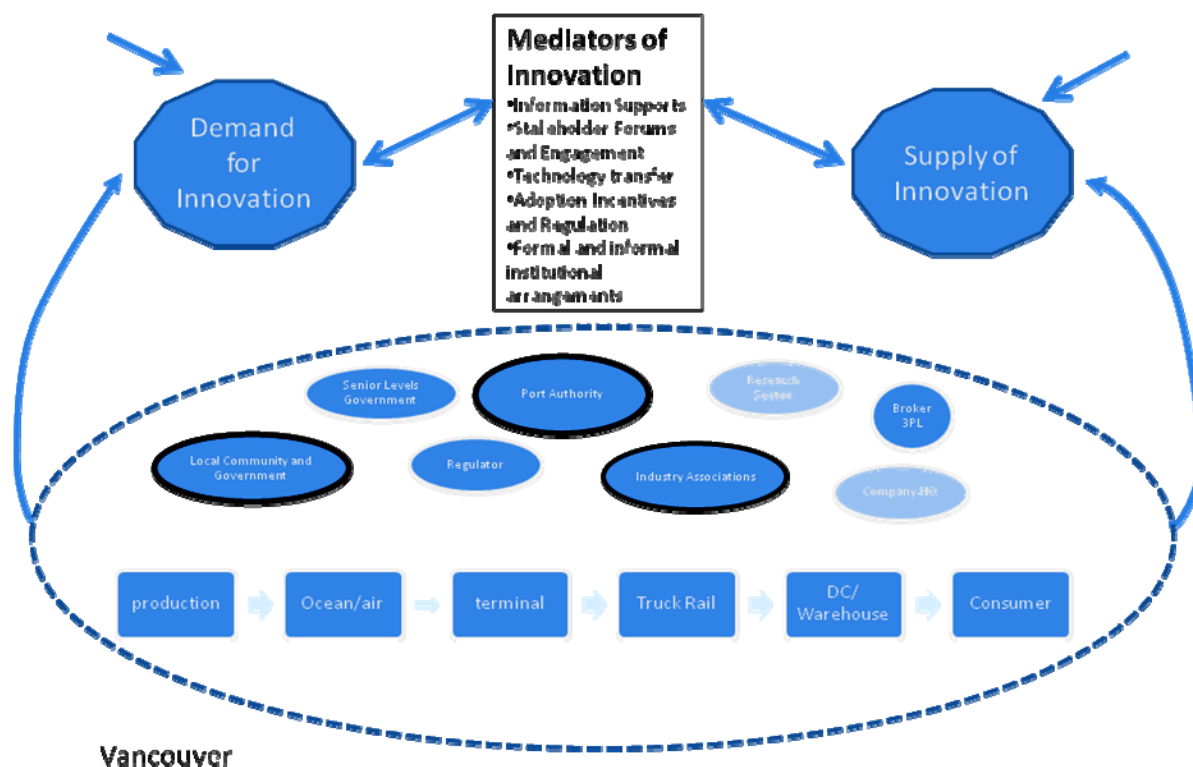
The Vancouver ports have a track record of working collaboratively and cooperatively with other ports and agencies in the Puget Sound. Increasingly, the supply of innovations has a West Coast character, with ideas, policies and programs being exchanged from California to Alaska. In some sense, the intense experimentation with policies, processes and technologies in the ports of Los Angeles and Long Beach means that Southern California is playing the role as a lead jurisdiction.

For Vancouver itself, there are some hard questions about the supply of innovation because of the small number of lead firms, and the lack of a traditional focus on transportation in the local research and advanced services sector. For example, there are very few large, Vancouver-based global shipping lines; a leading one of these reported that it turns to various Scandinavian universities for research and advanced engineering functions. As noted above, the sources of innovation may also be changing in the face of the global downturn. Firms are still looking for innovation opportunities to improve their bottom line but without expending capital. As a result, the mediation role has changed – relying on financial incentives to bring on new capital equipment for example – and the shore power innovation may not work in the near future.

That said, the cases of successful innovation in Vancouver all display the prominent role of mediation. We found examples of conscious engagement of stakeholders, and also of less explicit but longer-standing relationships between key actors, information sharing and education. While Vancouver's federally-created port authority may lack connections to local governments and communities (a vital source of demand for environmentally-focused innovation), it does have deep connections with the transportation industry, with members of the Board drawn from industry and with port staff having in-depth knowledge of terminal operations. Despite the diversification process and the Port's landlord business model, the port authority remains hands on, convening a series of stakeholder interactions.

Another advantage of the Vancouver gateway is that almost all of the provincial industry associations are based in Vancouver (based in Greater Vancouver are the Chamber of Shipping BC, BC Terminal Elevator Operators' Association, International Ship-Owners Alliance of Canada Inc, BC Maritime Employers Association, ILWU-Canada, BC Wharf Operators Association, BC Trucking Association, Northwest Cruise Ship Association). Beyond the port, agencies such as the Fraser Basin are consciously engaging stakeholders, sharing information.

Figure 3: Vancouver's Innovation Framework



Returning to the Innovation Framework (Figure 3), we now present it in a form specific to the case of Vancouver. In the diagram, note how the darker lines are associated with segments of the gateway which are more prominent for understanding innovation in Vancouver – local government, the Port Authority and the presence of Industry associations are key. Conversely, the lighter shading for Research and Company HQ (head quarters) indicate that they are less prominent. Finally, the thin arrow between ocean transportation segment and marine terminals refers to the lack of carrier-operated terminals in Vancouver, which implies a lower degree of integration at this point in the supply chain in the Vancouver gateway. This potentially raises the complexity of implementing innovations that connect ship- and shore-based activities.

3.4 Looking South: Looking North

The Vancouver story underscores the role that both internal and external forces play in the development and adoption of innovation in the Gateway. Many of the external forces are the result of the interconnected nature of the West Coast supply chain. Vessels call at multiple West Coast ports as part of the same vessel string. Competitors share vessel space on the transpacific trade lane. Coast-wide contracts are negotiated between long shore labor and marine terminal operators.

As the largest port complex on the West Coast of North America, the San Pedro Bay ports of Los Angeles and Long Beach (Table 2) are likely to exert a certain influence on the rest of the ports within the system. The amount of trade-related activity they draw to the West Coast provides a critical mass of actors who help to mediate the development and adoption of innovation for the system of ports stretching from Baja to Prince Rupert. At the same time, LA and Long Beach provide the incentive for

innovation within the individual gateway. The desire to draw traffic away from Southern California and increase market share relative to other West Coast ports is one reason gateways like Vancouver try to differentiate themselves. Innovations in process, policy and technology help them compete more effectively.

LA/LB has long been a trade gateway for many of the reasons already discussed in the Vancouver context. It exhibits scale economies in international shipping, has a large local consumer market, offers good connections to the US national market as well as an extensive network of supporting industries. Its role as a gateway has been further defined as a result of the tremendous growth in trade from Asia. Since the early 1990s and up until the recent economic downturn, East Asian exports to the U.S. grew some 7% annually. Because of its proximity to Asian production centers, California in general, and the Los Angeles region in particular, has accommodated a large share of this growth. In 2007, the two ports accounted for 64% of total US Pacific traffic (in TEUs, or twenty foot equivalent units), 54% of total Pacific traffic including Canadian and Mexican ports, and 35% of all US container traffic¹. Despite being a down year for the ports along the West Coast, Los Angeles and Long Beach moved a combined 16.67 million TEUs in 2007.

The rapid growth in trade came with an increasing awareness on the part of local communities of the negative environmental impacts of that growth. Reports from the South Coast Air Quality Management District (SCAQMD, 2000), a regional air quality regulatory agency, began to quantify the cost of trade-related activity in terms of exposure to cancer causing agents like diesel emissions. Elected officials, particularly at the State level, responded with a series of legislative measures designed to bring about changes in the way the supply chain in general, and ports in particular, operate. Environmental lawsuits were pursued with the same outcome in mind.

The success of policy measures and court action – and sometimes merely the threat of the same – has played a critical role in encouraging the ports to become environmental innovators. It has also encouraged the development of new stakeholder associations designed to mediate the development and adoption of new processes, policies and technologies. Many of the same kinds of advancements coming out of the Vancouver story can be found in Southern California as well, even if the impetus for innovation differs (Figure 4). Like Vancouver, local government and community groups play significant roles, often through the court system. In addition, the presence of a vibrant research community provides a test bed for many port-driven innovations.

¹ Calculated by authors from American Association of Port Authorities (AAPA) data.

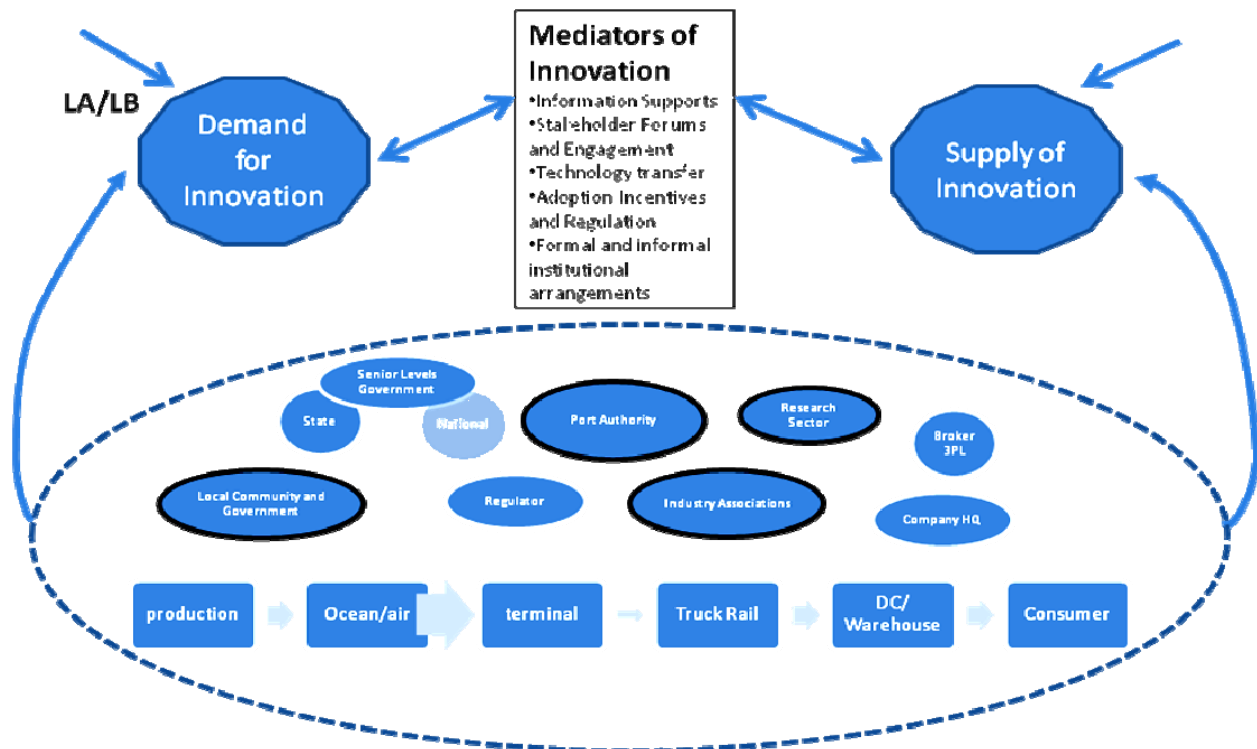
Table 2: Vancouver LA/LB Summary Statistics

| 2008 | Vancouver | Los Angeles/Long Beach |
|--|--|--|
| Population | 1,943,000 | 12,872,808 (LA-LB-SA MSA) 9,948,081 (LA-LB-Glendale MD) |
| Population density | 735.6 per km ² | 1,029 per km ² |
| Transportation and warehousing employment (2006) | 65,600 | 152,300 (LA-LB-Glendale MD) |
| Transport employment as % of total (2006) | 5.6% | 3.7% |
| Land area (port) | 999 hectares | 3,035 hectares |
| Shoreline distance (port) | 600 km | 109 km |
| Port authority board | One member appointed by Government of Canada; one appointed by the government of British Columbia; one appointed by provinces of Alberta, Saskatchewan and Manitoba; one appointed by Lower Mainland municipalities; seven appointed by the Minister of Transport from a list of nominees from port users. | Port of Long Beach: Harbor Commission appointed by the Mayor of Long Beach and confirmed by the City Council. The board comprises a President, Vice President, and three additional members. Port of Los Angeles: Board of Harbor Commissioners appointed by the Mayor of Los Angeles and confirmed by the City Council. The board comprises a President, Vice President, and three additional members. |
| Number of terminals | 28 | 59 |
| Container terminal operators' global linkages | DPW (Dubai-owned) TSI (US-owned) | West Basin/China Shipping (China) TraPac (Japan) Yusen (Japan) Seaside (Taiwan) APL (Singapore) APM (Denmark) California United (Korea) TTI / Hanjin Shipping Co. (Korea) Int. Transportation Service (Japan) Long Beach Container (China) Pacific Container (USA) SSA (USA) |
| Laden TEUs | 2,153,815 | 14,287,816 |
| Auto (Units) | 456,442 | 529,101 |
| Bulk - Dry (tonnes) | 69,495,722 | 9,169,695 |
| Bulk - Liquid (tonnes) | 9,450,967 | 51,200,000 |
| Breakbulk - Logs (tonnes) | 10,717 | 304,000 (Long Beach only) |
| Breakbulk - others (tonnes) | 9,844 | 1,700,000 (Long Beach only) |
| Cruise Passengers | 854,493 | 1,807,000 |
| Foreign Vessel Calls | 3,005 | 3,700 (does not include US Jones Act vessels) |

Source: Port Authorities, Statistics Canada, Bureau of Labor Statistics and California Employment Development Department.

Ship-to-shore power is one example of the power of local communities and environmental groups working in conjunction with the courts. The use of ship-to-shore power at the San Pedro Bay Port complex came about as a result of a lawsuit filed by the Natural Resources Defense Council (NRDC) against the Port of Los Angeles over the construction of the China Shipping Terminal in 2000. The settlement included \$10 million to clean up diesel trucks. It also required the terminal to use yard equipment powered by cleaner burning fuels, and to test what was then a new alternate marine power (amp) technology, cold ironing, so that ship engines could be turned off while in port. The adoption of the technology stemmed from local pressures and the lawsuit, not from a desire to remain competitive as was the case with Vancouver.

Figure 4: LA/LB's Innovation Framework



The LA-Long Beach version of a truck licensing program grew out of the Clean Air Action Plan (CAAP) adopted by both ports in the fall of 2006. CAAP can be seen as an attempt by the ports to get ahead of state-mandated environmental mitigation. The Action Plan consolidated many of the existing measures that the two ports had previously adopted individually. These include the previously mentioned Green Flag Program. The Clean Truck Program, a component of the CAAP, progressively bans older vehicles or those that have not been retrofitted from accessing the port complex. Grants and financial incentives are designed to allow trucking companies to accelerate the replacement of older, high-polluting vehicles with newer, cleaner trucks. Subsidies also encourage the use of alternative fuels. The use of port subsidies to replace older trucks was not new to the Clean Air Action Plan. Both ports were partners with the Gateway Cities Council of Governments, a coalition of 27 cities in the vicinity of the ports, in a truck replacement program targeting pre-1987 vehicles. This program began in 2002 and represents another locally based association which has acted as a mediator of innovation.

Los Angeles and Long Beach have been involved in developing and testing technology in the past, but this has also been standardized across the two ports through the Clean Air Action Plan. The CAAP includes a Technology Advancement Program which initially identified \$15 million over a five-year period to be spent on accelerating the verification and commercial availability of new, clean technologies in four main areas: control measurements, green container transport, emissions inventories, and emerging technology demonstrations. Recent technology investments have supported the conversion of rubber tire gantry cranes to run on electricity at a container terminal and the development and testing of the world's first hybrid tugboat. In the summer of 2009, the ports jointly released a Request for Qualifications to develop and demonstrate a zero-emissions container mover system. This is being done in conjunction with the Alameda Corridor Transportation Authority, the joint powers authority which runs the 20-mile grade-separated rail link between the ports and rail yards around downtown Los Angeles. Respondents are likely to come from a combination of the numerous technology firms – some of which are defence related – and research universities located in Southern California.

The Clean Air Action Plan is itself a policy innovation, but the Ports of Los Angeles and Long Beach have also been at the forefront of other policy measures driven by the need to respond to environmental pressures. In February of 2004, a bill (AB 2041) was introduced in the California Assembly requiring off-peak gates at the two ports as a means of spreading out truck traffic and reducing truck-related congestion. AB 2041 also established a regional governing body, the Port Congestion Management District, and authorized a charge for cargo moved at the Ports of LA and Long Beach. The fee revenue would be spent on freight-related congestion mitigation projects. The bill was adamantly opposed by marine terminal operators; fee revenue would be under the control of a public authority, and provisions included stringent reporting requirements and quarterly public hearings.

Terminal operators were faced with a difficult choice, since passage of AB 2041 seemed certain. They responded by setting up their own extended gate program to forestall further legislative action. Fees collected on peak hour cargo moves are used to pay terminal operators to offset the cost of labour in the off-peak. The program, known as PierPASS, has resulted in a shift of approximately 35-40% of eligible gate moves to the evening and/or weekend with noticeable impacts on the freeway system around the ports (Giuliano and O'Brien, 2008).

A combination of congestion and external political and environmental pressures forced the hand of ports and terminal operators; but their ability to respond with operational, technological and policy-based innovations was due in part to a number of other supporting factors, not the least of which is the concentration of industry professionals to be found in a gateway and metropolitan region of 16.5 million people.

A prime example of this is the development of the Coalition for Responsible Transportation, which occurred in response to the clean truck requirements of the Clean Air Action Plan. A combination of international goods movement stakeholders like NYK Line and Target, and Southern California based trucking companies have agreed to facilitate the lease or purchase of low-emission vehicles for independent owner operators. The trucking companies will offer financial assistance to the drivers; ocean carriers and shippers within the Coalition have agreed to pay higher freight rates in order to

compensate the trucking industry for the costs of transitioning to a cleaner fleet. The incentive is to forestall any action coming out of the CAAP that would require companies to use employee drivers instead of owner-operators.

Another driver of innovation is the competitive nature of the ports. While Los Angeles and Long Beach are immediately adjacent to each other and act in many ways like a single port complex, they are in fact competitors. Each is an independent entity, part of a greater municipal authority; i.e. the City of Los Angeles and the adjacent City of Long Beach. The desire of each to draw business away from the other means that they are forced to differentiate themselves in the way of operations and facilities, including new technologies.

Their ability to act as both partners and competitors is due in part to the unique structure of port governance in California. While the ports are departments of city government - with commissioners appointed by their respective mayors - the ports actually operate under state tidelands law dating from the early part of the 20th century. The State cedes authority to the City to maintain coastal waters. Port-generated revenue is required to go back into the ports for the protection of coastal water and the development of port-related projects. The city cannot use revenue for other purposes, including education or other services.

However, the independent nature of the two ports can also pose difficulties for other aspects of innovation. Despite adopting a joint Clean Air Action Plan, the Ports of Los Angeles and Long Beach have pursued different approaches to driver licensing requirements as part of the same plan. The Port of LA initially required that drivers be employees of trucking companies as a means of ensuring that vehicles are maintained and investments are made in newer and cleaner fleets. The Port of Long Beach continued to allow independent owner operators to obtain port licences, as long as other vehicle requirements are met. The kind of uncertainty over program implementation, along with the perceived proliferation of regulatory measures and fees, could create an unwelcoming environment for innovation and investment to occur, thus the pressure on the industry to form a mediating association like the Coalition for Responsible Transportation.

Finally in the case of LA and Long Beach, locally-generated innovation is made necessary by the absence of a truly national freight policy. While Washington has funded port security improvements - including technology advancements - since 9/11, the federal government has been largely absent when it comes to fostering goods movement innovations. The distance between Southern California and Washington makes it more difficult to convey the benefits that accrue to the rest of the nation resulting from trade activity in the greater LA region.

Finally there is the scale and scope of the environmental problems driving the innovations in the first place. The greater the problem, the greater the impact needed by new processes, policies and technologies. With some opponents of trade holding out for a rollback in emissions (as opposed to merely holding the line), there is the potential that innovators will be discouraged by a political arena that does not reward their efforts. This would have implications for Vancouver. Any absence of innovation would provide an opportunity for another gateway to fill the void; but would also remove the driving force in innovation for the entire West Coast system of ports.

4 Implications

Thus far, we have articulated a conceptual framework for innovation in a gateway. Our detailed exploration of innovations in Vancouver, and comparative assessment of LA/LB, have been used as case studies to test this framework and explore our original research question - how do organizations and stakeholder dynamics contribute to the adoption of innovation in gateways? Our discussion has served to strengthen our position that mediating forces are essential for effective innovation. But what are the implications of this central finding?

In general, innovation keeps the gateway competitive – and is a good thing. If we focus on the environment, we’re anticipating that the gateway would respond to the global challenges and local pressures through the adoption of innovations that work toward solving or mitigating environmental issues, exhibiting a “social consciousness” that one might expect in a gateway. However, we are in the midst of a change in how environmental innovation works. There appears to be no uniform path for a gateway innovation; instead it depends in large part on prevailing market conditions as well as the local mediators of innovation. Many of the innovations we’ve examined emerged during an economic growth period, and today we would expect to see differences in the path to innovation.

It is also critical to focus on the broader spatial context when exploring innovation. Our research has shown that we should be thinking about the Vancouver Gateway in conjunction with the (Puget) Sound and the (West) Coast as nested elements of a single system. The topmost arrows in our framework represent the bigger forces of innovation supply and demand that lie outside a single gateway that make a critical difference. In our research, we see evidence of innovations being demanded and supplied at each scale of this nested system, and that collaboration between stakeholders in different gateways plays an important role in mediating the adoption of innovation.

4.1 Best Practices? The Innovation Process

Examples of the mediating forces at work in the development, adoption and diffusion of innovation have been highlighted for both gateways examined in our research. Each of the following can be found, typically in combination:

- Information Supports
- Stakeholder Forums and Engagement
- Technology Transfer
- Adoption Incentives and Regulation
- Formal and Informal Institutional Arrangements

And, in many innovation examples, there is a story that speaks to the importance of stakeholder dynamics and collaboration. Seldom is it a case of a firm adopting a more sustainable option in isolation. While there are examples where innovation has been a straightforward competitive response

to an incentive, regulation, or litigation, we would argue that the stakeholders and collaboration central to the mediating forces of innovation are the “best practice” identified in this research. The role of local port authorities, the various levels of government, industry associations, and their willingness to be mediators of innovation is a recurring theme. Similarly, the “West Coast character” – the importance of the shared regional perspectives and operational connectedness in the supply chains active on North America’s West Coast – is common in many innovations.

4.2 West Coast Ports: The Innovative Range?

Ports are in competition with each other, and this is perhaps especially true at the “gateway” level. They copy each other; they are often visited by the same ships and lines² and they may share other linkages from similar membership in international maritime groups to similar rosters of “key players”. Among these similarities, we have identified key stakeholder groups as a central theme in port and gateway innovation.

What has emerged from our analysis and assessment is the importance of being part of the “West Coast.” Often, local stakeholder groups are most essential in the innovations examined, but increasingly, the local/regional (Puget Sound) groups and larger regional (West Coast) groups are playing the key mediating role. The Vancouver experience certainly has exemplified this “innovative range”, with examples of the various scales of stakeholder interaction within this West Coast range. Within this range, the Vancouver Gateway is seldom the lead jurisdiction. Scale, research capacity, and low presence of lead firms contribute to this lack of leadership. However, Vancouver is an example of the importance of the mediating forces of innovation in dealing with an apparent innovation challenge – the follower rather than the leader in innovation. Unlike LA/LB which may have size-related resource and research advantages behind its innovation development scene, Vancouver works harder at cultivating and nurturing stakeholder interactions ranging from continental to local in order to promote innovation adoption. This is perhaps even more critical in the current economic climate.

4.3 Policy Implications for the New Economic Context

The current recession is affecting the shipping and logistics industry profoundly, with trade volumes down throughout the world. The innovations we have described in this paper all emerged and were adopted in a context of rapid growth, which created pressures/demands for innovations that addressed congestion and externality issues, and that were implemented in more forgiving supply (of finance especially) conditions. It is not clear that these conditions will return soon or indeed even in the foreseeable future.

This is not to say that the demand for and supply of innovations has gone away – it is still here, but it is different. For example, firms may be more likely to try to achieve efficiency improvements within existing systems rather than adopt new systems. Demands from industry may focus on cost reduction rather than exploring environmental performance improvement. At a time when firms are not rapidly replacing equipment, incentives like those to adopt cleaner technologies may no longer be effective, while firms are likely to be more resistant to regulation in tough market conditions.

² For a reference on the pattern of shipping calls on US West Coast see Esteban, Malchow and Kanafani, 2000.

The supply of innovation is also altered under the current recession. Firms and other generators of innovation are hampered by an overall lack of willingness to take risks in this climate – risks that are often mitigated by the innovation mediators. So the bigger challenge now is to understand the new circumstances that shape innovation; we think that stakeholder groups can play a role here too, but deserving more thought as to what they provide. It is harder in this economic climate for mediators to do big things like coordinate new business processes requiring major equipment or infrastructure investments. Instead, there is a focus on smaller, but not necessarily less effective things such as training and education investments.

The mediating forces are still important for innovation – but the involved stakeholders and authorities have to re-think what they do as well as what they offer and what they can reasonably hope to achieve.

5 Conclusion: Moving the Gateway Forward

Our research report opened with a context setting discussion of complexity and the challenges of fostering the innovation needed to grapple with it. We argued that gateways, by their very nature are places where we expect to see lots of innovation, yet with no guarantees. A conceptual framework was offered to better understand the interplay between the supply of and demand for innovation, highlighting the key role of stakeholders and collaboration as part of the mediating forces which reconcile the demand/supply dimensions. Returning to our original question:

How do organizations and stakeholder dynamics contribute to the adoption of innovation in gateways?

In brief, they are essential. The successful adoption of innovations in the gateway context relies very heavily on the mediators of innovation. Although demand and supply are present within each gateway, across the Sound and along the West Coast, innovation requires support through incentives, training, education, experimentation, communication and collaboration.

It's not just a matter of the goods flowing through the gateway but it is the broader context of the gateway that is highlighted in the examples of successful innovations. The local pressures and expertise are there while innovators also keep an ever watchful eye on port competitors and broader regional spheres of influence. In some examples, Vancouver looks south to LA/LB or north to Juneau for innovation examples and influence. In other examples like the adoption of the ballast water exchange program, Vancouver's initial innovation was later extended and replicated.

Finding ourselves in the midst of a global recession, the approach to innovation in the Gateway may have to change. This is perhaps most evident in considering the response to demands for environmental innovation. Rather than capital intensive technology options, the emphasis is now on learning how to be more efficient, to become better managers of existing operations rather than searching for technological solutions. Although many innovations we explored emerged pre-recession, stakeholders certainly drove home the shifting innovation agenda in our discussions with them.

While the specific types of innovation may be changing, our research findings all support our central point; despite the fact that the gateway is a place of intense demand for innovation, and may be a place in which innovations are readily supplied, stakeholder and organizational dynamics play a critical role in determining which innovations actually succeed. This has been consistently identified with past innovation success and will no doubt be central to the success of future gateway innovation.

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