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Ecolopolis 5.0: High Speed Rail in Cascadia



April 18, 2011

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Introduction and Acknowledgements

This is the fifth paper added to the resources available describing the Cascadia megaregion. These “Ecolopolis” papers have been developed through the work of graduate classes concerned with a wide range of regional development, planning, governance, and implementation issues. They are intended to be linked through a common interest in Cascadia and its prospects as a megaregion. In this case, the topic is high speed rail, but the fundamental purpose in addressing this issue is part of the continuing inquiry into what can contribute to a great understanding of the region and what its sense of place, now and in the future.

What is an Ecolopolis?

Jean Gottman’s “Megalopolis”, first described in 1964 as the urbanized area stretching from Boston to Washington, DC, has inspired the contemporary use of the term “megapolitan” (or “megaregion”) to describe linked cities and the micropolitan areas between them. However, does or should the East Coast’s Megalopolis provide a model for potential Cascadian-scale urban development and interaction?

The heavily urbanized nature of Megalopolis immediately seems to clash with Cascadian sensibilities. After all, access to the outdoors, open space and preservation of agricultural land provide many residents here with a strong sense of place and pride. People are attracted to the quality of life in our cities. Proximity to pristine mountains, rivers and forests, and the ocean is a top draw for skilled workers and young people. Cascadia’s competitive advantage lies, at least in part, in the fact that it is NOT a continuously urbanized region yet still provides cosmopolitan amenities like arts and culture, fine food, shopping and sports.

What kind of Pacific Northwest do we want to live in? Can celebrating our uniqueness be the cornerstone for boosting our competitiveness? How can we prosper, accommodate a growing population and remain livable? The answer lies in the commitment of decision makers, developers and citizens to develop the region into what we’ve called an “Ecolopolis” rather than a Megalopolis.

What is an ecolopolis? We have defined it as a networked metropolitan system consisting of the metropolitan areas for Portland, Seattle, and Vancouver, BC, other metropolitan areas in the I-5 corridor from Eugene, north, and the vital working and wild landscapes between them. An Ecolopolis, in our view, is a continental and global economic unit, and it is a reflection of the unique Pacific Northwest bioregion known as “Cascadia.”

What have we learned so far?

In “Ecolopolis 1.0: Making the Case for a Cascadian Supercity,” we took up the challenge of investigating the nature and promise of a binational, tristate regional supercity in the territory referred to as Cascadia. For the purposes of this study, we concentrated on the three major metropolitan areas in the Pacific Northwest, namely Portland, Seattle, and Vancouver, BC.

The question we asked ourselves was what, besides locations in the northern temperate rainforest and the expectations of national interests outside of our respective corners of the Pacific Northwest, did these three metros share? What dynamics linking the three pointed to the promise of working to unite them under a common banner? More specifically, what would justify an investment in high(er) speed rail? If this is about economic competitiveness, what about current models of competitiveness suggested that the territory we should care about was Cascadian in scale?

What we found in that first effort was that local concerns trumped megaregional ties. Simply put, Cascadia was not yet at the point where megaregional projects would receive priority over local metropolitan and even statewide concerns. That said, we found strong suggestions for possible economic clusters organized and operating at a Cascadian scale, and clear allegiance to what can best be described as a Cascadian “brand.” Both of these observations suggested the potential development of a competitiveness strategy for a Cascadian megaregion based on distinctive traits, landscapes, and culture. Further, work done on high and higher speed rail laid the groundwork for imagining a more connected and highly accessible Cascadian megaregion.

In “Ecolopolis 2.0” we identified a rationale for Cascadia-scale planning within global, national, and regional contexts. Globally, we found that Cascadia done right could become a laboratory and source for innovation in the world-wide search for more sustainable development patterns and life styles. Nationally, Cascadia provides an opportunity for exploring Federal-State and international relations aimed at creating both sustainable urban places and a better future for intervening rural areas and towns. Regionally, imagining Cascadian-scale strategies for global competitiveness, accessibility, and sustainable development opens up new opportunities not immediately apparent in the existing context provided by states and separated metropolitan regions.

Ecolopolis 2.0 began by documenting the history of the idea of Cascadia as a means for better understanding what a unified Cascadian brand might consist of. We analyzed conditions and trends for both rural Cascadia and for its metropolitan centers. Though we found many similarities linking the metropolitan regions of Cascadia, as in Ecolopolis 1.0 we also found many forces working against integration of efforts at a Cascadian scale. Nonetheless, we identified four strategies that could be used to both better integrate the Cascadian megaregion and to prepare Cascadia for engaging future national initiatives directed at megaregions:

- In light of the similar strategies for metropolitan growth management employed in Cascadian metropolitan regions, create an internationally recognized effort to learn from this experience;
- Save agriculture, and the working landscape more generally, to maintain separation between metropolitan areas;
- Develop industry clusters across Cascadia, particularly in areas like green building and software that are already operating at a Cascadian scale; and
- Increase accessibility through the development of high speed rail and other strategies linked to their strategic value at a Cascadian scale.

With “Ecolopolis 3.0” we took the next step towards defining a strategic agenda for Cascadia. Through the efforts of members of Congress and others, and due to the catastrophic collapse of the I-35W bridge in Minneapolis, new attention is being paid to the condition of the nation’s infrastructure. Calls for a national infrastructure initiative are being made, echoing previous national initiatives in 1808, the Gallatin Plan, and 1908, President Theodore Roosevelt’s plan for national conservation and development.

Whereas the Gallatin plan was about moving the natural resource bounty of the nation to the seaports in the east coast cities, and Roosevelt’s effort focused on mitigating the impacts of rapid urbanization and industrialization, the focal point for this new effort remains undefined. Many expect that sustainability, energy conservation, and a fundamental response to climate change and uncertainty will emerge as organizing principles, at least in part, for this new endeavor. In addition, given the demands of global competition coupled with demographic shifts, realizing the promise for innovation emerging from the interaction of people in cities will likely become part of this new national conversation.

Nonetheless, the lead strategy is likely to be infrastructure planning and finance, with a new role for and sense of urgency on the part of the Federal government. Consequently, with Ecolopolis 3.0 we attempted to identify an infrastructure agenda for the Cascadian megaregion, one that is attuned to the objectives for creating an Ecolopolis, as outlined above. To do this, we approached Cascadia as being defined by three central elements:

- Competencies – the things that Cascadian metros and the megaregion itself are distinctly and perhaps uniquely good at, and which differentiate us from other megaregions in North America.
- Sustainability – patterns of resources use, settlement, and interaction that address core values in Cascadia underlying the turn towards growth management, resource conservation, green building, local food systems, and other core behaviors and activities associated with the Cascadian brand.
- Flows – the movement of people, goods, materials, capital, ideas, and information throughout the megaregion.

For each of these elements, we identified issues, trends, and the roles that infrastructure development can play in advancing them. Our intent was to both advance the idea of a unified and integrated Cascadia, and prepare Cascadian decisionmakers to be effective on behalf of the megaregion as the details got worked out in Washington DC.

Ecolopolis 4.0, examined the implications for Cascadia from the U.S. federal livability partnership of the Environmental Protection Agency, the Department of Housing and Urban Development, and the Department of Transportation. This new interest in the role that Federal agencies can and should play in furthering goals for livability and smart growth prompted an investigation of how the livability theme might be acted on here in Cascadia in anticipation of increased engagement from federal partners. The report is divided into three parts:

- Defining Livability – all of the Cascadian metros, states, provinces, and major cities have worked with this idea in the past. We sought to document what “livability” means here, and what Cascadians have already identified as a livability agenda.
- Planning and Acting on Livability – planning and acting at the scale of the megaregion requires a focus on techniques and outcomes appropriate to that scale. Our task was to identify the techniques and objectives that made the most sense from the perspective of the Cascadia Ecolopolis.
- Understanding Livability from the Federal Perspective – similarly, each of the federal agencies involved in the Livability Partnership have, in the past, adopted and acted on a range of initiatives directed at what we’re now calling livability themes. We wanted to better understand what those agencies were engaged in as a means for better understanding the intent and direction behind the seven Federal Livability Principles.

Ecolopolis 5.0

In Ecolopolis 5.0: High Speed Rail in Cascadia, we present the products of a unique collaboration between students at the University of Washington and at Portland State University. Continuing on in the tradition of previous documents, what you have before you is the product of term-long projects conducted by graduate students from the two universities, and enrolled in either PBAF 544: Transportation and Land Use Policy, taught at the Evans School of Public Policy by Professor Daniel Carlson, or USP 549: Regional Planning and Metropolitan Growth Management, taught at the Toulon School of Urban Studies and Planning by Professor Ethan Seltzer.

The courses, both taught during the Winter term, 2011, engaged the questions of identifying the impacts, maximizing the benefits, and exploring implementation options for high speed rail development in the Cascadia corridor. Though passenger rail has long been a shared interest in the corridor, recent U.S. Federal initiative proposed by the Obama administration have accelerated high speed rail activity and discussions in Cascadia. To explore these issues and add to the dialogue, a two-part project was developed:

Part 1:

- Identify baseline route, alignment and system attributes
- Assemble and analyze existing state, regional and local comprehensive plans in the HSR corridor
- Identify likely impacts on the corridor’s environment, municipalities, residents and businesses consistent with the comprehensive land use and transportation plans
- Identify the potential benefits of HSR
- Develop a set of principles to guide future analysis and implementation. The products of this inquiry will be developed by Ethan Seltzer’s USP 549 class and presented to Dan Carlson’s PBAF 544 class at a seminar in Portland on Friday, February 4, 2011.

Part 2: using the information developed in Part 1,

- Identify the policy implications of developing a Cascadia HSR with particular emphasis on community development, economic development, growth management and the environment
- Explore and analyze options for financing, governing, and operating regional HSR passenger service in order to optimize potential benefits at the local and regional level. The products of this inquiry will be developed by Dan Carlson's PBAF 544 class and presented to Ethan Seltzer's USP 549 class at a seminar in Seattle on Friday, March 4, 2011.

The seven papers developed by students in these two courses are presented in this document. The first paper identifies key principles for high speed rail development gleaned from the literature and from the experience in other countries. The second chapter looks specifically at alignment and operations issues. The next two chapters consider community-level impacts in both Oregon and Washington. The last three chapters present scenarios for high speed rail development-- rationales for a range of service options and analyses of their impacts governance, funding, economic development, land use and the environment-- starting with the existing system ("sensible rail") and proceeding to true, 150 mph+ service in the corridor.

As with our previous efforts, we welcome your comments and suggestions. All of the Ecolopolis documents are posted on the America 2050 website (www.america2050.org) and are available for downloading. The Ecolopolis series is presented as a work in progress, just as the very idea of Cascadia and conception of megaregions themselves are works in progress. We are optimistic in our belief that acting on behalf of the megaregion will ultimately prove to be a useful strategy for achieving the kind of future that residents of this megaregion would prefer for Cascadia in the years to come.

Acknowledgements

This project could not have happened without the commitment and interest of the students involved in both classes. In addition, we received financial support from the Oregon Transportation Research and Education Consortium (OTREC) at Portland State University, Transportation Northwest (TRANSNOW) at the University of Washington and the Cascadia Center for Metropolitan Development and its Director, Bruce Agnew, that enabled our students to travel between the two campuses.

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Principles of Successful High-Speed Rail: Lessons from Around the World

Principles of Successful High-Speed Rail: Lessons from Around the World

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Introduction

The United States lags far behind many parts of the world in its capacity for passenger rail. As policy makers and state and federal agencies embark on the process of planning for and implementing high-speed rail (HSR) along the Cascadia corridor from Eugene, Oregon to Vancouver, British Columbia, we feel it is important to inform our efforts with a study of those who have led the way. There are many case studies of successful rail lines worldwide to guide our efforts here in Oregon and Washington.

What follows is a list of guiding principles drawn from an examination of case studies around the globe. In some instances, these lessons are based on successes, as in the case of HSR in Japan, France, Germany and China. In others, we can learn from mistakes made, as in failed attempts to implement HSR in the United States, or in Spain's failed attempt to use HSR as an economic development tool. We have consolidated these lessons into five principles that are both relevant to HSR in Cascadia and could be utilized as a guide for any region looking to build HSR. Where appropriate, we have analyzed how these principles relate specifically to local scenarios. Our principles of successful HSR are as follows:



1. Establish a shared goal and vision
2. Acknowledge HSR's opportunities and constraints
3. Utilize existing assets
4. Integrate HSR with the rest of the public transportation network
5. Maximize operational efficiency and service reliability

The first principle, to establish a shared goal and vision, is immensely significant to any planning issue spanning multiple jurisdictions and of regional importance. The motivation for pursuing rail infrastructure will vary by locality, and specific objectives of HSR will serve as the basis of evaluation for measuring progress and success. Developing a shared goal and vision, then, will ensure all parties will be working within in the same framework and towards the same ends rather than at cross-purposes. In turn, this first principle acts as a starting place for the remaining four principles of successful HSR, which assume a shared objective exists and provide insight into the limitations, benefits, and best practices of HSR.

Principle 1: Establish a Shared Goal and Vision



Mainstreet Cascadia

Source: Smith, 2008. "Branding Cascadia."

Most successful HSR lines worldwide have been implemented in Europe and Asia, where systems of planning and governance bear little resemblance to those of the United States. In France, for example, the Train à Grand Vitesse (TGV) was built based on the decisions of a strong central government, without any regional input about alignment (Albalade, 2010). In stark contrast, HSR in the United States requires commitment by, and coordination among, leaders at a local, state, and federal level. The most salient lessons of HSR for Cascadia stem from examples within the US.

The rail system itself is only as strong as the vision and the governing process that creates it. Several key elements are critical considerations for policy makers in the development of HSR:

- Leadership, authority, and means
- Shared vision and goal-setting
- Stakeholder engagement

Leadership, Authority, and Means

In a congressional report by the Mineta Transportation Institute, de Cerreño et al. (2005) point to leadership, authority, and means as fundamental elements influencing the successful implementation of HSR in the United States. There are examples of the necessity of these three components in successful and unsuccessful HSR projects in the United States.

Many state-level HSR proposals begin with one political champion, often influenced by an inspiring experience onboard world-class rail lines such as Japan's Shinkansen or France's Train à Grand Vitesse. Florida has been pursuing HSR in some capacity for over 30 years because of such a trip by Governor Bob Graham (de Cerreño et al., 2005). He was able to rally support for HSR initially, but many of the original champions of HSR have since left the political arena and leaders have now cooled towards development of faster rail in their state. Because HSR has not benefited from

consistent and continuous political support, the state has made very little progress towards development and implementation of HSR. In order for HSR to be realized, there must be long-term political support and leadership that will withstand the lengthy planning process necessary to see the project through to completion.

Rail on the East Coast is another case in which “leadership, authority and means” made the difference in successful implementation (de Cerreño et al., 2006). Like the proposed line in Cascadia, Amtrak’s Acela line is a multistate operation, passing through eight states and the District of Columbia. HSR in the Northeast was initially funded through the federal High Speed Ground Transportation Act of 1965, followed by the Railroad Revitalization and Regulatory Reform Act of 1976 which gave Amtrak the right of way to the Northeast corridor. Congress had the authority and funding to make a regional rail line possible across state boundaries, and the leadership to pass legislation that led to the rail line’s creation.

Cascadia has two of these three aspects in place. Federal funding provides the initial means for the Northwest Rail Corridor and Oregon Department of Transportation (ODOT) and Washington State Department of Transportation (WSDOT) have the authority to begin planning efforts. However, no outstanding political champions have emerged to help introduce supportive legislation or secure matching local funds. The level of political support for the project has remained fragmented and varied across state lines. Washington and Oregon have pursued planning and goal-setting independently, and have received differing levels of federal funding. Vancouver, BC, the northernmost city on the proposed line, has remained disengaged from the rail project, consistent with its current refusal to fund the one daily train that currently runs across the US-Canada border. In spite of federal financial support and local authority to implement the project, Cascadian HSR risks being planned piecemeal unless coordination takes place between Oregon, Washington, Vancouver, BC, and the many other stakeholders with an interest in the project.

Shared Vision and Goal-setting

There is no “one-size-fits-all” HSR solution, and its design choices will depend on the purposes HSR will serve. If the overarching goal is to reduce congestion and increase commuting by rail, then incremental improvements to existing passenger rail may be the most effective strategy. Incremental improvements capitalize on existing stations, rights of way and ridership, and are accessible to more users along the route. However, if the goal is to connect major metropolitan areas by decreasing the travel time between cities, or relieve air congestion between cities, then fully grade-separated HSR with minimal stops may be the best option.

Washington and Oregon have exhibited very different priorities in planning for their stretch of Cascadia’s HSR line. While both states play a vital role in rail travel along this corridor - the vast majority of ridership occurs between Seattle and Portland - all interim stops are located within Washington borders. The Oregon portion of the alignment, from Portland to Eugene, experiences much lower ridership, making ODOT Rail hesitant to invest in a costly new right of way. Additionally, Washington’s rail

feasibility reports have conducted a cost-benefit analysis of HSR using the cost of highway growth as a baseline for comparison, whereas Oregon's rail strategies have only compared new separated track with incremental improvements to existing track, making incremental improvements seem like the better investment. Washington's plans include ambitious goals for increased efficiency and speed in the Seattle to Portland trip that Oregon does not share (de Cerreño, 2005). If WSDOT wants to achieve its aspirations for the Cascadia line, it needs to coordinate with ODOT Rail to develop a shared goal and vision for the rail corridor.

Engage Public and Private Stakeholders

HSR in much of Europe was developed without any consultation with localities regarding alignment, but rail projects in the United States require a more robust public involvement process. There are many businesses, service providers, community groups, non-profits, and local governments that have an interest in how HSR will be built. These include airlines, freight companies, railroad companies, large-scale businesses along the corridor, cities along the alignment, and environmental groups. California's planning process for HSR has involved engagement with many such stakeholders regarding station placement and right of way alignment (de Cerreño, 2005). Many of the communities along proposed HSR alignments in Cascadia have strong feelings for or against locating a station in their town or having a tracks run through their community. These stakeholders need to be invited into the conversation early in order to create a constituency for change able to identify opportunities for joint gains and overcome HSR's many obstacles (McKinney and Johnson, 2009).

Designing a system of governance that meets these criteria will be difficult and complicated, but there is no better time to begin than the present. We recommend forming a regional steering committee comprised of diverse stakeholders with the leadership, authority, and means to define and guide the project's vision and maintain communication between stakeholders and implementers.

Principle 2: Acknowledge High-Speed Rail's Opportunities and Constraints

In large urban areas that are centers of cultural, social, and economic activity, HSR may be used to direct growth and support existing systems. Additionally, HSR presents an opportunity to accommodate an increasing travel demand while reducing air and highway congestion and greenhouse emissions in the region. However planners should be cautious about promoting HSR as an economic development tool, particularly in small cities, rural communities, or remote locations.

HSR and Local Economic Development

Local planning and development incentives can play an important role in aiding station-area development, but HSR's role in this growth is mixed at best. In urban areas, dense development appears to increase around stations, and in some cases HSR has been shown to help improve the region's economic competitiveness by integrating peripheral communities with one another and with regional centers (Ross, 1994; Melibaeva, 2010). However, in other cases higher land costs have stymied development around rural stations. For example, rural station development along Japan's HSR network often took decades to realize, while some areas remain underdeveloped (Ehlers, 2010). Economic activity has increased near stations in regions with self-sustained economic growth, but HSR itself may not change development patterns. For these reasons, some studies suggest that Spain might have benefited more from improving existing rail service than building HSR (de Rus and Inglada, 1997; Gutiérrez, 2001).

It is difficult to determine the exact role played by HSR stations in a community's economic development. For example, when HSR came to the French city of Lille, it was transformed from a shrinking industrial town to a knowledge-intensive, service-producing city within the culturally and economically integrated Oresund region. Much of this change, though, was due to the role Lille plays as an important node between London, Paris and Brussels. Additionally, Lille's station attracted substantial public and private investment, without which development would not have occurred. (Matthiessen, 2005; Gutiérrez, 2001; Vickerman, 1997; Campos and de Rus, 2009; Ehlers, 2010).

Intelligently Accommodating Growth

According to America 2050, Cascadia's population is estimated to grow upwards of 40 percent by 2040 (Hagler and Todorovich, 2009). This dramatic increase has serious implications for transportation, livability, and the human impacts upon natural systems both locally and globally. Managing increased congestion between cities in Cascadia will be a major challenge in the future. Currently, "traffic congestion between Portland and Seattle is about average, with nearly 50 percent of Interstate 5 operating at above 75 percent of design capacity during the peak hour," but as the region grows, increased congestion along the only major corridor between these cities may limit both business

and personal travel, ultimately leading to fragmentation of the region (Hagler and Todorovich, 2009).

The distance between Eugene to Vancouver is only 466 miles, making HSR travel a potential alternative to short haul flights and automobile traffic in the region. The HSR network in Spain, for example, halved demand in air travel between Madrid and Sevilla and there has been a significant reduction in traffic and road congestion between Madrid and Sevilla (de Rus and Inglada, 1997; Campos and de Rus, 2009). The region has derived benefits from the associated time-savings, reductions in automobile operating costs, road repairs, and accident prevention.

In summary, HSR can aid the economic integration of a region, but it should not be viewed as a panacea for struggling localities (Hagler and Todorovich, 2009; Vickerman, 1997). Authors have agreed that quantifying HSR's economic impact is difficult, but studies indicate a strengthening of existing social, cultural, political, and economic networks based in urban cores. Urban centers are therefore likely to receive the largest benefit from HSR in Cascadia, which has direct ethical implications for its planning and implementation (Sasaki et al., 1997; Melibaeva, 2010; Hagler and Todorovich, 2009). Examples from Japan, France, Spain, Portugal, the multinational Oresund region, and potential American sites all support these conclusions.

Principle 3: Utilize Existing Assets

Planners and engineers will face many alignment choices in the implementation of HSR. There are trade-offs to be considered in deciding whether to use existing tracks, upgrade infrastructure along existing corridors, or acquire entirely new rights of way. In addition to monetary costs, there are environmental and political issues to be considered. The following sections hope to inform these decisions and advocate leveraging the cultural attitudes within the region.

Existing Rights-Of-Way

Utilizing existing transportation corridors can reduce the costs of land acquisition and construction while minimizing environmental impacts. Substantial barrier effects are created by roads and railways in both communities and ecological systems, and these costs must be balanced against benefits of a new corridor (Nash, 2003). HSR can also follow freeway corridors to reduce the need for right-of-way acquisition, which can take advantage of current development patterns that follow freeway corridors and potentially make HSR more accessible.

Impacts upon the region's freight system must be considered as well. Currently, Cascadia's rail rights-of-way are shared between passenger and freight trains in a manner that reduces the speed and reliability of both systems (Nash, 2003). However, incremental improvements such as passing tracks and coordinated signaling systems can improve the corridor for all users while keeping costs relatively low. Freight operators have been opposed to increased passenger capacity in the region, but HSR funding could be used in a way that provides opportunities for mutual gain (California High-Speed, 2010). Germany's Intercity Express system provides an example of shared track with HSR trains using tilt-train technology, allowing trains to maintain higher speeds when rounding a curve on regular tracks (Gimpel and Harrison, 1997).



German ICE Tilting Train
Source: Deutsche Bahn AG in Nash, 2003

Local Commitments

There are currently eighteen stations on the Amtrak Cascades line, with high ridership at Vancouver, BC, Seattle, and Portland. Attempts should be made to align the system with existing stations demonstrating high ridership and stations poised to significantly increase their ridership. This will reduce or eliminate the need for building new stations, retain and expand existing ridership, and provide the ability to revitalize stations and enhance station areas with development.

HSR can be seen as a tool of “smart growth,” facilitating sustainable development in line with current environmental commitments. The Portland metropolitan region has developed a culture of growth management and Portland’s Metro Regional Government’s 2040 Growth Concept envisions a hierarchy of nodes (central city, regional centers, town centers, station communities, and corridors) where urban development will occur in various densities and forms, and where land will be preserved for rural uses and nature (Metro, 2000). HSR can help leverage and complement current planning commitments to sustainable growth by helping focus growth along corridors and station areas.

Principle 4: Integrate High-Speed Rail with the Rest of the Public Transportation Network

Airport Interoperability

Studies show that HSR can replace a significant portion of short-haul flights along routes where the journey time is comparable to that of air travel and where service is reliable (Steers Davies Gleave, 2006). These flights are less fuel-efficient per passenger-mile than longer flights, which can cover greater distances at high altitudes. Rather than competing with HSR, cooperative integration of airports into a HSR system can provide benefits to airlines through reduced runway congestion and increased capacity for long-haul flights (Givoni and Banister, 2007).

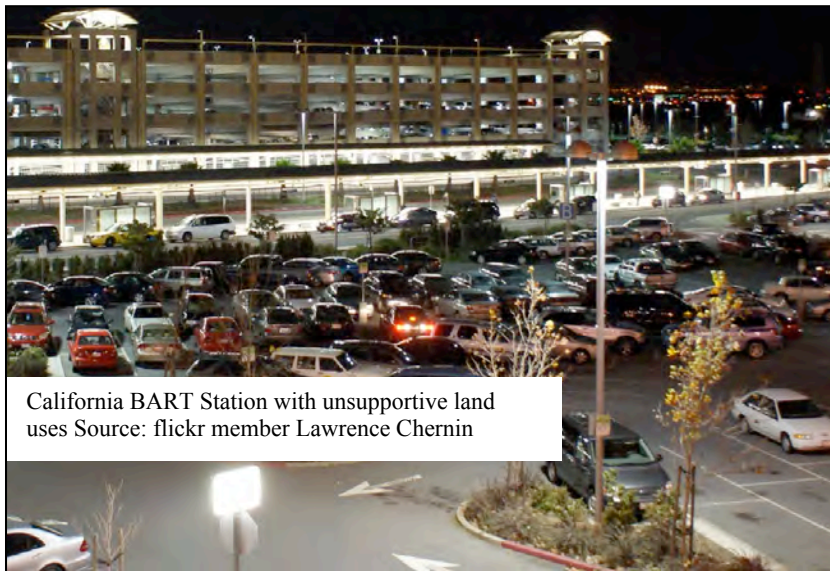
There are different levels of air/rail interoperability. Rail can serve as merely an access mode to airports, which could lower air pollution in the vicinity, reduce parking requirements, and improve the image or visibility of the airport. Alternatively, rail could be more closely integrated into air travel through coordinated scheduling, combined ticketing, and luggage services, though the small number of these systems operating today speaks to the technical difficulty and security concerns involved.

The choice of whether to include an HSR stop at one of the region's airports should be addressed in the visioning process, with airlines themselves actively engaged as stakeholders. If attracting tourists from abroad and facilitating their movement throughout the region emerges as an important goal of HSR in Cascadia, then tight integration with at least one large airport in the region could be more desirable than relying on conventional rail or other public transit for airport connectivity.

Station Location and Supportive Land Uses

A major benefit of rail over air travel is the ability to bring passengers into the urban core and connect them to local transit systems. Without convenient options for reaching their final destination, passengers must rely on automotive travel at the beginning and end of their trip, reducing environmental advantages and convenience of high-speed rail. Ridership on the Acela service, for example, has benefited greatly from connectivity to the New York City subway system and DC Metro (Hagler and Todorovich, 2009).

Station location and design will affect not only the system itself, but will also have a substantial impact on the communities along the route. Stations on the urban periphery or between cities, known in France as “beet field” stations, can draw development away from historical downtowns and require automobile-oriented infrastructure unless great care is taken to provide appealing transit alternatives. Stations located in central cities, on the other hand, can more easily facilitate intermodal connections and encourage supportive, sustainable development nearby (Facchinetti-Mannone, 2009).



California BART Station with unsupportive land uses Source: flickr member Lawrence Chernin

In the United States, local governments have control over issues of urban form. “BART Syndrome” refers to the missed opportunities that occur when communities receive a regional transit station but do not make land use decisions that are

supportive to access and density near the station, often negatively impacting the transit system and the community itself. The 2011 San Francisco Planning and Urban Research Association (SPUR) report “Beyond the Tracks” addresses this issue. Acknowledging the great variation between communities in size and planning capacity, SPUR makes several recommendations for creating supportive land uses near HSR stations, which we have adapted for HSR in Cascadia:

- Develop station-area plans for each station area.
- Draft state- or region-wide planning guidelines to inform local decision makers, including possible implementation tools such as form-based codes and tax increment financing.
- Establish oversight and certification of station-area plans, either at the state level or through a regional body.
- Link HSR considerations to statewide land use goals, where applicable.
- Correlate future HSR investment with measured ridership, giving localities incentives to support HSR through land use decisions.

Implementation of coordinated station-area planning will require a robust regional effort and faces many difficulties, as Cascadian HSR will cross state and national boundaries. Providing funding for planning efforts in smaller communities and tying transportation investment to desired station designs are strategies that may overcome these obstacles.

Principle 5:

Maximize Operational Efficiency and Service Reliability

Maximizing operational efficiency and service reliability requires the consideration of several factors from both an operator's perspective and from a passenger's perspective. Some improvements to operational efficiency can also serve to make high-speed train travel more attractive to passengers, while others may involve trade-offs between service, travel time, and energy efficiency. Agencies who will plan and implement HSR should consider how best to incorporate the following practices.

Maintain Uniform Train Speeds

International experience suggests that maintaining uniform speeds minimizes the amount of energy trains require to accelerate and decelerate (Nash, 2003). Train speed variation can be lessened by a by minimizing the overall number of stations and locating them at greater intervals, minimizing at-grade crossings with roads, and limiting the amount of travel through developed areas. On the Acela line on the U.S. East Coast, citizen reports suggest that "When stops average 35-40 miles apart ... 70 mph average speed results. When stops average 45-50 miles apart, more respectable 80-85 mph average speeds ... result." (Dorsey, n.d.).

Minimize the Number of Stops

As previously noted, this is an important consideration for the practice of maintaining uniform train speeds, as the number and location of stations will determine how frequently the trains must accelerate and decelerate. It also helps to decrease overall journey time. Finally, HSR is most competitive with other travel modes for trips that are 100-500 miles long (Albalade and Bel, 2010). Even for "higher-speed rail," which does not reach top speeds of more than 110 mph, fewer stops means greater energy efficiency and shorter overall travel times.

Locate Stations According to Population Density and Passenger Accessibility

Locate stations where the most passengers can access them with the least inconvenience and cost. This means that, to a certain degree, the practice of minimizing stops must be balanced against the practice of making the HSR system accessible to many communities. Lessons from other HSR systems suggest that stations should be located in medium-sized cities, at a minimum. In European systems, it has been recommended that stations should link urban centers with populations of at least .75 million (Vickerman, 1997). In the Cascadia corridor, only Portland, Seattle, and Vancouver, BC have sufficiently large populations by this standard. Smaller communities can be connected to the HSR system through local or regional transit. Siting stations in dense, downtown locations is also recommended, as this makes them more easily accessible than peripheral stations.

Keep Grades Separated

Employ grade-separation where possible, particularly at crossings and stations. This is important both for ensuring safety and for improving speeds. European HSR systems do not have at-grade crossings, and the U.S. Federal Railroad Association has determined that no grade crossings should be allowed for trains traveling over 125 mph. At stations, grade separations and HSR passing tracks separated from the platform can improve the safety of waiting passengers and allow high-speed trains to bypass the station (Nash, 2003).

Coordinate with Freight

Where high-speed trains share track with freight and conventional passenger rail services, operations and maintenance should be coordinated to maximize the benefits to all parties. In particular, operators of different systems should coordinate train schedules and dispatching to minimize conflicts and delays. Multiple tracks or passing tracks allow for increased capacity, and track and alignment improvements can allow for higher speeds, but improvement options must be considered in the context of how they will benefit the varied needs of all users (Nash, 2003). Shared-use, while challenging, can offer significant benefits such as shared costs. It is possible to have fully or partially shared-use systems; partially shared systems are common in urban areas. ICE in Germany, TGV in France, and Acela in the Northeast United States are three examples of partial shared-use HSR systems.



Employ Demand-Responsive Pricing Strategies

Make greater use of yield management systems to improve overall efficiency per passenger. This means that rail operators could employ more flexible pricing strategies to encourage more efficient use of existing train capacities (Steers Davies Gleave, 2006). Airlines use demand-responsive pricing and on average fill 85-90% of the seats, while rail operators may fill as few as 35% of their seats. However, unlike airlines, train operators face difficulty filling seats due to passengers boarding or alighting at intermediary stops. Also, the success of these strategies depends upon improving the attractiveness of rail services in order to increase demand.

In summary, passengers of HSR seek reliability, reduced journey time, high frequency trains, affordable ticket prices, and easily accessible stations. These service needs must be balanced against operational needs. Rail operators need to reduce costs, which in the Cascadia corridor includes coordinating freight and conventional passenger rail operations, as building dedicated track for HSR is likely cost-prohibitive given current population densities along the corridor. This coordination in turn means that there

are limitations to the top speeds that trains can reach, making reliability improvements more complicated. Operators also need to fill trains to reduce costs per passenger, meaning high frequency trains are not viable unless demand for rail travel increases significantly. However, improvements to reliability, journey times, and system accessibility, could lead to increased demand, creating a virtuous cycle of both improved operational efficiency and improved services.

Conclusion

We have attempted to distill lessons and insights from the experiences of others in creating passenger rail systems for the 21st century. The unique political and economic realities of American governance, with its emphasis on planning at the local level while funding transportation projects at the state or federal level, certainly limits the applicability of HSR experiences internationally, but we believe these examples from abroad should inform our discussion in the Cascadian region. To summarize:

- First and foremost, “High-Speed Rail” has a multitude of meanings, and its Cascadian incarnation should be part of a regional conversation that serves to promote regional identity, establish shared goals of the system, and address the distribution of costs and benefits in an equitable manner.
- While it does have distinct advantages over automobile and air travel, HSR is not without its costs and limitations and should not be seen as a panacea for struggling economies, especially in the short term.
- The monetary, environmental, and social costs of implementing HSR can be reduced by using existing rail infrastructure and highway corridors.
- Benefits to HSR ridership and to communities are maximized when stations are located in urban cores with supportive transit connections and land uses.
- Reducing the number of stops and at-grade crossings, coordinating with freight, and locating stations only in the most populous communities will increase speed and service reliability, but must be balanced against regional goals.

High-Speed Rail in Cascadia presents an exciting opportunity to shift our regional transportation and land use systems away from inefficient and costly automobile-oriented infrastructure, and we hope that our efforts will help inform its implementation.

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Cascadia High Speed Rail: Alignment and Operations

CASCADIA HIGH SPEED RAIL

ALIGNMENT & OPERATIONS



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Section I. Introduction

This chapter presents information on potential Cascadia High Speed Rail station locations, alignment alternatives, and operational considerations. Criteria for station location and alignment is presented for both siting stations within the major cities of Portland, Seattle, and Vancouver BC, as well as the corridors between them. Alternatives are evaluated and proposed station location recommendations provided. HSR station analysis in major cities consists of evaluating station locations and alignments within each metro region. Analysis for smaller cities focuses on which cities should have a station, why, and the recommended level of service it should receive. Considerations for rights of way options are discussed and presented.

This report finds that right of way considerations, station locations in regional centers, as well as stops between those centers depend on the goals of the overall system. Improvements to existing service is possible using existing right of way; building a rail system that provides true high-speed service between regional metropolitan centers requires grade separated right of way acquisition. Likewise, avoiding impacts to freight and achieving service competitive with regional air and highway travel also requires new right of way.

HSR stations in major cities of the Pacific Northwest should promote overall goals of HSR development, including focusing growth on urban centers rather than promoting sprawling development on working and wild lands, by reflecting strong integration with land use and transportation planning throughout Cascadia. In order for high speed rail to maintain an appropriate level of efficiency, stops between major metropolitan areas need to be carefully considered before deciding on their inclusion in a High Speed Rail system.

Section II. Rights of Way Considerations

Rights-of way (ROW) considerations have significant implications for regional HSR planning efforts in Cascadia. The primary options include obtaining new and/or dedicated ROW, using existing shared-use ROW, or other new novel solutions. As expected, new ROW costs can be a major obstacle to HSR implementation. Using existing ROW is less costly, however, in order to reach true HSR speeds, new and/or dedicated ROW is often needed. Further, the Federal Rail Administration requires grade separated crossings in design guidelines for HSR threshold speeds. Grade level crossings are numerous on existing ROW, especially outside of urban area. The following sections describe the motivation behind using existing ROW as well as the motivation for using new ROW in planning for regional HSR.

Two western states, California and Washington, are moving forward with plans for HSR using both existing ROW and new ROW. California is planning to acquire new ROW for the majority of its HSR system that is projected to reach speeds of up to 220 MPH. Washington, on the other hand, is taking an incremental approach to HSR, utilizing existing ROW and even sharing track in some areas of the proposed system

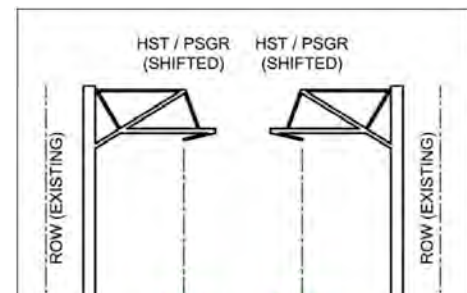
with freight rail (Washington State Department of Transportation, 2010). Speeds are expected to reach 90 MPH in the Washington State system.

CONSIDERATIONS FOR USING EXISTING RIGHTS OF WAY

Planning for HSR utilizing existing ROW coincides with the Emerging Routes category as defined by the federal government (de Cerreno, 2005). By using existing ROW, overall maintenance costs are lower, especially when track is shared with freight operations. Enhancements made to existing ROW would not only benefit passenger rail, but also improve the freight system while leaving it undisturbed to continue freight operations as usual. Impacts to the environment are minimized since little land is disturbed when using existing ROW (Washington State Department of Transportation, 2010). Land-uses do not need to be redesignated or rezoned along the alignment using existing ROW, and unwelcomed development stemming from HSR can largely be avoided by cities and other populated areas along the alignments. Farmland is kept unaltered and political criticism regarding land acquisition is curtailed, giving incremental HSR a better chance of being realized.

The typical cross section shown in Figure 1 below demonstrates an upgraded existing ROW that shifts original ROW used by freight and Metrolink in Southern California outward to be configured for use by HSR (Murakami, 2010). Note that this design, as illustrated, takes advantage of unused ROW that isn't necessarily available along an entire alignment or along every alignment. Further, the use of Overhead Cantilever System (OCS) poles in HSR also pose a challenge as they require large and deep foundations that must be considered when evaluating ROW. Studies estimate that 25 to 30 feet of additional ROW is needed to accommodate HSR along most existing freight and passenger alignments (de Cerreno, 2005).

Figure 1: Use of Existing ROW for HSR



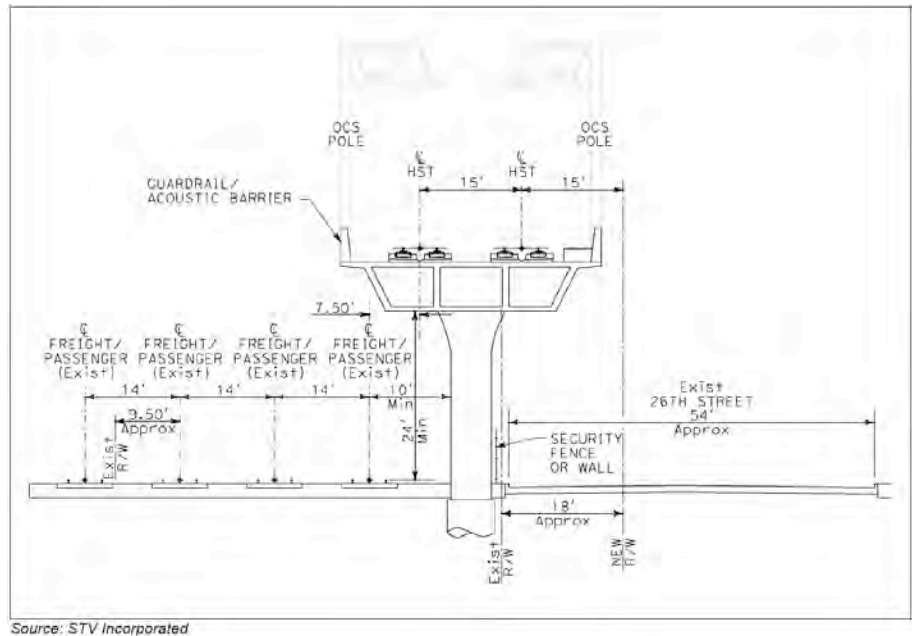
CONSIDERATIONS FOR NEW AND/OR DEDICATED RIGHTS OF WAY

New and dedicated ROW would allow for higher speeds comparable to HSR systems found in Asia and Europe (de Cerreno, 2005). Cutting edge technologies could be used in building a HSR System with new ROW, allowing for much needed updated transportation infrastructure. More current technologies can also help reduce risk of liquefaction, enabling a more reliable transportation network overall. Moving people quickly and effectively can be better accomplished through dedicated ROW at higher passenger rail operating speeds. Freight rail bottlenecks, currently a problem in many areas of the country, would be improved by proposed HSR using new ROW since it reduces interference between faster passenger trains and slower freight trains. Obtaining new ROW also reduces implementation risk factors based in the need to procure new agreements and cooperation from existing private-sector freight rail owners.

NOVEL RIGHTS-OF-WAY SOLUTIONS

Designs using grade separated track facilities have been fashioned using existing and newly acquired ROW for HSR. Figure 2 below shows a cross section whereby HSR travels above existing freight rail (Murakami, 2010). This design is proposed in densely populated sections of Los Angeles and can be implemented in similar areas elsewhere. A bore and tunnel alternative is also available for areas along an alignment where new ROW is cost prohibitive and going underground is feasible. New techniques for a bore and tunnel approach to implementation of HSR have decreased in cost and is viable under certain conditions.

Figure 2: Use of Grade Separated Track



Ultimately, the literature suggests that the appropriate approach to ROW depends on the goals of the overall system. Where goals include mitigating vehicle congestion in urban areas, existing ROW for HSR should be used. In contrast, new and/or dedicated ROW should be used if the goal of the HSR system is to reduce airport congestion between urban areas of 100 miles to 600 apart.

Section III. Criteria for Metropolitan Station Location

HSR stations in major cities of the Pacific Northwest should promote overall goals of HSR development including secondary effects on transportation and land use. The *Finding of No Significant Impact* (FONSI) for the *Pacific Northwest Rail Corridor* by the Federal Railroad Association and WSDOT (2010) lists policy goals of “reducing the nation’s dependency on foreign sources of energy, reducing greenhouse gas emissions that contribute to climate change, increasing public safety, and strengthening transportation system redundancies in the event of natural and man-made disasters,” which incremental improvements to passenger rail would address.

Reduced auto trips, fuel use and emissions are modeled for improved rail service between Seattle and Portland. (USDOT, 2010) The FONSI states that any immediate

energy and land use impacts would be small and mitigated by various particular efforts. The finding does not, however, consider the dynamic role HSR might take in influencing the form of land use and transportation systems in the broader context of the mega-region.

The *High Speed Rail in America* report by America 2050 (2011) lists employment and population as the main factors which determine which markets are best served by HSR. However, the transit catchment in potential rail markets is also an important criterion for evaluating the potential for ridership without creating additional roadway congestion and other deleterious effects associated with low density development and increased vehicle miles traveled.

The Fall 2010 OSPIRG Foundation Report, *A Track Record of Success*, includes recommendations for HSR implementation in line with such goals. The OSPIRG Foundation (2010) recommends that HSR station locations should be:

- easily accessible to people using multiple modes of transportation;
- located in areas which support transit-oriented development;
- in existing downtowns or inter-modal facilities (in contrast to greenfield or park-and-ride type facilities);
- located to focus future development and increase intensive commercial and residential uses or
- reinforce existing high density locations like central cities, rather than creating sprawl;
- integrated with other transit, particularly other commuter and freight rail, to facilitate track upgrades and shared stations.

Guidance from the USDOT, America 2050, and OSPIRG reports informed the creation of criteria used for evaluating possible HSR station locations in the three urban centers of the Cascadia mega-region. Criteria are in categories of local and regional access, and land use density as summarized in Table 1 below. The application of these criteria help evaluate possible station locations which would best integrate with existing and planned transportation systems and land use to provide access for strong ridership and focus development at high-density locations.

Table 1: Urban Station Location Criteria

Criteria	Measurement
Local Access	
Transit access	Number of transit lines
Local inter-modal access	Proximity to bike and pedestrian facilities; walkability
Regional Access	
Central to regional population	Regional population density distribution
Central to regional employment	Regional employment density distribution
High Density Location	
High population/employment area	Localized population and employment data
Supportive current land use	Land use regulations, designations, and current conditions
Supportive long-range land use	Land use and comprehensive plans

Section IV. Vancouver, B.C. Alignment and Station Alternatives

VANCOUVER ALIGNMENT ALTERNATIVES

There are three existing rail corridors, highlighted in Figure 3, that enter Vancouver and could be used to travel to the Central Business District (CBD).

Alignment A is an abandoned rail line that runs primarily through residential districts and terminates just south of the CBD near Granville Island. Its main advantage is that it is abandoned. Its primary disadvantages is that it would also require extensive upgrades at grade crossings and safety improvements. The corridor runs down the middle of an arterial street and would likely be a very controversial due to the adjacent residential uses.

Alignment B is the existing corridor for Amtrak and Via Rail and also shared with freight. Alignment C is also an active freight corridor shared with a regional commuter rail line between the CBD and the City of Mission to the east. Both B and C run primarily through industrial districts. Of the two lines however, alignment B is the most direct to the United States border and would offer opportunities to improve track for Via Rail. For this reason the preferred alignment for a Cascadia high-speed rail within the City of Vancouver using existing right of way is Alignment B. Potential alignments using new right of way was not evaluated within Vancouver.

Figure 3: Vancouver Rights of Way



Source: GoogleEarth

VANCOUVER STATION ALTERNATIVE A: PACIFIC CENTRAL STATION

Pacific Central Station (shown in Figure 4) is the current terminus for Amtrak's Cascades line, Via Rail's Canadian line, and the central bus station for Greyhound and Pacific Coach Lines. It is located just over one mile to the southeast of the central business district near False Creek. This station has a moderate level of access to the greater Vancouver region through 9 bus lines and the Main Street SkyTrain station (Translink 2010).

Pacific Central station is relatively close to the central business district where the highest residential and employment densities are located. The zoned land uses around the station, however, are less than ideal. It is surrounded to the east and south by light industrial uses and commercial and residential to the north and west (Vancouver 2009). Based on City of Vancouver's zoning the long-term land uses are not as supportive.

Figure 4: Pacific Central Station



Source: Bing

Table 2: Pacific Central Station Criteria

Criteria	Measurement
Local Access	
Transit access	11
Local inter-modal access	Medium-High
Regional Access	
Central to regional population	Medium (Near high population, but not central)
Central to regional employment	Medium (Near high population, but not central)
High Density Location	
High population/employment area	Yes
Supportive current land use	Medium
Supportive long-range land use	Medium

VANCOUVER STATION ALTERNATIVE B: CANADA PLACE / WATERFRONT STATION

This new proposed station would be constructed at the north end of the central business district above the existing rail yard. This location is one of the most highly accessible locations in the greater Vancouver region. Well over twenty bus lines are within walking distance to the proposed station. The regional commuter rail, SkyTrain, and the West Coast Express (serving communities between Vancouver and Mission to the east) both terminate at Waterfront station. The SeaBus Terminal provides ferry service to North Vancouver and multiple cruise ships dock at Canada Place one block away. This location is also centrally located to the regions' highest employment and residential density locations.

Figure 5: Proposed Waterfront / Canada Place Station



Source: Bing

Table 3: Proposed Waterfront / Canada Place Station Criteria

Criteria	Measurement
Local Access	
Transit access	25+
Local inter-modal access	High
Regional Access	
Central to regional population	Medium (Near high population, but not central)
Central to regional employment	Medium (Near high population, but not central)
High Density Location	
High population/employment area	Yes
Supportive current land use	Yes
Supportive long-range land use	Yes

VANCOUVER, B. C. RECOMMENDED STATION LOCATION

Waterfront/Canada Place is recommended as the future high speed rail station for Vancouver, B.C. This location edges out the current Pacific Central Station because it is better served by regional transit and closer to the central business district. The higher employment and residential densities would better support HSR goals than a less centrally located station.

Table 4: Summary of Seattle Station Location Criteria

Criteria	Pacific Central Station	Waterfront / Canada Place
Local Access		
Transit access	+	+
Local inter-modal access	+	+
Regional Access		
Central to regional population	O	O
Central to regional employment	+	+
High Density Location		
High population/employment	+	+
Supportive current land use	O	+
Supportive long-range land use	O	+

Section V. Seattle station location alternatives

For the Seattle metro area, four locations were evaluated for potential HSR station development (Figure 6), including two central city locations, and two international air terminal locations. In central Seattle the South Lake Union district was considered on the north side of downtown Seattle, as well as at King Street Station on the south end of downtown. Airport locations evaluated include Boeing Field, and SeaTac International Airport, both of which are south of the core central business district.

Information and maps used to characterize aspects relevant to station location criteria for the Seattle region include documents provided by King County (2010), Seattle Department of Planning and Development (2006, 2011a, 2011b), Seattle Department of Transportation (2011), and Sightline Institute (2006).

Source: GoogleEarth

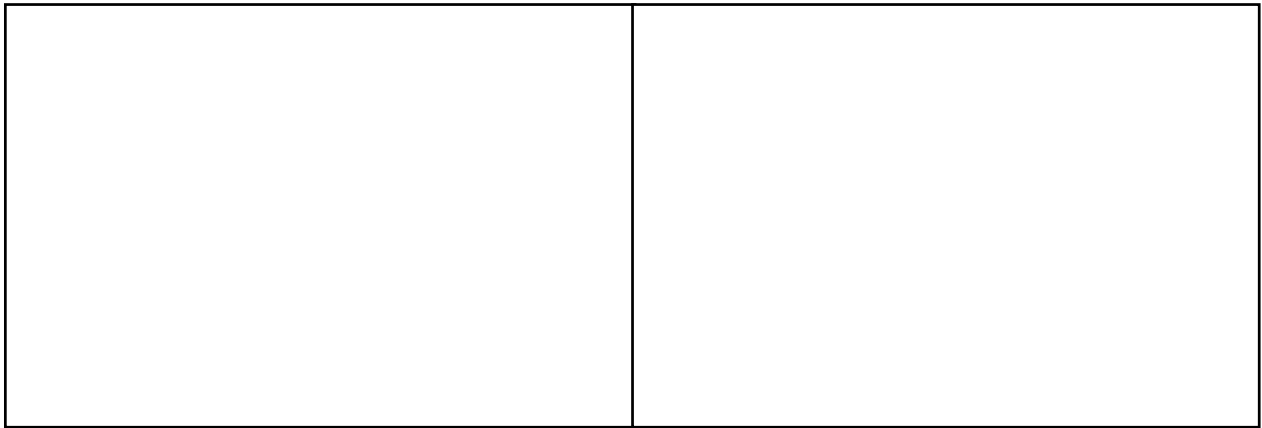
Figure 6: Seattle Station Locations Evaluated



SEATTLE STATION ALTERNATIVE A: SOUTH LAKE UNION

South Lake Union is a former industrial area on the north end of downtown Seattle bordered to the north by commercial uses along Lake Union, and to the south by relatively dense multifamily housing. Increased development density is planned for the area which was given an Urban Center designation by the Seattle Department of Planning and Development (2011). The district lies between the University of Washington and downtown is linked to downtown by streetcar. Current freight rail corridors do not service this area. Access from the I-5 corridor is possible, as is a linkage to the current BNSF line (Figure 7). However, each of those alternatives would likely require above or below grade facilities given existing dense development in the central city.

Figure 7: South Lake Union



Left: Connecting to the current BNSF line (green) requires tunneling or other substantial corridor development issues for traversing central Seattle. **Right:** Utilizing an I-5 alignment is likely to require similarly intensive corridor development, but over a shorter distance. Source: GoogleEarth

Table 5: South Lake Union Station Criteria

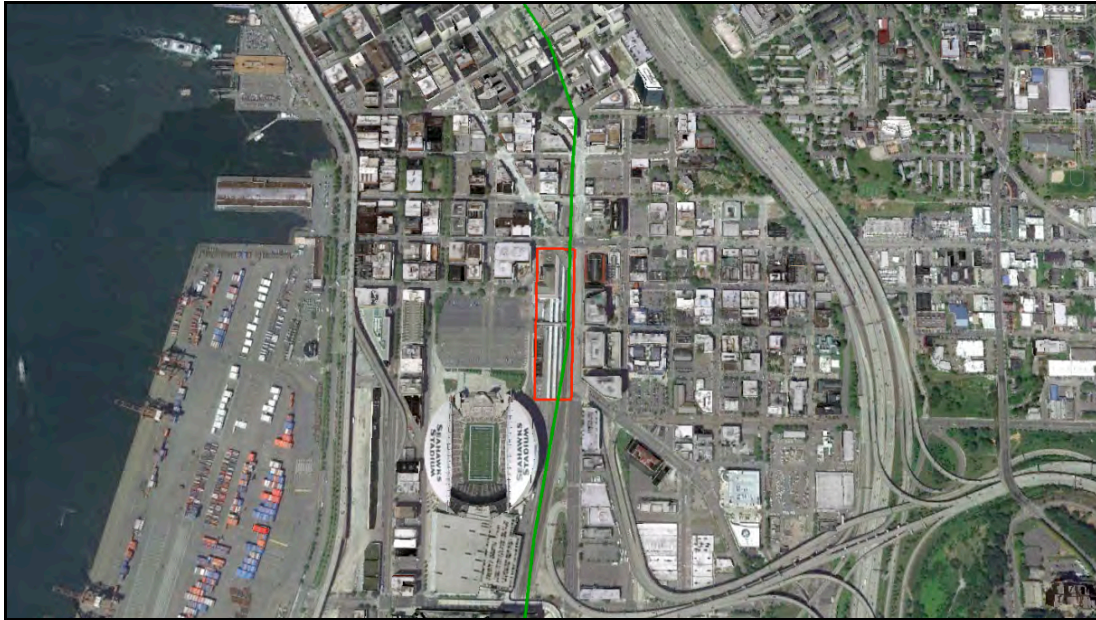
Criteria	Measurement
Local Access	
Transit access	5
Local inter-modal access	High scores
Regional Access	
Central to regional population	Yes
Central to regional employment	Yes
High Density Location	
High population/employment area	Yes
Supportive current land use	No (Commercial, Industrial)
Supportive long-range land use	Yes

SEATTLE STATION ALTERNATIVE B: KING STREET STATION

The King Street Station (Figure 8), the current Amtrak station for Seattle on the main BNSF rail, is located in a comprehensive mix of major transportation infrastructure and

the Seattle central business District. The station is served by the Sounder Commuter Rail line to Tacoma and is adjacent to the Seattle Ferry Terminal. Situated just south of the downtown business core, the station neighbors Safeco and Qwest Fields, the Pioneer Square Historic District and the International District. Its location is also at the southern terminus of the downtown transit tunnel and has access from I-5 and I-90.

Figure 8: King Street Location



Source: GoogleEarth

Table 6: King Street Station Location Criteria

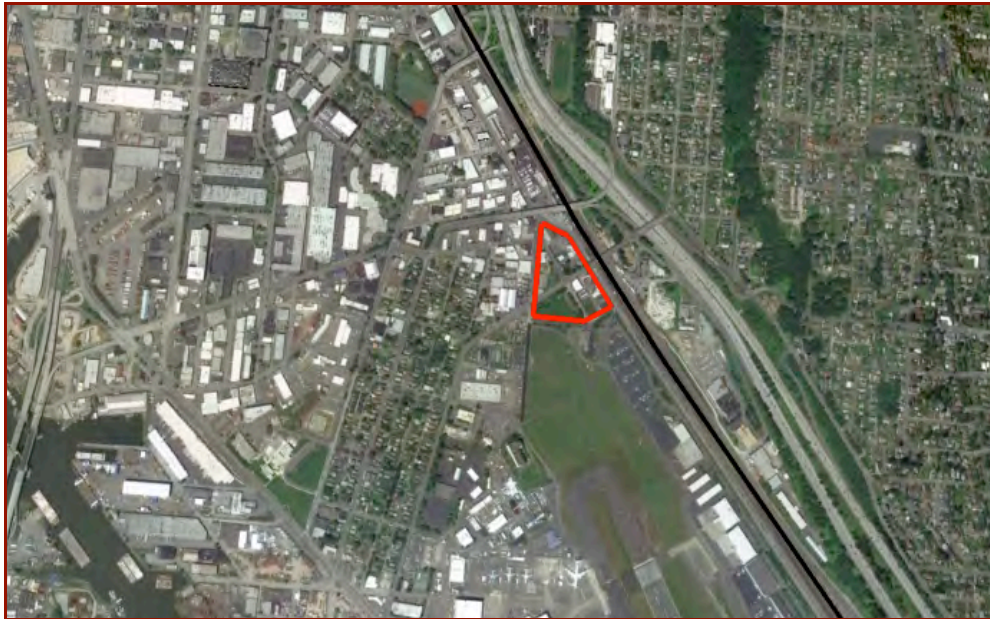
Criteria	Measurement
Local Access	
Transit access	12
Local inter-modal access	Medium-High
Regional Access	
Central to regional population	Yes
Central to regional employment	Yes
High Density Location	
High population/employment area	Yes
Supportive current land use	Yes
Supportive long-range land use	Yes

SEATTLE STATION ALTERNATIVE C: BOEING FIELD KING CO. INTERNATIONAL AIRPORT

Serving as the Seattle Metro area's second international airport, Boeing field is a regional hub for general aviation and air cargo. Lying 5 miles south of downtown, adjacent to I-5, it offers connections beyond the region with better access to downtown Seattle relative to

SeaTac. Because of its location in Seattle’s sprawling Duwamish Industrial Area and its close proximity to I-5, Boeing Field offers relatively inexpensive station and corridor development. However, this alternative does not match the density and centrality of downtown station locations.

Figure 9: Boeing Field Station Location



The BNSF line (black) and I-5 have are close to a possible Boeing Field Station. Source: Google Earth

Table 7: Boeing Field Station Location Criteria

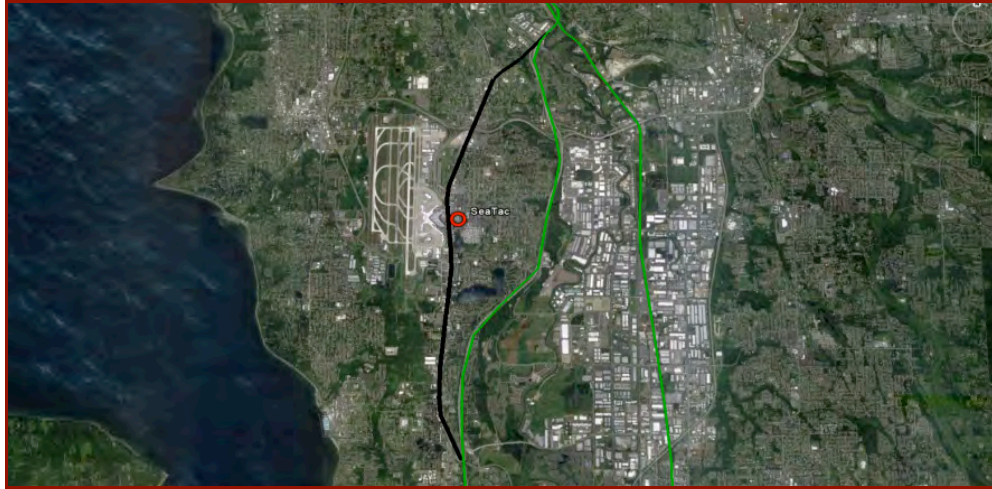
Criteria	Measurement
Local Access	
Transit access	7
Local inter-modal access	Low/Medium (Sightline Walkable King County)
Regional Access	
Central to regional population	Moderate (poor access to North Seattle)
Central to regional employment	Moderate
High Density Location	
High population/employment area	Mixed
Supportive current land use	No (Industrial)
Supportive long-range land use	No (Greater Duwamish Industrial Area)

SEATTLE STATION ALTERNATIVE D: SEATAC INTERNATIONAL AIRPORT

SeaTac, the Seattle Metro area’s primary international airport, is a major air hub for the Cascadia Region. It is located between the major cities of Seattle and Tacoma, 11 miles south of the Seattle CBD. SeaTac is also an incorporated city in King County. The City of SeaTac comprehensive plan identifies an area across from the main airport terminal for future high capacity transit development in conjunction with Sound Transit. Substantial land assemblage is required for HSR service as the main terminal lies several miles from

existing corridors of I-5 and the BNSF railway. SR 99 is the primary roadway connection between SeaTac and I-5. Its location is also near other highway facilities including SR 518 and SR 509.

Figure 10: SeaTac Station Location



SeaTac is some distance away from both I-5 (left green line) and the BNSF rail corridor (right green line). Source: GoogleEarth

Table 8: SeaTack Station Location Criteria

Criteria	Measurement
Local Access	
Transit access	6
Local inter-modal access	Low
Regional Access	
Central to regional population	Poor
Central to regional employment	Poor
High Density Location	
High population/employment area	No
Supportive current land use	No (low density commercial and residential)
Supportive long-range land use	Mixed (High capacity transit, but continued low density)

SEATTLE RECOMMENDED STATION LOCATION

King Street Station ranks as the most promising HSR station location for the Seattle metro area. The central city station locations are suggested much more strongly than the airport locations according to the evaluative criteria applied here. Both South Lake Union and King Street Station were given positive rankings for a majority of the criteria. The transit access and current land use are more supportive of an HSR station at King Street Station relative South Lake Union, which currently lacks density.

Both airport locations rated neutrally or negatively for each of the criteria. Both Boeing Field and SeaTac lack sufficient regional and local access, population and employment density, and supportive land use needed for locating an HSR station.

Table 9: Summary of Seattle Station Location Criteria

Criteria	South Lake Union	King Street Station	Boeing Field	SeaTac
Local Access				
Transit access	O	+	O	O
Local inter-modal access	+	O	O	-
Regional Access				
Central to regional population	+	+	O	-
Central to regional employment	+	+	O	-
High Density Location				
High population/employment	+	+	O	-
Supportive current land use	-	+	-	-
Supportive long-range land use	+	+	-	O

Section VI. Portland Station Alternatives

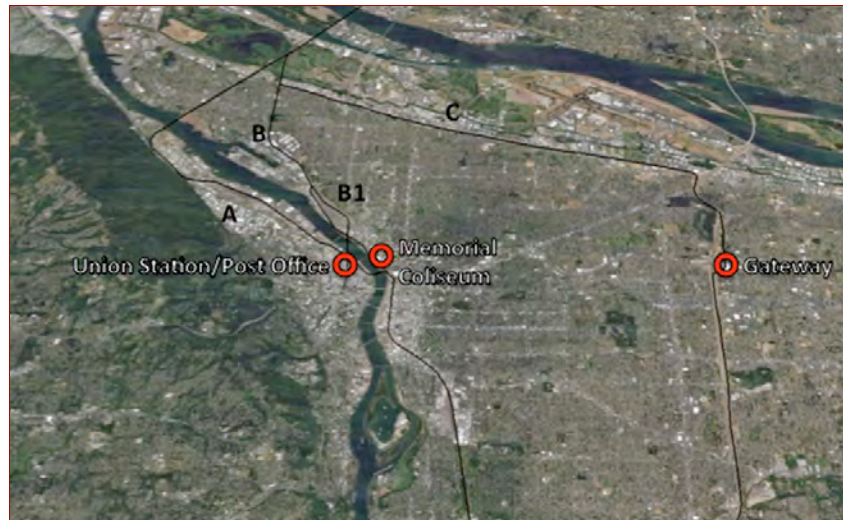
PORTLAND ALIGNMENT ALTERNATIVES

Figure 11 shows potential rail alignments within the City of Portland. Most alignments use existing corridors except for the portions of alignment C and B1. All existing alignments are owned and used for freight rail and all would need extensive right of way retrofits to accommodate high speed rail. Many of the alignments that are abandoned or have minimal freight operations were not considered (such as the Lake Oswego alignment proposed by Oregon Department of Transportation) because a large proportion of the corridor would operate in close proximity to residential areas. The proposed alignment, the B/B1 alternative, largely travels through industrial districts.

Alignment A is the existing corridor for Amtrak and primarily owned by BNSF and requires two Willamette River crossings. Alignment B, mostly owned by Union Pacific, offers a more direct route into downtown compared to Alignment A. This route would utilize the existing Peninsular Tunnel avoiding impacts to North Portland neighborhood and travels through Swan Island and the Albina rail yard. The main disadvantages of alignment B is that it would be expensive to widen the Peninsular Tunnel and would require a new Willamette River crossing if the Portland HSR station were to be located in downtown Portland. In contrast, if the HSR station were to be located in the Lloyd District alignment B1 could be utilized and connected to the current Alignment A to the south.

Alignment C travels along the Columbia industrial corridor and heads south in a new right of way along Interstate 205 on its way to a potential station in Gateway. An Interstate 205 alignment may be a cheaper and faster alternative because room for a rail corridor was included when the highway was constructed. Currently the MAX light rail has taken advantage of this space and high-speed rail may be able to do the same. Alignment C would connect back with the existing Amtrak corridor south of Gateway near Oregon City.

Figure 11:Portland Alignment Alternatives



Source: GoogleEarth

PORTLAND STATION ALTERNATIVE A: UNION STATION / POST OFFICE

Union Station is the current Amtrak station for the Portland metropolitan region. It is located at the north end of downtown adjacent to the Greyhound bus terminal. Across the street is the 13-acre central Portland United States Post Office site. Currently, this site is used as a sorting facility and mail distribution center. The postal service, however, has long term plans to vacate the site and move operations closer to the airport. This post office facility, thus, is included as a potential high speed rail station along with Union station because it is relatively close to the existing alignment and may minimize construction impacts to existing freight and passenger service, particularly if a new tunnel or bridge is built under/over the Willamette River. Also the size of the Post Office site offers opportunities to integrate high density transit oriented development with the high speed rail station.

Union Station is served by nine bus lines, two MAX light rail lines, and the Portland Streetcar. The location is highly walkable and bike friendly based on Portland's draft accessibility analysis (Portland, draft). The station is centrally located from a geographic perspective and within the downtown business districts where high employment densities are located. The current and long-term land uses would be very supportive of a high speed rail station. The regional government Metro has designated that the central city serve as the finance and commerce, government, retail, tourism, arts and entertainment center for the region have will have the most intensive form of housing and employment development within the entire metropolitan region (Metro 2000).

Figure 12: Portland's Union Station Location



Source: GoogleEarth

PORTLAND STATION ALTERNATIVE B: LLOYD DISTRICT / MEMORIAL COLISEUM

The Lloyd District is located in the central city opposite of downtown Portland on the eastside of the Willamette River. A station located in the broader Lloyd District offers many advantages for a high speed rail line, particularly if it is located at or near the Rose Quarter Transit Center. The Memorial Coliseum is included here as a focus site because it is owned by the City of Portland, the future use for this building is under consideration, and it is adjacent to existing railroad corridors.

Memorial Coliseum has excellent transit connections. About two blocks away is the Rose Quarter Transit Center which is serviced by four MAX light rail lines and ten bus lines including CTRAN which connects to Vancouver, WA. To the north will be a Portland Streetcar stop which is currently under construction. Additionally, the station is centrally located from a geographic perspective and within the downtown and Lloyd business districts both of which enjoy high employment densities. The current and long-term land uses would be very supportive of a high speed rail station. The regional government, Metro, has designated that the central city serve as the finance and commerce, government, retail, tourism, arts and entertainment center for the region have will have the most intensive form of housing and employment development within the entire metropolitan region (Metro 2000).

Figure 13: Proposed Memorial Coliseum Station



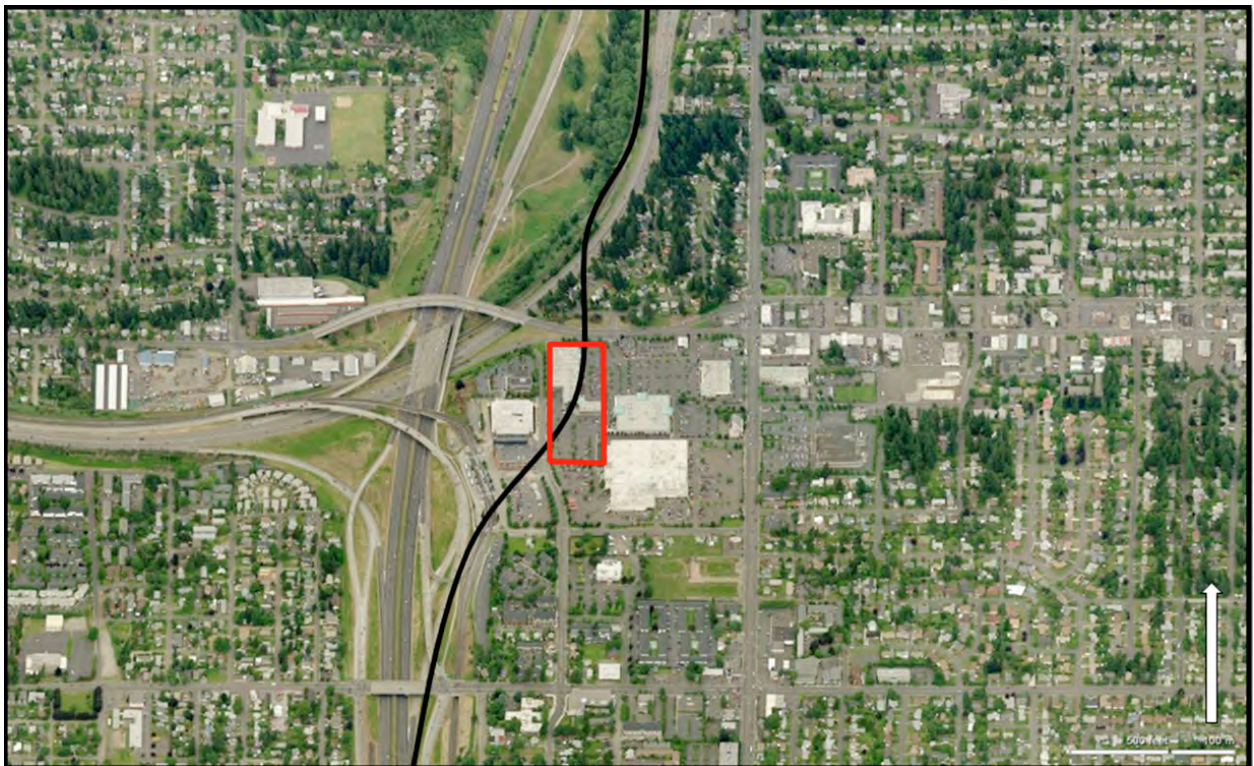
Source: Bing

PORTLAND STATION ALTERNATIVE C: GATEWAY

Gateway is located about seven miles east of Portland's downtown near the convergence of Interstates 84 and 205. Gateway is designated as a regional center by the Metro regional government and intended to be a center of commerce and local government services with a development pattern comprising of two- to four- story compact employment and housing types served by high-quality transit (Metro 2000). The primary advantage for this station is that it may offer a cheaper alignment/station combination compared to the more central Portland alternatives.

Gateway has a moderate level of access to the region. It is served by three MAX light rail lines and seven bus lines. The current local infrastructure is not well suited for pedestrian and bicycle modes (Portland 2010). Given the station area's regional center status, it may have supportive land uses in the long term. However, it is currently surrounded by low density commercial and residential uses. Another disadvantage is that this location is not central to the metropolitan region.

Figure 14: Proposed Gateway Station



Source: Bing

PORTLAND RECOMMENDED STATION LOCATION

Both Union Station/Post Office and the Lloyd District/Memorial Coliseum are recommended as potential future high speed rail stations. Both stations have a high degree of accessibility, supportive land uses, and are central to the regional employment and population. Union Station may have a small advantage being a little closer to the central city but Memorial coliseum may have advantages from an alignment perspective as it avoids two Willamette river crossings required to reach the Union Station / Post Office location.

Table 10: Summary of Portland Station Location Criteria

Criteria	Union Station / Post Office	Memorial Coliseum	Gateway
Local Access			
Transit access	+	+	O
Local inter-modal access	+	O	-
Regional Access			
Central to regional population	+	+	-
Central to regional employment	+	+	O
High Density Location			
High population/employment	+	+	-
Supportive current land use	+	+	-
Supportive long-range land use	+	+	+

Section VII. Ancillary Service

STATIONS AT POINTS IN BETWEEN

In order for high speed rail to maintain an appropriate level of efficiency, stops on the alignment between major metropolitan areas need to be carefully considered before deciding on inclusion in a High-Speed Rail system. The Principles section of this report identifies an efficiency for HSR for travel of between 100 and 500 miles. Beyond this distance, rail travel even at the highest speeds is not competitive with air. At shorter distances, automobiles become competitive as rail efficiency declines with slow-downs due to starting and stopping. Further, in order to minimize the potential for HSR to induce sprawl and low-density development, siting locations at supportive environments is recommended.

Based on these principles, HSR station site selection criteria for ancillary station locations include:

- Station access to local and regional transit
- Centrality to Regional population and employment (generators and attractors)
- Current Amtrak boardings
- Supportive vision for future development by the community
- Minimum spacing between stations

Additional factors to be considered include land uses, density, and supportiveness of station location to alternative transportation options. In the Cascadia mega-region, the current population densities are largely located along the existing rail / Interstate 5 corridor. For this reason, evaluation of inter-metropolitan station locations assumes that the existing passenger train stations would serve the final HSR route with or without minor modifications to the actual track alignments between stations. Thus, the ancillary alignment becomes “*which stops?*”

While not all smaller towns would qualify under the above criteria for inclusion of a HSR station, most smaller towns would benefit by improvements to existing rail services. For this reason, alternate levels of service are proposed for locations with less supportive potential. Table 11 summarizes recommendations for level of service for stations along the proposed Cascadia HSR corridor. Super Express Stations will serve large cities north and south of the Canadian border (Vancouver, BC; Seattle, WA; and Portland, OR). The stations recommended for a “Regional Express” level include those with strong local attractors, supportive local transit, and medium levels of existing ridership. These Regional Express stations may require special siting arrangements with respect to overall track alignment to ensure that regional services could stop but allow HSR to continue through with minimal negative impact to local station area locations. As such, exploration of HSR “bypass” routes are suggested for all Regional Express service stations.

However, most towns and small cities along the current right of way do not meet the station location criteria for Regional Express or Super Express Stations. Local service improvements that increase access to Regional Express and Super Express Stations will be part of High-Speed Rail implementation and will be critical to overall success of the projects. For example, it may be necessary to locate HSR right of ways on new infrastructure (instead of shared track or adjacent right of way) to reduce the interference of higher speed trains on local and freight services. These new and improved infrastructure should improve local service by allowing increases in schedule frequency and increasing schedule reliability. The growth and interest in these smaller towns may warrant building capacity into the system for later HSR implementation.

Table 11: Station Level of Service Summary

Station	Super-Express (HSR)	Regional Express	Local
Vancouver, BC	X	X	X
Bellingham	X	X	X
<i>Mt. Vernon</i>			<i>X</i>
<i>Everett</i>			<i>X</i>
<i>Edmonds</i>			<i>X</i>
Seattle, WA	X	X	X
Tacoma		X	X
Olympia/Lacey		X	X
<i>Centralia</i>			<i>X</i>
<i>Kelso / Longview</i>			<i>X</i>
<i>Vancouver</i>			<i>X</i>
Portland	X	X	X
<i>Oregon City</i>			<i>X</i>
Salem		X	X
<i>Albany</i>			<i>X</i>
Eugene		X	X

CANADA TO SEATTLE SERVICE RECOMMENDATIONS

The state of Washington has done much to plan and prepare for high-speed rail implementation. The *Washington State Long-Range Plan for Amtrak Cascades* is a comprehensive overview extending over a twenty year horizon of implementation elements from infrastructure development to economic outcomes. Their findings included that “development of a new rail corridor—especially in western Washington—would be very expensive.”(WADOT, 2010) New rail corridors (relocating HSR right of way around existing business districts, for example) may also be met with resistance.

Current conditions at existing Amtrak stations along the Canada to Seattle service area are summarized in Table 12. The level of commitment and community buy-in already present in Washington is demonstrated in the fact that these stations all serve as multi-modal transportation hubs for their cities and enjoy local transit service. BNSF, the track owner, is a cooperative partner with WADOT on track improvements.

However, existing stations are closely spaced. Further, Everett and Edmonds are already served by commuter rail to Seattle and Tacoma is connected to Seattle via public transportation. While there are some strong trip attractors along the local routes, only Seattle has density and access sufficient to location of a Super Express Station. Even though better rail service along this stretch would benefit communities and the region, only the Bellingham station, 95 miles from Seattle, has the demand figures and distance for true High Speed Rail.

Table 12: Canada to Seattle Stations Summary

Station	Recommended Level of Service	2009 Pop	2009 Boardings	Local Transit	Other Attractors
Bellingham	HSR	80k	62k	Yes	Alaska Cruises
Mt Vernon	Local	32k	21k	Yes	Ferry to San Juan Islands
Everett	Local	99k	23k	Yes	Boeing Assembly Plant US Naval Station Port of Everett
Edmonds	Local	40k	23k	Yes	

SEATTLE TO PORTLAND SERVICE RECOMMENDATIONS

Population densities and boarding numbers along the existing rail route between Seattle and Portland are not sufficient to generate the number of riders necessary to successfully support high-speed rail. Attractors for these interior cities are limited largely to industry (with the exception of Olympia, the state capital and home to Evergreen College). While disappointing to communities that are anxious to see High-Speed Rail implemented locally, as stated previously, Super Express Service should be limited to the largest cities.

The distance from Seattle to Portland includes long haul sections of track that create the potential for significant efficiency gains in Cascadia High-Speed Rail if stops and slow downs on the route are limited or eliminated. A direct, high speed connection between Portland and Seattle is more likely to serve and create regional agglomeration economies than a more inclusive set of stops catering to relatively small populations. High-speed service to smaller interior towns with low ridership may encourage undesired development such as making low-density bedroom communities more attractive. Regional Express Services may be sufficient to support the existing demands of mediums sized towns that have positive employment and business attractors such as Olympia and Tacoma.

Existing Amtrak stations closest to the major cities, in contrast to the interior stations, enjoy the largest populations, best local transit service, and greatest boarding numbers. However, instead of inclusion as HSR stops, increased capacity for these local transit serving train stations through improved short run service to Seattle would best support HSR implementation goals.

Table 13: Seattle to Portland Stations Summary

Station	Recommended Level of Service	2009 Pop	2009 Boardings	Local Transit	Other Attractors
Tacoma	Regional Express	196k	93k	Yes	Port of Tacoma Major Oil refinery
Olympia/ Lacey	Regional Express	84k	48k	Yes (2009 award winner!)	Capital of Washington Evergreen State Ft Lewis (between Tacoma & Lacey)
Centralia	Local	15k	19k	Limited	
Kelso/ Longview	Local	49k	23k	Yes	Timber Industry
Vancouver	Local	160k	75k	Yes	

PORTLAND TO EUGENE SERVICE RECOMMENDATIONS

The stations along the Portland to Eugene stretch do not have the same level of boardings to population ratios as stations on stretches between major cities in Washington. Further, along the Oregon rail corridor there is a mix of community sentiment with regard to high-speed rail implementation. These communities have not demonstrated the same unified strategy with the state as have the communities in Washington. The owner of the existing right of way (Union Pacific) is resistant to allowing HSR on its property. Exploration of alternate rights of way between Portland and Salem are being met by local opposition by both communities which stand to gain and lose rail service.

Given the attractors offered by the universities along the southern terminus and the state capital in Salem, communities along this alignment would benefit from improvements to existing rail service, especially for schedule enhancements and reliability. An upgraded service to Regional Express may be sufficient to meet these demands without dramatic upgrades to a true HSR corridor.

Table 14 : Portland to Eugene Stations Summary

Station	Recommended Level of Service	2009 Pop	2009 Boardings	Local Transit	Other Attractors
Oregon City	Local	31k	8k	Tri-Met	
Salem	Regional Express	155k	37k	Yes	Capital of Oregon
Albany	Local	48k	20k	Yes, but transit hub not at station	Access to Oregon State University
Eugene	Regional Express	150k	51k	Yes	University of Oregon

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Community Impacts of High Speed Rail in Washington State

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USP 549: Regional Planning and Metropolitan Growth Management

Winter 2011

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Introduction

The Washington State Department of Transportation received over \$600M in Federal American Recovery and Reinvestment Act (ARRA) Dollars in 2010. The State of Washington has decided to allocate these dollars toward select projects along the existing 297 miles of Burlington Northern Santa Fe (BNSF) rail between the Columbia River in Southern Washington and the Canadian border (see Figure 1). The goal of this effort is to improve the reliability and the frequency of Amtrak Cascade service between Portland, Oregon and Vancouver, British Columbia, Canada. The Findings of No Significant Impact (FONSI) prepared by the Federal Railroad Administration explain that improvements are concentrated along the current BNSF line to avoid or minimize impacts (FONSI, p. 1).

The majority of High Speed Rail (HSR) improvements will occur in the State of Washington, but it is acknowledged and understood that the improvements made to Washington rail will align with improvements in the State of Oregon. As of today, Oregon's process is in its nascent stage; however, the State of Washington has known that rail improvements were necessary as early as 1993 (FONSI, p. 2). In 2009, application for federal funds accelerated the planning process and prompted a Tier-1 Environmental Assessment. State-level impact assessments have been prepared and documented in the Federal Railroad Administration's FONSI, but this document fails to address impacts of concern to specific jurisdictions as they relate to a particular county, city, or town's comprehensive plan. The following is an examination of anticipated impacts of High Speed Rail development upon the Washington counties, cities, and towns affected by Amtrak Cascades service, based upon evaluation of comprehensive plans.

Washington State

As per Washington State's Growth Management Act (GMA), passed in 1990, local governments are required to develop comprehensive land-use plans in accordance with the State's thirteen land-use planning goals. These goals include concentrating development in areas with adequate public infrastructure, encouraging density in urban areas, provision of affordable housing, encouragement of economic development, ensuring just compensation for land acquisition and several others. While many of Washington State's land use planning goals intersect with goals for and possible benefits of High Speed Rail, goals pertaining to transportation are central to this discussion. According to Revised Code of Washington statute RCW36.70A.020, transportation should "Encourage efficient multimodal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans." Analysis of potential impacts must address compliance with this goal as well as adherence with local comprehensive plans.

Washington's HSR projects have undergone Tier-1 analysis, which assesses environmental impacts generally. The findings stipulate that individual projects planned for lengths of BNSF track will require more in depth Tier-2 review (FONSI,

p. 1). Improvements include two updates to Tacoma rail, such as the D to M Street Connection and the Point Defiance Bypass (Figure 2); Vancouver's Yard Bypass Track, New Middle Lead, West Side Port Associate Trackage, and a variety of reliability upgrades in the southern and northern counties Amtrak traverses. Improvements are expected to increase the frequency and reliability of Amtrak service. Amtrak's record-breaking 2010 ridership, up a staggering 13%, is attributed to connection with Vancouver British Columbia. The addition of four trips between Portland and Seattle is expected to meet this growing demand. Improvement is met with mayoral-approved protocol agreements from the mayors in Portland, Seattle and Vancouver which will unite cities in order to attain HSR improvements. Impacts of these improvements are discussed extensively in the FRA prepared FONSI and a selection of environmental, community and commerce impacts are highlighted here.

Environmental

Environmental considerations are two-pronged: 1) the impact of construction and improvement and 2) the impact of increased frequency of Amtrak service. Construction impacts are discussed extensively FONSI indicates most impacts can and will be mitigated. Construction may lead to air quality disturbances, but mitigation procedures will minimize effects of dust, odor, particulate matter, and hydrocarbons. Construction is also likely to affect between 18 to 25 acres of vegetation, but FONSI indicates mitigation procedures should limit the effects of improvements.

The primary benefit associated with higher speed train service is increased fuel efficiency and decreased fuel emissions. It is anticipated that increased reliability will decrease traffic congestion on I-5; however, it is more likely that HSR will provide an option for those seeking a timely and reliable alternative to vehicle travel. Fuel efficiency shall be realized through use of new models of locomotives assumed to be 10% more fuel efficient than current models. Currently, fuel consumption is 3,200 gallons per day or 1.17 million gallons per year; however, future fuel consumption is estimated at 1,000 gallons per day or 365,000 gallons per year.

Communities and Residents

Specific impacts of HSR improvements on Washington communities will be discussed in more detail throughout this analysis; however, this portion reflects the findings of the initial assessment by the FRA. Namely, increased frequency of Cascades service is likely to have adverse affects on the communities through which it travels including construction, increased speeds and frequency of train vibrations and whistle sounds, and in some cases accessibility will be permanently altered as a result of improvements. Vibration and noise is expected to impact each community as it has before, but improvements seek to mitigate noise and vibration to maintain usability and livability of communities impacted by train travel.

Eight at-grade crossings will be removed and six grade separations will be constructed. These alterations will alter access in Clark, Cowlitz, Snohomish and

Whatcom counties. In Kelso, construction may require the relocation of five homes and one business; however the exact details remain at large and should be addressed during Tier-2 review. FONSI finds that by adhering to the existing BNSF rail, corridor service expansion shall affect most residents equally. Improvements shall not effect populations disproportionately.

Commerce

Trade and freight are significant stakeholder interests in the HSR discussion. HSR threatens the efficiency of Freight Rail and ensuring that commerce remains uninterrupted by passenger rail. Freight moves commodities and links the economies of many states, so balancing the interests of freight rail with HSR is essential. HSR improvements are expected to reduce bottlenecks in the rail system resulting in increased frequency and reliability of Amtrak Cascades service while maintaining the efficiency of the freight system.

In the following pages, local impacts are assessed and discussed in relation to these same areas. Commerce, community, environmental and economic lenses are applied to understand how HSR will impact, either positively or negatively, the communities of Washington State.

Bellingham, Washington

Bellingham, with a population of roughly 80,000 spread over 25.6 miles, is bisected by I-5, and located on the coast of the Puget Sound (City-data, Bellingham). It sits approximately half an hour south of the Canadian border, only one hour south of Vancouver, B.C., and is the largest hub of employment in Whatcom County. The City of Bellingham is committed to policies which reduce reliance on single-occupancy vehicles (SOVs) as well as traffic congestion (predominantly caused by vehicles traveling through Bellingham from loci outside of city limits). Up until now, the City has tackled its congestion issues primarily by way of land use policy, fostering infill development and sustainable building practices.

Bellingham has acknowledged the future role of HSR explicitly in its comprehensive plan, settling forth the goal of fostering inter-county and inter-national transportation links, including Amtrak and HSR, as well as the continued maintenance of rail rights-of-way. While the City pledges to “support State and regional planning efforts to develop and improve passenger and freight rail transport within the region,” the City does strictly limit the areas in which such development may be permitted to occur, stressing the importance of preserving environmentally sensitive areas (Bellingham Comprehensive Plan). Being already a recipient of Amtrak service, and given the current trend of funding, it is likely that improvements within the Bellingham area will coincide well with existing lines of service.

Bellingham would experience numerous benefits from HSR. The City has built its image on progressive planning and environmentalism, and HSR would reinforce that image. Additionally, the improved link to British Columbia could be a major

development in terms of its international business. A large portion of Bellingham's economy stems from Canadian dollars, and an improved link could increase that influx of revenue. It also offers a sensible stop in that it is the last major population center along the tentative HSR line prior to the Canadian Border, as well as the most populous area along the HSR line north of the Seattle MSA, and is well distanced from the terminus of the HSR line in Vancouver, B.C. For these reasons, and given that HSR has already been a feature of Bellingham's planning efforts, this is a city in which a HSR station should be strongly considered.

Mount Vernon, Washington

Skagit County reports a population of 117,500 residents, approximately 30,000 of which live in the county seat of Mount Vernon. Mount Vernon is located on the Skagit River, roughly 60 miles north of Seattle's urban center. The City markets itself through a "Get a Great Life" campaign. A Mount Vernon community visioning process in 2005 revealed that the residents share a sense of pride in the quality of life and character of their city. The community is viewed as a mixed employment center set in a scenic rural landscape, within convenient proximity to the greater Seattle-Everett urban area.

The community credits wise planning for the preservation of outlying natural resources and working landscape by focusing growth on the redevelopment of urban areas. Specifically, the City has focused strategic planning and investment in its downtown through flood mitigation, economic development, and a multi-modal transportation hub for the city. Mount Vernon is reliant upon rail and the I-5 corridor for the transportation of passengers, goods and services, regionally as well as internationally. Mount Vernon's Skagit Station is a stop on the current Amtrak Cascades route. Residents are concerned about preserving the Mount Vernon quality of life, when faced with growth, development, transportation improvements, and regional transit projects.

The Washington Department of Transportation (WSDOT) is undertaking improvements to rail sidings in Mount Vernon. The Washington DOT reports that this construction project will improve speed and reliability of the trains by enabling southbound trains from Bellingham to pass northbound trains from Seattle. Additionally, the closure of one at-grade crossing at Hickox Road in Mount Vernon will increase community safety by eliminating potential conflicts with rail. The project is managed by the BNSF Railway and will cost \$7.1 million total, \$3.3 million of which is 2010 HSIPR grant funding.

Skagit Council of Governments (SCOG)

The Skagit Council of Governments (SCOG) is an organization of local governments for regional collaboration, predominantly on transportation and economic development-related issues. The SCOG is the lead agency in both the Regional Transportation Planning Organization (RTPO) and the Skagit Metropolitan Planning Organization (SMPO). Additionally, the SCOG partners in the North Sound Connecting Communities Project (NSCCP) and the Skagit/Island Regional

Transportation Planning Organization (SIRTPO). The current draft of the Skagit-Island Counties Metropolitan & Regional Transportation Plan was completed in January of 2011. The draft plan identifies an increasing demand for Amtrak Cascades passenger rail at Skagit Station, as well as the critical role that freight rail plays in maintaining a diverse regional economy. The draft plan references planned incremental capital improvements to the BNSF rail line for high speed rail within the Pacific Northwest Rail Corridor.

Stanwood, Washington

Stanwood, located in Snohomish County with a population of 5,705, is too small to get a stop for HSR (City-data, Stanwood). However, HSR may still pass through the town, which has the residents worried about safety of at-grade crossings and preservation of the rural character of their town. The FONSI report, which states that all construction impacts will be mitigated, may allay some of their fears. Also, the so-called 'high-speed' rail will reach a maximum speed of 110 mph and will not necessarily travel at that speed along its entire length. Small towns like Stanwood will have to negotiate to get HSR to slow down when passing through, especially if the grade is not separated.

Everett, Washington

Everett, with a population approaching 100,000 spread over roughly 33 square miles, is located between the Snohomish River (along which runs I-5) to the east and the Puget Sound to the west (City-data, Everett). The city itself is largely suburban in composition, and is often characterized as a bedroom community to Seattle. However this is not entirely true: while only approximately 21,000 people both live and work in the city, the city undergoes a population increase of nearly 40,000 people due to commuting (City-data, Everett). Consequently, traffic congestion (particularly along the I-5 corridor and I-405) is an issue which has plagued Everett for over a decade. HSR, while perhaps initially exacerbating congestion issues during the construction phase, could ultimately serve to reduce congestion by providing an alternative to SOVs. Another clear benefit for the City of Everett would be the provision of jobs, but more importantly the link to additional job-centers such as Seattle and Portland.

In early 2010, five projects were proposed for the lines north of Seattle which included over \$8.9 million for projects improving service for Everett. However, only \$3.6 million for an Everett track addition survived cuts which came in March of 2010. Figure 3 highlights the area of rail proposed for improvement in Everett. The logic for the cuts was that areas north of Seattle did not possess the potential ridership to justify investment, at least in the initial phases of system improvement. Everett was ready and willing to adopt those projects, and appears highly willing to embrace HSR.

Given its location among many environmentally sensitive areas, restrictions stemming from Everett's Critical Areas ordinance and Washington's Shoreline Management Act could present a few hurdles, but Everett possesses well-

established industry and freight lines, making improvements to those lines a highly attainable goal given adequate funding. Still, closer analysis is needed as to the provision of a high-speed stop in Everett. While its proximate location to Seattle has been an asset (if not a primary driver) to Everett's development, the city may be too close to the Seattle stop to justify an additional station.

Edmonds, Washington

Like many of the communities in Washington, the community already has a significant rail presence. Commuter trains to Seattle, freight shipments and AMTRAK all run through the town. An average of 37 trains per day already roll through Edmonds. Thus, any increase in Amtrak traffic is deemed to be of negligible consequence. In order to reduce conflicts between modes of transport, the City wants to build a new multi-modal transportation facility downtown called Edmonds Crossing.

It would bring together ferry, rail and transit services under one roof. It would also upgrade the station to Amtrak passenger standards. The new station would require a realignment of Highway 104, but the impacts of this are unclear at this time. The City also desires new, transit-oriented development near the proposed train station to take advantage of Edmonds Crossing.

Unfortunately, the money for the project has yet to appear. The proposed price tag is well over \$200 million and the latest news seems to put the project at least \$100 million short. It is obvious that the City views the development of the Crossing Project as a catalyst for development, but how much that relates to high-speed rail is not quite clear. Everyone's favorite libertarian, Randal O'Toole, wrote the only local newspaper article addressing high-rail. No prize will be awarded for guessing his stance.

Seattle, Washington

The population of the City of Seattle is currently estimated to be 612,000. Seattle's Comprehensive Plan and Transportation Strategic Plan (TSP) serve an overarching vision for urban villages as the focus for concentrated development and multi-modal transportation hubs throughout the city. The TSP supports the development of a regional high capacity transit system with complementary intermediate and local transit systems of rail and bus. The TSP calls for the integration of these systems into existing neighborhoods such that the design reflects the community identity, minimizes negative environmental and economic impacts to surrounding areas, and provides safe, accessible options for all residents. Further, integrated transit services in Seattle serve an important connection to the Washington State Ferry System.

The King Street Station in Seattle is undergoing two separate projects (see Figure 4). The first project provides for the construction of new tracks and switches in the rail yard to increase the capacity of the station to serve both passenger and freight purposes. The King Street rail tracks are currently shared by Amtrak, Sound Transit,

and the BNSF Railway. The second project is the renovation, seismic retrofitting, and modernization of the historic King Street Station. Located just south of the city center, the station is one of the main transportation hubs in Seattle, and a current Amtrak passenger rail stop. The station was purchased by the City of Seattle in 2008. This project leverages a number of funding sources, of which, the Federal High Speed Intercity Passenger Rail (HSIPR) Grant is the largest contributor.

Two other critical rail projects in King County include an engineered design to increase the speed limit for the Talgo trains on the Ballard Bridge and the recent phased construction of an Amtrak maintenance facility south of downtown Seattle.

Puget Sound Regional Council (PSRC)

The Puget Sound Regional Council (PSRC) is an association of regional governments in the greater Seattle-Tacoma Metropolitan area. The council guides regional growth through land use, transportation, and economic development planning. Member organizations include: King, Pierce, Snohomish, and Kitsap Counties, their respective jurisdictions, and local tribal authorities. Planning in the region is guided by three major processes: VISION 2040, Transportation 2040, and Prosperity Partnership. Other capacities of the PSRC include data warehousing and project funding.

The current two-year budget is just over \$26 million, acquired largely through federal and state grants. The PSRC has served to review and coordinate ARRA HSR funding such that all projects are aligned with the regional economic strategy. The position of the council is that “the State of Washington should take the lead role in planning for long-term commercial air transportation capacity and supporting high speed inter-regional ground transportation” (2004). Transportation 2040 calls for an “aggressive transit strategy”; in support of the state’s commitment to develop a high-speed rail corridor in the Pacific Northwest region (2009).

Tukwila, Washington

Tukwila is a small suburb, population 17,000, situated south of Seattle. Due to its small size and relatively close proximity to Seattle (12 miles), the community is primarily concerned with its immediate connections to the central city rather than with the broader Cascadia region. Washington State procured \$9 million in funding in FY 2010 to construct a new train station in Tukwila to better support HSR improvements and Sound Transit Commuter Rail. This upgrade will allow for better local connectivity with the nearby Seattle-Tacoma International Airport.

Tacoma, Washington

The City of Tacoma’s primary transportation goal is to balance multi-modal transportation with the efficient and safe movement of people and goods (Tacoma Comprehensive Plan, p. T-1). The following demonstrates how HSR meets the policy intent of the Comprehensive Plan’s Transportation goal and the unique challenges it poses for the City of Tacoma.

HSR is a regional service and promotes interconnectivity between jurisdictions. Interconnectivity increases the potential for information and talent exchange. Arising as a genuine non-automobile mode choice, HSR will provide Tacoma with convenient access to Seattle and Portland. Availability of non-automobile multi-mode choice supports several policy objectives of the Tacoma Comprehensive Plan, including availability of a well connected urban core, construction of Transit Oriented Developments, and linkages with the region as a whole. It is unclear how increased speeds and frequency of HSR will affect pedestrian and cycling safety in the urban core and Tier-2 analysis should discuss this element.

HSR supports the efficient operation of Tacoma's port. The Port of Tacoma is an economic lynchpin for the City of Tacoma and State of Washington and serves as the Continental US' hub for Alaskan imports and exports. Freight Rail disseminates most of these goods to the continental US and rail efficiency is integral to smooth operation of the Port. Improvements set forth by WSDOT plan rail extensions and construction of bypass track which will support Freight Rail while enhancing frequency and reliability of Amtrak Cascades service.

HSR improvements align with Tacoma's Comprehensive plan and its policy objectives. Connectivity via HSR is one strategy to comply with the Commute Trip Reduction Law, promotes improved fuel emissions quality as stipulated by Washington's Clean Air Act, and complies with the National Environmental Policy Act and State Environmental Policy Act, thereby balancing the interests of community, environment and commerce.

Olympia, Washington

The City of Olympia, located in Thurston County, WA, has enumerated several transportation goals in their comprehensive plan that can be served by HSR. These goals include providing for alternative transportation services, increasing personal mobility, allowing denser development, and committing to sustainability (Olympia Comprehensive Plan, 2002). In order to reduce the growth of traffic as much as possible, Olympia wants to provide realistic transportation options to reduce car ownership and vehicle miles traveled.

In a shared vision exercise in January 2010, the residents of Olympia named HSR their third top transportation priority (after safe bike lanes and regional transportation/light rail). They also envisioned that by 2030 Olympia will be served by HSR as part of a regional transit system that makes it possible for most residents to work, play, shop and meet most needs without owning or using a motor vehicle, as well as have significantly reduced vehicle miles traveled to 1990 levels. Olympia also wants to make sure that the city's aesthetic qualities are not degraded with increased infrastructure.

HSR and other service options are being actively explored in a partnership between Thurston Regional Planning Council and the Washington State Department of Transportation. The most direct future rail service into the urban core area of the

county (Olympia, Lacey, and Tumwater) could occur over the St. Clair-to-Olympia corridor. Identified in the Railroad Right of Way Strategy Report (March 1992), this rail corridor offers the most direct connection to the mainline service north to Tacoma and south to Portland. In order to connect HSR to the central city, the most likely scenario would be to transfer from the HSR to light rail or bus rapid transit (BRT). Two options being explored would allow service either to the waterfront and Port Peninsula or close to Capitol Campus.

The challenge for the HSR option in Olympia is that part of this alignment is out of use and already abandoned. The need for right-of-way purchase for high capacity must be identified and acted upon before rights-of-way become more costly or are dedicated to other uses. Currently, efforts to piece the right-of-way back together are proceeding in order for the corridor to be used for recreation purposes and possible future transportation purposes.

Intercity Transit (Thurston County's public transportation provider) has prepared commuter service alternatives in its Transit Development Plan (TDP). Alternatives to HSR include fully utilizing the transit system that is currently in place (i.e. Amtrak) and/or developing bus rapid transit (BRT). Current Amtrak service is increasing and allows commuters and others to use the train for trips north to Tacoma and Seattle and south to Portland on the mainline. Passengers board on Amtrak at the Centennial Station on the Yelm Highway with connecting service to the Olympia City Center by Intercity Transit. Although Olympia supports HSR, it is only a second-tier candidate for a stop. If HSR does not stop in Olympia it will have more of an impact on the identity of the city than on the residents themselves.

Centralia, Washington

Centralia's comprehensive plan does not specifically mention HSR, but does list several goals for rail. These include safety, sustainability, and efficiency of circulating goods and people. The expansion of both passenger and freight services is encouraged (Centralia Comprehensive Plan, 2007). A major problem in Centralia is congestion due to freight conflicts. Centralia's comprehensive plan encourages grade-separated crossings for rail. The BNSF line currently has three grade-separated crossings in Centralia: East 6th Street, North Pearl Avenue and North Tower Ave. If HSR does not introduce any more at-grade crossings in Centralia and helps to improve the timing of freight as well as passenger rail then it will be of much benefit to the city.

Kelso/Longview, Washington

There were no findings of significant impact to the Kelso/Longview community in the EIS report. However, the area will see a significant number of projects come its way. The projects are essentially phased parts of one larger effort that will see the construction of new track. Right now, Kelso acts as a bottleneck for passenger rail. Freight traffic trying to get into the Kalama Port interferes with the passenger rail. The changes that come to Kelso will be primarily aimed at separating the two types of trains and increasing efficiency for both freight and passenger traffic.

The proposed projects include:

- New siding near the port of Kalama.
- A siding track extension and a new grade separation for Toteff Road.
- A new 4.5 mile main line between Kelso and Longview Junction and a new grade separation on Hazel Avenue.

For the most part, there will not be a “significant impact” on the way people live or get to work. One section of track will see 4-5 homes being moved along with one business. The report deemed this consequence of no significant impact. Home owners may differ. Noise is already high in the area from freight traffic and will continue to be high. Additionally, 4 to 5 acres of farmland could be displaced because of rail improvements. New bridges will be built, but they will be alongside the old ones and won’t do anything to rock the boat. A number of at grade crossings are going to be turned into above grade to eliminate the chance of Grandma being run over by a train and to limit time wasted in traffic.

Construction will be in areas with lots of hazardous materials and underground storage tanks. Officials seem to believe this is quite manageable. So will management of waste generated. Long-term impacts of having high speed trains running are deemed negligible, if not positive. Jobs would mostly be short term and most likely would not have a long term impact.

The comprehensive plan for the city does not mention high-speed rail, although it does mention a desire to be tied into a rail system.

Vancouver, Washington

With a rapidly growing population of over 165,000 residents, Vancouver is the heart of Clark County in southwestern Washington and the largest suburb of Portland. While not explicitly mentioned in the community plan, goals and guidelines emphasize balancing all transportation modes when determining future infrastructure improvements. HSR is on the radar politically for Vancouver as evidenced by the Mayor recently signing a protocol agreement with the Mayors of Seattle and Portland. This protocol agreement was an effort to cooperatively align the cities in order to attain HSR development along the Cascadia corridor.

Developers are already starting to take notice of the push towards HSR in Vancouver. Sen. Patty Murray and Rep. Brian Baird steered \$3 million in federal funding towards infrastructure improvements in the Crescent Industrial area near downtown. The goal is to unlock the potential of this under-utilized area and set it up mesh with the forthcoming HSR improvements. Local leaders are eager to see the development return on its estimated 750 jobs generated given the currently struggling economy.

Despite Vancouver’s prominence in southwestern Washington, it’s train station is just 10 miles from Portland’s. While this arguably duplicative station is much more

convenient for residents north of the Columbia River, having stations so closely spaced makes it difficult for trains to achieve and maintain higher speeds. It is clear that given the recently signed protocol that Vancouver has no intentions of being omitted from an HSR stop, and this must be taken into consideration when planning for stops.

Conclusion

The State of Washington has directed significant energy toward HSR by securing hundreds of millions of dollars from the Federal Government, conducting an initial FONSI, and planning projects to balance economic, environmental and community impact with HSR benefits. The major cities of Seattle, Bellingham, Olympia, Mount Vernon, Vancouver, Tacoma, and Everett explicitly support HSR. Kelso, Centralia, Tukwila, and Edmonds do not explicitly support HSR but support regional rail and have enumerated goals that can also be supported by HSR. The small town of Stanwood has decidedly less enthusiasm for HSR than do the larger cities in Washington. The proposed HSR is unlikely to stop at all of the cities that desire access to HSR, and the cities that do not get a stop have a right to fear that all of the drawbacks to HSR will be imposed on their cities while they reap none of the benefits. However, our research considers this an unlikely scenario.

HSR will be successful for all cities throughout Washington if it decreases freight and passenger conflicts. Freight conflicts cause major congestion in many cities and decrease the reliability of passenger service. Also, the Federal Railroad Administration's FONSI report acknowledged that HSR construction impacts will be minimal and readily mitigated. When built, HSR will benefit Washington's image as a state leader in sustainability by providing a reliable alternative to single occupancy vehicles commutes throughout Cascadia.

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Appendix: Images

Figure 1: Map of current and proposed rail corridor in the Pacific Northwest, including the cities along the corridor.



Figure 2: Proposed Pt. Defiance bypass near Tacoma, WA.



Figure 3: Area of rail improvement proposed for HSR in Everett.



Figure 4: Region of proposed improvement for HSR near King Street Station, Seattle.



Laying the Tracks for High Speed Rail in Oregon

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INTRODUCTION

Discussion concerning high-speed rail (HSR) in Oregon has only recently gained traction despite its inclusion in a federally designated HSR corridor--the Pacific Northwest Corridor, also known as the Cascadia Corridor (Federal Railroad Administration). With the recent influx of Federal funds for the development of HSR between Vancouver BC and Eugene, OR, the importance of beginning the process of identifying stakeholders, engaging with communities, and identifying the benefits and impacts of development cannot be overstated. Such steps will help to define a cohesive vision for HSR service in the both the region and the State. Despite a lack of comprehensive data regarding the needs and desires of Oregon communities along any of the potential alignments, the development of HSR is known to align with several State and many local community's transportation, economic, and environmental goals. The following sections illustrate the existing conditions in Oregon through an examination of State and local community plans and policies, the relationship with private freight interests, and the rationale for engaging the public in a more meaningful and comprehensive manner, as the process to develop HSR in Oregon progresses.

WHY HSR in OREGON?

Oregon is predicted to experience a significant increase in population over the next two decades. With much of this growth expected to occur in the central Willamette Valley, the State is interested in pursuing increased or enhanced passenger rail service. Improving the reliability, capacity, and inter-city travel time for passenger rail service is viewed as a means for battling the negative impacts associated with projected increases in highway congestion. These impacts include increased emissions of green house gases (GHGs) which can lead to the degradation of the environment and human health, as well as impacts to the economy due to loss of time and efficiency in transporting people and goods. A number of Oregon communities are addressing these issues through planning efforts at the local, regional, and statewide level.

CONSIDERING FREIGHT

Demand for freight is projected to increase up to 80 percent by 2030, according to the Oregon Transportation Plan. HSR passenger rail is seen as a mechanism to relieve commuter congestion on Interstate 5 and other State Highways. By giving commuters an alternative to the private automobile conditions for the robust freight trucking industry might be improved—an industry requiring free flow of traffic to reliably and cost effectively deliver goods. In addition, HSR in Cascadia could further ensure an efficient shipping system and increased benefits for local and global economies.

While rail lines are privately owned and operated in Oregon, round-trip Amtrak service between Eugene and Portland is currently available through a combination of train and bus service. Due to the private ownership of the rail lines, the State has been limited in its ability to shape the future role of rail and effectively plan for its growth. The 2010 Oregon Rail Study is the most recent planning effort concerned with freight and passenger rail in Oregon. The study recommends three key factors to consider in any discussion about HSR:

- Involve freight railroad stakeholders early in the process
- Recognize that land use decisions have real impacts on freight rail
- Include rail carriers in local jurisdiction plans

The study further stipulates that due to having no State-owned public rail right-of-way, it is paramount that a unique strategy for incorporating freight interests be developed during the planning phase. Findings from the 2010 Oregon Rail Study and analysis of community plans in relation to HSR punctuate the importance of corresponding rail and community plans.

EXISTING CONDITIONS

National Environmental Policy Act

The current condition of planning and public process related to HSR development in Oregon is largely due to the federally mandated National Environmental Policy Act (NEPA). NEPA requires federal agencies to analyze and document actions that may have adverse effects on environmental resources. This requirement must be fulfilled whenever a federal agency proposes an action, grants a permit, or agrees to fund or authorize an action that could possibly affect environmental resources (Bass, 2001). In the case of the Cascadia HSR Corridor, NEPA applies because the project will be federally funded, namely by the American Recovery and Reinvestment Act (ARRA).

One way in which a federal project can satisfy NEPA is by preparing an Environmental Impact Statement (EIS). Under NEPA regulations, an EIS must be prepared when an action: (Bass, 2001)

- Is likely to have significantly adverse impacts on natural ecosystems, cultural resources and scenic resources

- Is likely to require controversial relocations
- May divide or disrupt established neighborhoods
- Affects endangered or threatened species
- Is likely to have significant impact on groundwater, flooding, erosion, or sedimentation

Figure 1 illustrates the steps in the EIS process. Currently, the Cascadia HSR Corridor project is in the scoping phase. Scoping begins in the early planning stages of the project and is a public participatory practice intended to bring forth issues in the beginning in order to avoid future conflicts. Ideally, ODOT Rail will invite the participation of affected federal, state, and local agencies, Native American Tribes, interested parties, and the general public (Bass, 2001).

NEPA's shortcoming is that it does not contain time limits for EIS preparation. In practice, an EIS for a project like the Cascadia HSR Corridor could easily take several years, possibly even a decade, due to the need to address State and local laws between Oregon and Washington. Furthermore, the project may impact several public lands with the need for cooperation among several federal government agencies including the Bureau of Land Management (BLM), U.S. Fish and Wildlife Service (USFWS), Department of the Interior (DOI), and the Bureau of Indian Affairs (BIA), just to name a few. Additionally, this process may be further complicated with this project spanning international borders. While beneficial, the NEPA process is insufficient for fostering collaborative community planning efforts.

2010 Oregon Rail Study

Furthermore, the 2010 Oregon Rail Study--the only comprehensive study of HSR in Oregon--was largely technical and conducted without public input. Successful HSR in Oregon will require measures beyond these initial, and largely formal planning processes. A comprehensive planning effort, which includes all the affected communities and stakeholders, will more easily identify the opportunities and constraints associated with a given alignment, fare structure, station location, and the myriad other factors that must be considered.

Though many of the opportunities and constraints will only be revealed in future public processes and community outreach efforts, there are some general factors that should be discussed regardless of where the HSR corridor is developed and the level of service it provides. The following section describes several factors that must be considered for HSR in Oregon.

Opportunities

Existing Public Transit Systems

Many communities with the potential to be served by new HSR, such as Salem, Corvallis, and Eugene have existing public transit systems. Many of these communities have developed goals to reduce average vehicle miles traveled (VMT), reduce carbon emissions, and improve safety and equity in their transportation system. Access to HSR station locations will be a major factor in any city where an HSR station is developed and ensuring safe and equitable transportation to the HSR station will be vital to the success of the system. During the initial planning phase for HSR there should be a focus on connecting to existing public transit systems so that there are viable alternatives to the personal automobile for reaching the station. Seamless integration with the local transit service provider will improve the level of service for HSR and the community.

Congestion and VMT Reduction Goals

Existing conditions along the I-5 corridor exhibit a high level of congestion. Mitigating this problem by increasing capacity of the roadway is not possible in many places due to physical constraints, and is also in direct conflict with regional, state, and local goals related to climate change and energy conservation. An HSR system in Oregon has the potential to decrease reliance on the personal automobile for inter-city travel and this opportunity should be stressed to political leaders and the public. Quantifying the potential decrease in congestion and reductions in average VMT with hard numbers could further bolster the case for HSR development in Oregon.

Greenhouse Gas Emission Reduction Goals

Reductions in GHG's are closely related to reductions in VMT. The State of Oregon is known for its commitment to the environment, and air quality standards are one facet of Oregon's environmental goals as set forth in Oregon's Statewide Planning Goals and Guidelines. Therefore, any demonstration of HSR's potential to decrease VMT and harmful GHG emissions is a political win for development.

Potential Increased Travel Time Reliability

Current Amtrak service is hampered by unreliable travel times due to passenger and freight rail sharing tracks. Since freight companies are always given priority over passenger service, this arrangement has led to large discrepancies in passenger travel time between destinations. HSR has the potential to develop in such a way as to alleviate some of the current issues between passenger and freight rail.

If travel time reliability is improved it may encourage individuals to begin commuting by rail. If a travel preference for HSR is established it will reduce the numbers of passenger vehicles on I-5; improving travel time reliability for the trucking freight companies on which the regional economy depends.

Improving Connections Between Commercial and Educational Centers

Good connectivity improves quality of life by giving people access to goods and services that meet their daily needs. Developed correctly, HSR will also provide a vital link along the education corridor made up by the University of Oregon, Oregon State University, Portland State University, University of Washington, Washington State University, Simon Fraser, and University of British Columbia, among other small universities and research centers.

Constraints

Right-of-way Acquisition

Acquiring right-of-way is prohibitively expensive even when it is available. Oregon HSR is limited by the existing right-of-way available and the extremely limited funds that would be needed to purchase it. Given this very serious constraint, it is imperative that negotiations with freight rail owners be initiated early in the process. The result of such negotiations would hopefully provide a shared rail situation that can meet the needs of freight and passenger service.

Anti-HSR Communities

There are currently a few cities, notably in the south Portland metropolitan area, that oppose the possibility of an HSR alignment through their communities. Among these are Tualatin, Lake Oswego, and Milwaukie. According to an interview with Jeanne Lawson, who was recently hired to facilitate public involvement between ODOT Rail and the public due to the NEPA process activated by HSR, these cities have little interest in HSR. However, ODOT has already recommended, in the 2010 Oregon Rail Study, an alignment that passes through these areas. In the case of Tualatin, much of this controversy stems from previous issues that arose with the Westside Express Service (WES) commuter line, specifically impacts from noise and the creation of Quiet Zones still being debated today. Furthermore, if a separate right-of-way is considered with HSR, the lack of build-out area near existing rail infrastructure or the need to source a new alignment has communities worried about loss of land, impacts on property values, noise, and safety.

Sprawl

Despite a likely build scenario that includes connecting only the three largest cities (Portland, Seattle and Vancouver), an HSR corridor in Cascadia unquestionably stands to improve regional connectivity. However, with this increased connectivity comes an associated cost—the threat of sprawl. Historically, increased transportation options have encouraged migration patterns that allow greater separation of work and home

environments. Reliable and significantly reduced travel times between the major metropolitan areas may cause enormous pressure for local governments to allow unsustainable growth (low density residential in former open spaces/agricultural lands) in smaller towns, cities, and urban edges.

Equitable Placement of HSR Stations

Another constraint associated with HSR has to do with its alignment. While numerous alternatives may be explored during the planning process, one alternative includes placing stations in only the three largest cities in the Cascadia region. If developed in this way, Portland would be the only city with HSR in Oregon. Medium sized cities that might benefit from increased access to larger markets would be effectively passed-by. Cities such as Salem and the Corvallis/Albany metro area could be impacted by such a decision and these jurisdictions may present a strong lobby to have an HSR station. Especially in the case of Albany, the city has been planning their downtown central area around renewal efforts of the existing Amtrak train station. Consequently, what impacts can be expected by eliminating such a location from participating directly in the development of HSR in Cascadia?

Alignment of Plans for Oregon Communities

An analysis of comprehensive, regional, and transportation plans for communities along the proposed alignment was conducted to gauge readiness and receptiveness of HSR in Oregon. Comprehensive plans for these jurisdictions revealed a considerable lack of planning for HSR. However, Statewide Planning Goals and Policies related to transportation, environment and economy support multi-modal public transit relevant to HSR. Because comprehensive plans are required to be consistent with Statewide Planning Goals, the majority of local and regional goals are essentially slight variants of State goals. For this reason, this section examines the development of a HSR system in relation to statewide goals.

Transportation

Strategies to promote alternate travel mode choices are predominate in almost all planning efforts state wide including Oregon's city comprehensive plans, Council of Government's planning efforts, and Metro's 2040 Growth Concept. Additionally, Oregon's Statewide Planning Goal 12 focuses on transportation with nine objectives, of which HSR is consistent with seven. These objectives state that transportation plans should:

- 1) Consider all transportation modes
- 2) Be based on local, regional and state needs
- 3) Avoid primary dependence on any one transportation mode

- 4) Mitigate negative social, environmental and economic impacts and costs
- 5) Conserve energy
- 6) Provide transportation options for the disadvantaged
- 7) Strengthen local and regional economies through the flow of goods and services

Statewide Planning Goal 12

Transportation:

To provide and encourage a safe, convenient and economic transportation system.

Environment

Not having to create new right-of-way significantly helps ensure that HSR is consistent with environmental goals. Not only does the use of an existing right-of-way minimize the potential for negative environmental impacts, but also fewer impacts may ensure a more efficient and timely environmental review. HSR's potential to reduce carbon emissions and energy use while simultaneously extending the lifespan of the existing freeway system are also consistent with statewide environmental goals.

Statewide Planning Goal 5

Natural Resources, Scenic and Historic Areas and Open Spaces:

To protect natural resources and conserve scenic and historic areas and open spaces

Statewide Planning Goal 6

Air, Water and Land Resources Quality:

To maintain and improve the quality of the air, water and land resources of the state.

Economy

While HSR may not be a long-term economic development tool, it does have economic benefits. Construction and renovations to rail-related infrastructure provide an injection of capital and jobs into the economy. Additional jobs will be created to handle day-to-day maintenance and operations. HSR also posits to increase efficiencies of the current freight rail system. Additionally, HSR has the potential to bolster the regional economy by connecting regional markets.

Statewide Planning Goal 9

Economic Development:

To provide adequate opportunities throughout the state for a variety of economic

Case studies

The four cities most commonly proposed as possible Oregon HSR station locations include: Eugene, Albany, Salem and Portland. The transportation planning areas within jurisdictions are illustrated in Map 1. This section provides an overview of these communities along with relevant anecdotal findings uncovered during this analysis.

Eugene

Eugene is the southernmost city on the HSR corridor. It is the Lane County seat and is home to the University of Oregon. With an estimated population of 157,845 (Population Research Center, 2010) Eugene is Oregon's second largest city. It is part of the greater Eugene-Springfield metropolitan statistical area and serves as a cultural and retail center for central and southern Oregon. Lumber and agriculture are Eugene's largest industries, and the University of Oregon is the city's largest employer.

Current planning in Eugene consists of the Eugene-Springfield Metropolitan Area General Plan (a.k.a. Metro Plan) and TransPlan, the Regional Transportation Plan. Both plans note that future high-speed rail service will require improved infrastructure and make broad policy directives to improve tracks, rail crossings and signals. However, the TransPlan calls for more specific actions including:

- *System-wide Policy 3: Corridor Preservation:* stating that corridors such as rail rights-of-way, private roads, and easements of regional significance that are identified for future transportation-related uses shall be preserved.

- *Other Modes Policy 2: High Speed Rail Corridor:* identifying the purchase of the Amtrak station in downtown Eugene as the future high speed rail terminal; and planning for future high-speed rail train servicing facilities.

Based on the TransPlan, Eugene shows a strong willingness to participate in the development of an HSR system.

Albany

Albany, the Linn County seat, is located approximately 45 miles north of Eugene. It has an estimated 2010 population of 49,530 (Population Research Center, 2010), making it the eleventh largest city in Oregon, and the smallest city considered for a station in the Oregon HSR corridor. However, if an Albany station is included, it will also serve Corvallis and its 55,370 residents (Population Research Center, 2010). Albany has a diversified manufacturing industry that specializes in metal, food and paper production. Rail has long been of important cultural and economic significance to Albany. This is evidenced by the Albany Depot, around which the town center has been developed.

Current planning in Albany consists of the Albany Comprehensive Plan and its Transportation System Plan (TSP). Neither contains HSR specifically, but both reference infrastructure deficiencies at several existing railroad crossings. While the proximity of Albany to Eugene may deem it a non-essential station location, it is difficult to ignore Albany's pro-rail sentiment through current city development efforts. The personal interview with Jeanne Lawson of JLA Public Involvement, revealed that Albany is focusing its downtown planning efforts around the Amtrak station renewal and may be expecting an HSR rail stop (personal communication, January 17, 2011). Albany is currently updating its TSP, which will likely include provisions for HSR. Should HSR bypass Albany, this community's overall support may wane and turn into opposition.

Salem

Salem, the State capitol and Marion County seat, is located at the midpoint of the corridor between Eugene and Portland. It is home to an estimated 157,460 residents (Population Research Center, 2010), making it the third largest city in Oregon. Salem's largest employer is the State of Oregon.

Current planning in Salem consists of the Salem Area Comprehensive Plan (SACP), the Salem TSP and the 2031 Regional Transportation Systems Plan. The SACP makes no mention of HSR and the Salem TSP only mentions it as a possible future transportation system improvement. However, the 2031 Regional TSP, the most recently updated of the three plans, does make considerations for HSR. Specifically, Goal 4 calls for "staged infrastructure upgrades as part of the High Speed Rail Corridor Project."

While the 2031 Regional TSP seems to imply that Salem supports HSR, there is anecdotal evidence that suggests this community is more ambivalent than supportive. The

recently completed Riverfront City Park, part of the Salem Riverfront-Downtown Urban Renewal Area, sits between the Willamette River and the existing Union Pacific right-of-way. There is concern that an HSR corridor in this right-of-way would negatively impact the community by preventing safe pedestrian access to the riverfront. While it seems logical to include Oregon's capital and political hub among the designated HSR stops, controversy over unwanted impacts may impede HSR development.

Portland

Portland, Oregon's largest city and the Multnomah County seat, is located at the confluence of the Willamette and Columbia rivers. An estimated population of 583,835 in 2010 (Population Research Center, 2010) makes it the third largest city in the region after Seattle, WA and Vancouver, B.C. However, there are an estimated 2,241,841 (U.S. Census Bureau, 2009) people in the Portland metropolitan area, which consists of Multnomah County, parts of Washington and Clackamas Counties and extends across the river into Washington's Clark County. The metropolitan area is serviced by an extensive transit system that includes buses, light rail, commuter rail and a tram. Major employers in the Portland Metropolitan area include Intel, Nike, and numerous universities both public and private. It is also home to the Portland International Airport and a deep fresh-water harbor making it a regional shipping hub and directly connecting Portland to the global economy.

Current planning in Portland consists of Portland's Comprehensive Plan Goals and Policies, Portland Bureau of Transportation's (PBOT) Transportation System Plan (TSP) and Metro's 2035 Regional Transportation Plan (RTP). The Comprehensive Plan (1980) is currently being updated. Considerations for HSR in the revised plan are not yet known and Portland's current Comprehensive Plan makes no reference to HSR.

PBOT's TSP references HSR, but provides no actual planning or policy direction. Metro's 2035 RTP is absent of HSR, but does note that the Federal Rail Administration is developing an HSR network and that the next RTP will address this issue further.

Overview of Statewide Planning Goals and Local Plans

Analysis of plans for Oregon communities reveals that HSR vaguely aligns with broad transportation, environment and economic Statewide Planning Goals. There are several overarching themes among these goals, such as:

- Promoting Livability
- Creating a balanced, efficient, safe, and accessible transportation network
- Supporting environmental responsibility and protection of valuable natural resources and open spaces
- Responding to community needs and impacts

- Supporting responsible and sustainable development
- Being economically viable and financially stable

Of those communities along the proposed HSR corridor, Eugene, Albany, Salem and Portland are being considered as possible HSR station locations. Though this study found HSR to be consistent with themes from local, regional and state plans, how HSR will be realized in local plans is to be seen. As local and regional TSPs and comprehensive plans are updated, a process for providing continuity of planning goals should be considered.

CITIZEN INVOLVEMENT

The Federal Rail Administration (FRA) has appointed the Oregon Department of Transportation Rail (ODOT Rail) as the decision-making entity for the HSR planning process. Historically, ODOT Rail has taken a traditional approach to planning rail projects that is technical in nature. While NEPA mandates that HSR include a public process, ODOT Rail has fallen short of Oregon's public involvement planning standards.

ODOT Rail is primarily a regulatory agency, and is therefore not held to the same standards as other planning bodies. High-speed rail challenges ODOT Rail to travel into uncharted territory. For example, unlike comprehensive plans, ODOT Rail has not had to consider Statewide Planning Goal 1: Citizen Involvement in its planning process.

ODOT Rail's track record does not assume a sufficient public process. Consequently, a broad range of stakeholder groups has not participated in the visioning and planning of most rail related projects in Oregon. This holds true for the HSR planning process to date. As such, though HSR could bring transportation, environmental and economic benefits to jurisdictions within Oregon, a lack of public participation has given stakeholders mixed feelings about laying the tracks to HSR.

Rail and land use plans should not be mutually exclusive. As stated in the 2010 Oregon Rail Study, involving stakeholders early in the planning process, recognizing that land use decisions have impacts on freight rail, and including rail carriers in local jurisdiction plans, are key to the success of HSR. Involving multiple stakeholders in the planning process is one step toward forming some continuity among plans.

Though high-speed rail may provide added value to Oregon, to assure its long-term support and to align its goals more explicitly with local, State, regional and freight plans, an inclusive advocacy program must be created. To substantiate HSR via common interests, several stakeholders need to be invited to the table. These include, but are not limited to: freight, concerned citizens, the business community, city councils, counties, and environmental groups.

The process should match the situation. For HSR to be truly aligned with Oregon plans and stakeholder interests, a new type of governance model must be crafted. This model would provide a framework for regional collaboration that would include:

- A two-tiered governance model consisting of:
 - Tier 1: A participatory approach including a broad range of stakeholder groups
 - Tier 2: A regional decision-making and regulatory body representing regional interests
- Explicit roles, authority and communication flows among these two tiers
- Process evaluation
- A monitoring component

A collaborative two-tiered approach can articulate a regional strategy that is supported by common interests and objectives. As identified by Matthew J. McKinney and Shawn Johnson in *Working Across Boundaries* (2009), collaborative planning can bring the following benefits:

- By working together to identify a common vision, knowledge is shared and stakeholders gain understanding of each other's values and priorities;
- This process fosters community and a regional identity;
- By framing problems together, stakeholders discover solutions together;
- Actions are implemented that have broad community buy-in;
- This approach supports mutual learning and adapting among its participants.

Though the State has a long-standing rich heritage in public process, citizen involvement has not been implemented in conjunction with rail projects. HSR in Cascadia may meet broad Statewide Planning Goal themes, but, as mandated by NEPA, involving a range of stakeholder interests to the table from the outset will be key to its regional success.

CONCLUSION

Expected population growth in Cascadia calls for creative growth management practices. High-speed rail lays the tracks for increased transportation, environmental and economic benefits for the growing region. Opportunities provided by HSR include:

- Increasing connectivity among existing public transit systems
- Reducing congestion and VMT
- Reducing GHG emissions
- Increasing train travel reliability
- Enhancing connectivity among commercial and educational centers

These opportunities meet many state, local and regional planning goals. Conversely, possible adverse effects of HSR include the expense of acquiring right-of-way; anti-HSR sentiment among some Oregon communities; the threat of sprawl; and implications of HSR on those communities passed-by.

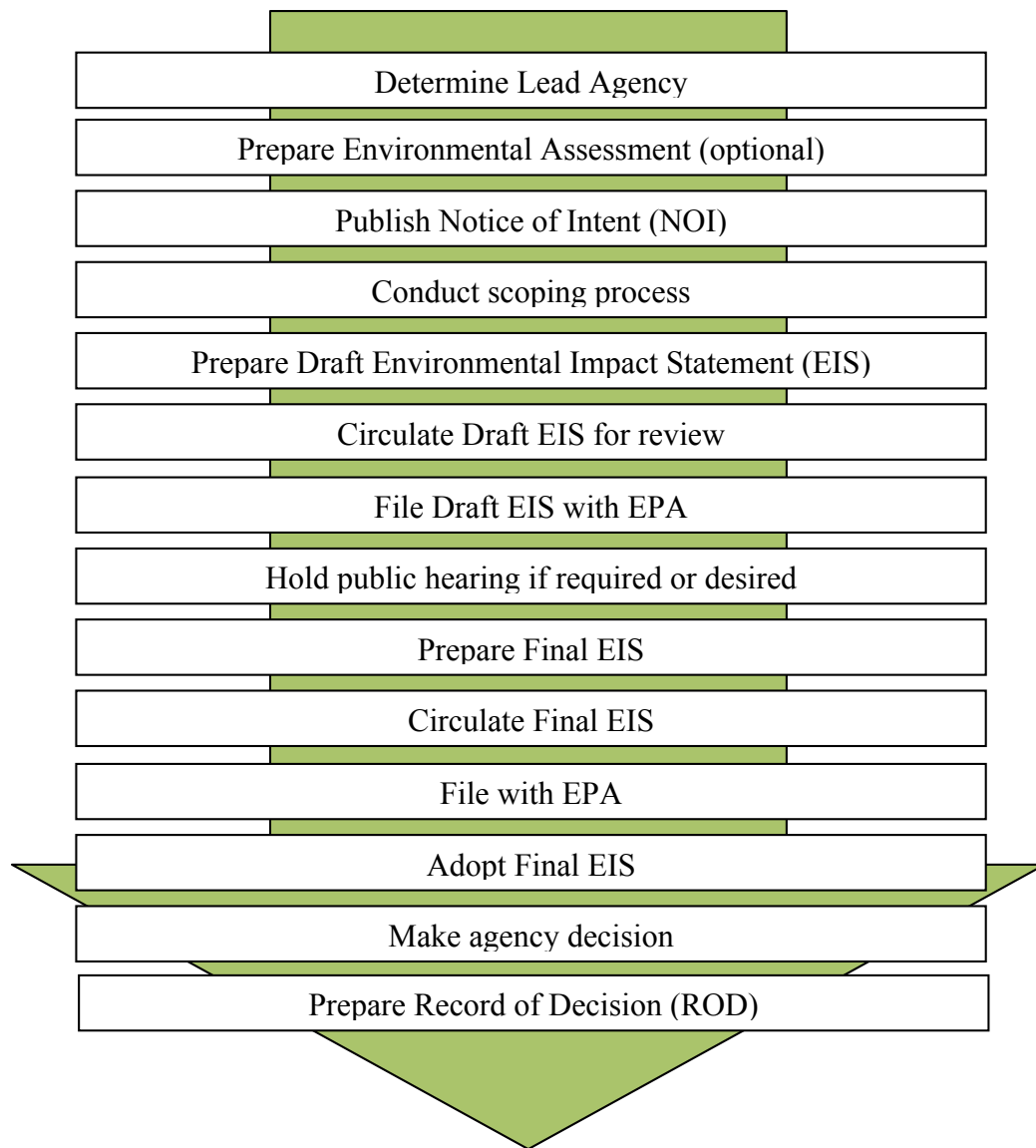
Attached to Federal funding for HSR come federal mandates. HSR challenges ODOT Rail to rethink its process. Though traditionally, protocol for rail projects in Oregon does not necessitate citizen involvement, NEPA federally mandates a public process be implemented for HSR.

To align with freight, local, State and regional stakeholder interests, ODOT Rail needs to consider a more collaborative approach. The Oregon Rail Study highlights the importance of freight and land use interests in relation to rail. A collaborative approach to planning HSR will lay the tracks to increased buy-in and support from regional, state and local stakeholders. In Oregon, process matters.

APPENDICES

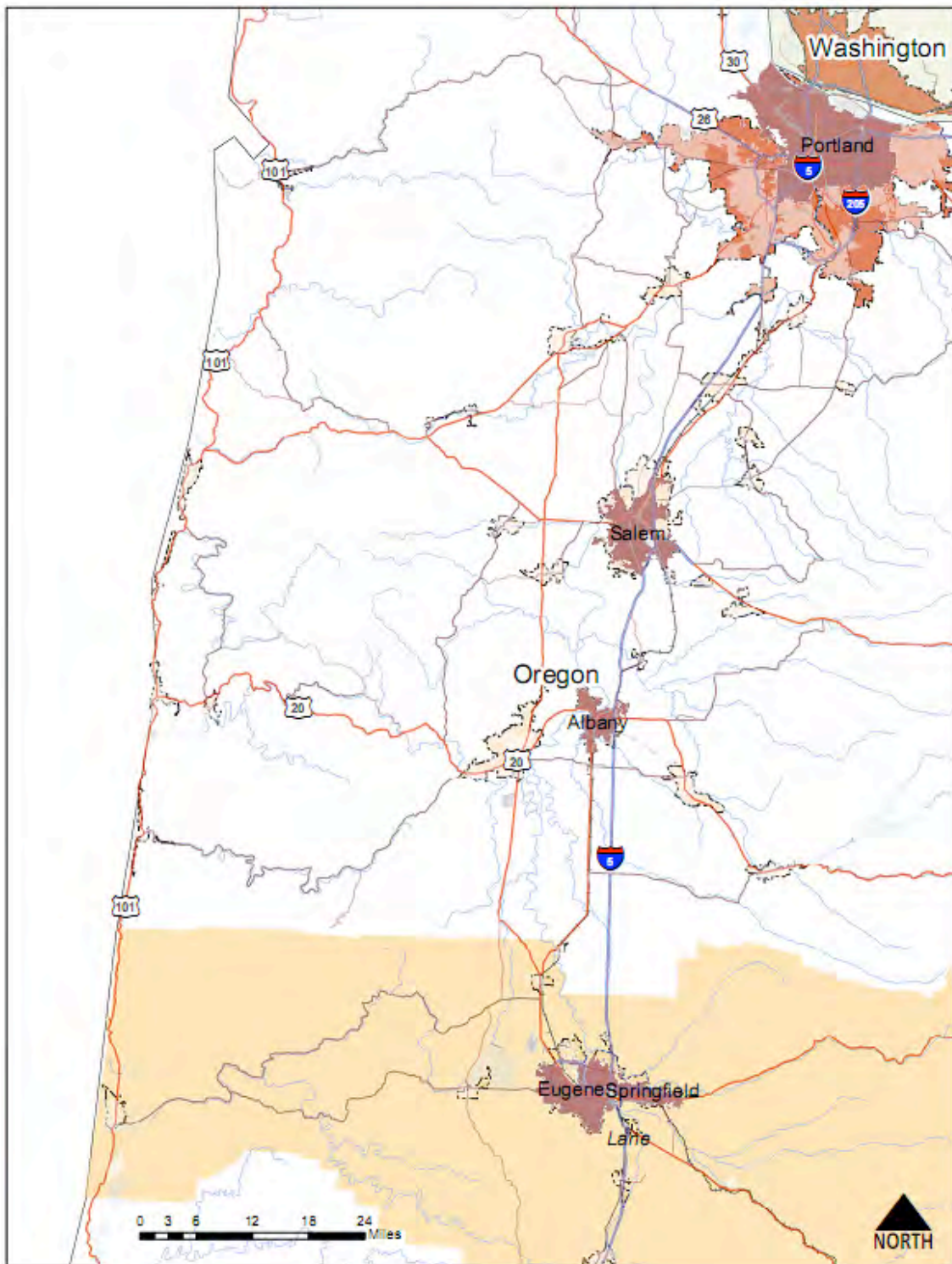
1. Figure 1: Steps in the Environmental Impact Study (EIS) Preparation
2. Map 1: Transportation Planning Areas addressed in the report

Figure 1: Steps in the EIS Preparation Process



Source: Bass, R. (2001). The NEPA Book.

MAP 1. Transportation Planning Areas addressed in the report



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Scenario 1: Sensible Rail

Sensible Rail

Term Paper

PBAF 544

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INTRODUCTION

Washington State and Oregon, along with the rest of the nation, stand at a crossroads. The new push for high-speed rail signals the most concentrated effort for a national transportation policy since the Interstate Highway System. The allure of high-speed rail, along with a feeling of being outpaced by our neighbors and competitors, has created a frenzy of activity intended to push high-speed links from one US metropolis to another. In this moment of passion, it is often difficult to recall the lessons learned years before, when a similar effort was made to construct the Interstate system. Many of the problems facing the US today, and, ironically ones the high-speed rail aims to fix, are a direct result of the passionate, “single vision” mindset that seems to overpower our most reasonable institutions in such crucial moments. Let us then examine the case for high-speed rail in the Northwest Corridor (from Eugene, OR to Vancouver, BC) from a level, dispassionate and, above all, sensible perspective.

Amtrak Cascades is a publicly funded service that operates on a privately owned rail line. This intercity passenger rail service carries travelers between major population centers, and connects with Amtrak’s long-distance trains and local/regional transit. Amtrak Cascades has 18 stations in Washington and Oregon, and one in Canada’s British Columbia Province. The typical rider travels 150 miles, which is roughly the distance between Portland and Seattle.

Presently, the Amtrak Cascades service, which runs through the Northwest Corridor, consists of six daily departures that serve primarily the cities of Seattle and Portland. The line operates at a deficit and at 50% capacity, but provides important connectivity between the two metro regions. Recent proposals have been made to upgrade the current line, shared with and owned by freight rail companies, to a standalone or near-standalone system one that would reduce the current travel time of three and a half hours to around two. The alternative to these “high speed” and “regional express” scenarios is to maintain and improve the current service and gradually grow to meet demand using existing facilities – the “Sensible Rail” scenario. To understand which alternative is best suited for the region, issues such as governance, funding,

economics, operations, and land use must be considered as a whole. This report attempts to review these facets from a realistic perspective, highlighting the relatively modest passenger travel needs of the region, immense costs of the high speed and regional express alternatives and the sensitivity of the current passenger-freight relationship.

GOVERNANCE

To improve the Cascades rail corridor, a vast array of public, private, and international stakeholders are involved. This makes decision-making and consensus significantly more complicated. The key stakeholders are:

- U.S. Department of Transportation
- Washington State Department of Transportation (WSDOT)
- Oregon Department of Transportation (ODOT)
- British Columbia
- BNSF Railways
- Union Pacific Railways
- Amtrak

United States Department of Transportation - Federal Railroad Administration¹

Created by the Department of Transportation Act of 1966, the Federal Railroad Administration (FRA) promotes and enforces rail safety regulations; administers railroad assistance programs; conducts development in support of improved railroad safety and national rail transportation policy; and consolidates government support of rail transportation activities. FRA supports the development of the nation's intercity rail passenger system and informs and implements Federal rail policy.

FRA administered the High-Speed Ground Transportation Act of 1965 and the Rail Passenger Service Act of 1970, which relieved private rail carriers of their obligation to provide passenger rail service. The Passenger Rail Investment and Improvement Act of 2008, which created new railroad investment programs and reauthorized Amtrak for five years, affirms Federal involvement in developing the nation's intercity passenger rail system. FRA's greatest contribution to the Cascades Corridor was investing \$8.4 million

¹ Federal Railroad Administration. <http://www.fra.dot.gov/Pages/5.shtml>

to improve grade crossings primarily between Seattle and Portland. In addition, FRA is helping to study the possibility of increasing frequency of trains in the Cascades Corridor.

Washington State Department of Transportation (WSDOT)

WSDOT's role in the Amtrak Cascades service includes many functions²:

- Planning and project identification
- Budget development
- Construction project management and reporting
- Operations oversight and reporting
- Local, regional, state, national, and international program coordination
- Public education, public involvement, and marketing activities.

WSDOT also contributes significant financial resources to the Cascades line, investing over \$331 million in public funds for track and signal improvements, new train equipment, station construction and renovations, and train operations.³

Oregon State Department of Transportation (ODOT)

ODOT pays for Cascades service between Eugene and Portland, with stops in Eugene, Albany, Salem, Oregon City, and Portland. Although Amtrak's Coast Starlight service between Los Angeles and Seattle makes these same stops, ODOT does not pay for this service. In addition to funding, ODOT provides several other functions for the Cascades service⁴:

6. Administers safety issues including public highway-railroad crossings, railroad employee safety, track inspections, and other safety monitoring;
7. Acts as an agent for the Federal Railroad Administration (FRA) by inspecting track, railroad equipment and cars, hazardous materials and operating practices;

*Amtrak*⁵

Amtrak (National Railroad Passenger Corporation) is a for-profit corporation that operates intercity passenger rail services throughout the United States. Amtrak was

² Washington State Department of Transportation. <http://www.wsdot.wa.gov/Freight/Rail/RideTrain.htm>

³ "WSDOT and Amtrak Cascades." March 2010 Washington State Department of Transportation

⁴ Oregon State Department of Transportation. http://www.oregon.gov/ODOT/RAIL/Passenger_Rail.shtml

⁵ Federal Railroad Administration. <http://www.fra.dot.gov/rpd/passenger/30.shtml>

created by Congress in the Rail Passenger Service Act of 1970, assuming the common carrier obligations of the private railroads (which found passenger service to be generally unprofitable) in exchange for the right to priority access of their tracks for incremental cost. Amtrak operates the Cascades line and funds a portion of its cost and is in charge of scheduling passenger trains and setting fares. While a key player in the governance issues of the corridor, Amtrak is limited in bargaining because it only owns the trains, not the rail on which they operate.

British Columbia

Via Rail Canada is an independent corporation offering intercity passenger rail services in Canada, carrying approximately 4.3 million passengers annually.⁶ The US to Vancouver, BC connection is provided by agreement with Amtrak. Due to the international boundary, several other agencies are involved in the Cascades service to Vancouver. The Canada Border Services Agency (CBSA) and the U.S. Customs and Border Protection Agency manage the Cascades border crossing. Border agencies are important to governance issues because they are a mandatory part of services to Canada. Border crossings are the single greatest reason for train delays into Canada, making the trip lengthy and generally unpredictable.

Freight and Private Rail^{7,8}

In addition to the challenges in coordinating the governmental agencies described in the previous sections, the role of private freight corporations in the corridor is arguably the most significant barrier to coordinating Sensible Rail improvements. The Burlington Northern Santa Fe Railway Company (BNSF) owns the majority of Washington's portion of the Cascades line, and Union Pacific Railroad owns Oregon's. The Staggers Rail of 1980 gave freight lines significantly more flexibility in operations, allowing them to enter into private agreements with no need of preapproval from the government. Private

⁶ Via Rail Canada. <http://www.viarail.ca/en/about-via-rail>

⁷ Rose, Mathew K. "Passenger Trains on Freight Railroads." *BNSF Railways*. 19 Oct. 2009. Web. 6 Mar. 2011. <http://www.bnsf.com/media/speeches/pdf/passenger_freight.pdf>.

⁸ "American Railways: High-speed Railroading | The Economist." *The Economist - World News, Politics, Economics, Business & Finance*. 22 June 2010. Web. 06 Mar. 2011. <<http://www.economist.com/node/16636101>>.

companies were able to remove passenger rail service as long as freight companies preserved access for Amtrak. For freight lines, the passing of the Staggers Act was an overwhelmingly positive and profitable outcome.

The question for the Cascades Corridor is, how and who should develop incentives for private rail lines to make concessions for passenger rail? While BNSF includes passenger rail in their planning, they are opposed to high-speed rail. Running a train at 110 mph on existing freight lines would require removing freight service on those lines, which is against their financial interest. BNSF already believes that Amtrak does not pay the true value for access rights onto its rail lines, further complicating negotiations. A more minor point regarding the private firms' aversion to passenger rail is the cost of the passenger safety liability associated with running passenger trains on their lines. The issues facing Union Pacific in Oregon can be assumed to align closely with those of BNSF in Washington, as both operators have similar goals and characteristics, although BNSF owns the majority of the Northwest Corridor.

What Can Increase Amtrak's Bargaining Position?⁹

Because Amtrak owns only the trains, it has almost no bargaining power. Some actions, however, could improve its relations with freight and allow for further passenger rail use. Small steps with private freight are more likely to have positive effects than large demands. The following are steps that can be taken to bargain with private freight lines more actively and positively:

- Secure funding
- Increased political support
- Find experienced negotiators
- Find common goals and objectives
- Establish a trusting relationship with private companies
- Make the situation a win-win for everybody, with each party coming away with a new positive aspect
- Develop partnerships with local DOTs that have political positions of power

⁹ Prozzi, Jolanda. "Passenger Rail Sharing Freight Infrastructure: Creating Win-Win Agreements." *Center for Transportation Research and the University of Texas Austin*. 1 Mar. 2006. Web. 6 Mar. 2011. <http://www.utexas.edu/research/ctr/pdf_reports/0_5022_S.pdf>.

These steps could aid preparations for Sensible Rail and future investments in the Cascades Corridor. In addition, Congress, after 30 years since the Staggers Rail Act's passage, has recently expressed interest in some re-regulation of freight rail. The time may be opportune for Amtrak to push for negotiations with private rail. In the current economic climate, rail freight has seen a significant decrease in revenues. With current need for capital investments for freight rail systems, a window of opportunity may have opened to make concessions for passenger rail in exchange for funds for capital improvements.

FUNDING

As there are few profitable rail lines in the country, investment and funding opportunities for the Seattle to Portland corridor are largely contingent upon public funding. For Cascades, this is mainly realized through the Washington Multimodal Transportation Fund.

Because this fund is sustained by automobile-dependent sources (e.g., licensing fees and taxes), it could decrease in the future if the U.S.'s primary means of transportation shifts away from the car.

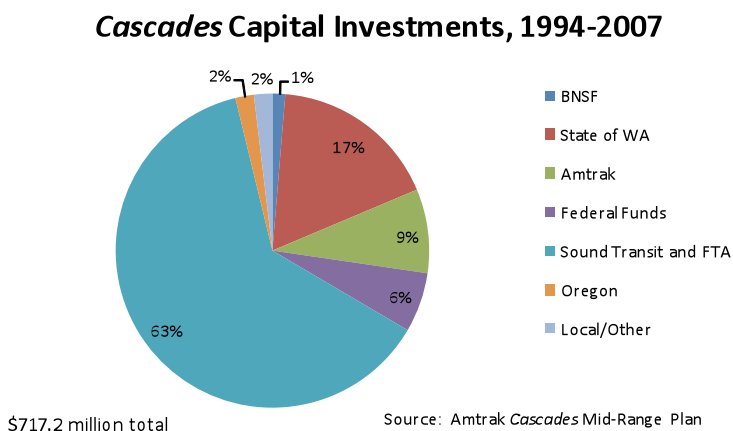


Figure 1: Cascades capital investments, 1994-2007

Funding for the Cascadia comes from a various sources (Figure 1). Washington State is the largest continuing contributor to capital and operating costs on the Cascades Corridor. From 1994 to 2007, Washington invested \$300.4 million out of the total \$984.6 million allocated for capital/operating funds for the Cascades Corridor.¹⁰ BNSF made the

¹⁰ Washington State Department of Transportation, "Amtrak Cascades Mid-Range Plan," December 2008, <http://www.wsdot.wa.gov/NR/rdonlyres/83B17378-CDC8-4D57-AA60-4CD64BAF6D94/0/AmtrakCascadesMidRangePlan.pdf>.

only private investment, which totaled less than \$10 million for Seattle to Vancouver signalization upgrades. Although some of these investments to commuter rail benefit Cascades, they are not explicitly directed toward Cascades service.¹¹ Sound Transit appears to be a large contributor due to two \$200 million dollar commuter rail packages for the Sounder commuter rail line.

Planned Funding—ARRA Money

In 2010, Washington State was selected to receive \$782 million from the American Recovery and Reinvestment Act (ARRA) funds, specifically for the High Speed Intercity Passenger Rail program. The passage of ARRA signified a substantial commitment from the federal government to fund rail projects. *ARRA funds were distributed through a proposal process via the High-Speed Intercity Passenger Rail (HSIPR) Program.*¹² Projects funded by these grants will help grow the Amtrak Cascades service and improve on-time performance and reliability between Seattle and Portland. For fiscal year (FY) 2009¹³ and 2010¹⁴, Washington and Oregon were awarded projects as follows:

- Washington FY 2009: 1 project – Seattle to Portland Corridor Projects (\$590 million)
- Oregon FY 2009: 3 projects – Union Station improvements (\$8 million)
- Washington FY 2010: 4 projects – King Street and Tukwila station improvements; Mount Vernon siding extension; Washington State Rail Plan (\$31 million)
- Oregon FY 2010: 3 projects – Union Station improvements; track improvements; rail plans (\$9 million).

While ARRA funds for rail projects are supposed to be the impetus for a true high-speed rail network throughout the U.S., they actually support incremental improvements that will provide Sensible Rail from Seattle to Portland. For example, roughly \$100 million will be funneled to the Point Defiance Bypass project near Tacoma.

¹¹ Ibid.

¹² This was set up in 2009 by President Obama. Federal Railroad Administration. “High-Speed Intercity Passenger Rail (HSIPR) Program” <<http://www.fra.dot.gov/rpd/passenger/2325.shtml>>

¹³ Federal Railroad Administration. “Summary of Applications.” <<http://www.fra.dot.gov/rpd/Downloads/hsiprapplist.pdf>>

¹⁴ Federal Railroad Administration. “FY10 and Remaining FY09 Funding Selection Summary.” <http://www.fra.dot.gov/rpd/downloads/Summary_of_FY10_Selected_Projects_1010.pdf>

This new track will cut six minutes of travel along the Cascades Corridor using existing train technology and speeds.¹⁵ IN addition, more funding might be allocated to Washington State. A portion of funding rejected by Wisconsin, Ohio, and Florida will most likely be allocated to Washington.

Sensible Rail is considerably less expensive than “true” high-speed rail in both total cost and cost per minute of trip time savings, as seen in Table 1 below.¹⁶ Given the immense cost of other options, Sensible Rail appears to be just that – sensible.

Table 1: Cost/minute travel saved for rail speed options

Options	Travel Time (mins)	Time Savings (mins)	Cost (million/mile)	Cost/Minute Travel Saved (\$/min)
1994 Baseline	240	0	0	0
Sensible Rail	210	30	1	5,000,000
Regional “Express”	180	60	3	7,500,000
High Speed Rail	150	90	10	16,666,667

Potential Funding Sources

Despite the significant investment of ARRA funds, which will cover much of the capital cost necessary to implement incremental improvements for sensible rail, continued funding will be necessary to support operating costs, ongoing maintenance, and future service improvements. Currently, ticket revenue, Amtrak, and the states of Washington and Oregon pay operating costs.¹⁷ These funds, however, still do not cover total operating costs given ticket revenue for FY2010 is \$27.6 million; this equated to a

¹⁵ Washington State Department of Transportation. “Rail – Tacoma – Bypass of Point Defiance.” <http://www.wsdot.wa.gov/projects/rail/pnwrc_ptdefiance/>.

¹⁶ Data from Washington’s Long Range Plan, based on lowest cost estimates of price per mile of rail and a distance of 150 miles. Washington State Department of Transportation, “Long-Range Plan for Amtrak Cascades,” December 2006, <<http://www.wsdot.wa.gov/NR/rdonlyres/E768E7BA-4788-42B1-ADC8-1BE01D1424E7/0/LongRangePlanforAmtrakCascades.pdf>>

¹⁷ Washington State Department of Transportation, “Amtrak Cascades Mid-Range Plan,” December 2008, <<http://www.wsdot.wa.gov/NR/rdonlyres/83B17378-CDC8-4D57-AA60-4CD64BAF6D94/0/AmtrakCascadesMidRangePlan.pdf>>

loss of 10.8 cents per passenger mile and 5.7 cents per seat mile.¹⁸ This suggests the trains are running at 53% capacity. Truer “high-speed rail” proposals, such as those found in the *Cascades Long Range Plan*, include operation of 13 trains daily.¹⁹ This volume seems unreasonable given current capacity levels. Nonetheless, continued funding is necessary to operate Cascades service in a Sensible Rail scenario. Some of these potential funding sources are described below.

Because Amtrak receives reduced fees for operating on freight-owned tracks, it already enjoys cost savings over state-run or private operators.²⁰ Still, there is likely room for further savings. Labor is Amtrak’s largest operating cost.²¹ Nine out of ten Amtrak employees are unionized, and their collective bargaining agreements limit the number of hours per day they may spend on certain tasks.²² Renegotiation of these contracts could potentially reduce labor costs.

Although transportation infrastructure in the United States has typically been financed by a combination of Federal and state tax dollars and user fees, partnerships with private entities have been seen as a way to increase efficiency, fill capital costs or operating funding gaps, or decrease government involvement. For example, a recent high-speed rail project in Florida attracted interest from corporations willing to pay for the state’s portion of capital costs and cover the risk, in return for profits from the line.²³ The United Kingdom transitioned their rail system to completely private operation in

¹⁸ Amtrak. “October 2010 Monthly Performance Report,” December 21, 2010. <http://www.amtrak.com/servlet/BlobServer?blobcol=urldata&blobtable=MungoBlobs&blobkey=id&blobwhere=1249219114530&blobheader=application%2Fpdf&blobheadername1=Content-disposition&blobheadervalue1=attachment;filename=Amtrak_1010monthly.pdf>

¹⁹ Washington State Department of Transportation, “Long-Range Plan for Amtrak *Cascades*,” December 2006, <<http://www.wsdot.wa.gov/NR/rdonlyres/E768E7BA-4788-42B1-ADC8-1BE01D1424E7/0/LongRangePlanforAmtrakCascades.pdf>>

²⁰ Texas Transportation Institute. “FUNDING STRATEGIES AND PROJECT COSTS FOR STATESUPPORTED INTERCITY PASSENGER RAIL: SELECTED CASE STUDIES AND COST DATA,” June 2005. <<http://tti.tamu.edu/documents/0-4723-1.pdf>>

²¹ Congressional Research Service - High Speed Rail:

²² Congressional Research Service

²³ Zink, Janet. “Florida Gov. Rick Scott rejects funding for high-speed rail,” February 16, 2011. <http://www.miamiherald.com/2011/02/16/2069844_p2/florida-gov-rick-scott-rejects.html>

1997, with some signs of success in terms of long-term cost savings.²⁴

Federal funding could be enhanced and stabilized through the creation of a dedicated funding source.²⁵ Suggestions to utilize a portion of the Highway Trust Fund have not been well received. An increase in the federal gas tax dedicated to a rail trust fund could be more politically feasible. Still, rising gas prices and increasingly efficient cars could contribute to declining revenue from this source. Other suggestions have included funding from Greenhouse Gas (GHG) emissions reductions programs. At the state level, a dedicated rail fund could also help fund maintenance and future improvements. Funding could not come from gas tax due to constitutional limitations; however creative alternatives could be explored. WSDOT recently partnered with Washington's lottery to sell a new ticket that will contribute to funding for a second Cascades train to Vancouver, B.C. The program could raise as much as \$144,000 over several months.²⁶

A stable source of funding at the State or Federal level would offer several benefits of greater funding reliability, and therefore efficiency; and the ability to increase Amtrak's rolling stock, which is at times limiting factor to service increases²⁷

ECONOMICS IMPACTS

Although rail tends to be more expensive than other modes in capital costs, Sensible Rail is a cost-effective solution in the long run. Tables 2 and 3 show the comparison of costs between the modes.²⁸ At first glance, the current capital costs for rail are much higher than air or auto travel. It is important to consider that the capital cost for

²⁴ http://www.sciencedirect.com/science?_ob=MIimg&_imagekey=B6VG8-3TN9P2P-4-2&_cdi=6032&_user=582538&_pii=S0966692398000052&_origin=gateway&_coverDate=06/30/1998&_sk=999939997&view=c&wchp=dGLbVIW-zSkzS&md5=8f3b4d2d67cf16cd523e067395dbb574&ie=/sdarticle.pdf

²⁵ Congressional Research Service

²⁶ Publicola. "Amtrak Teams Up With Lottery to Fund Cascades Route," March 8, 2011. <<http://publicola.com/2011/03/08/its-this-bad-amtrak-teams-up-with-lottery-to-fund-cascades-route>>

²⁷ Texas Transportation Institute. "FUNDING STRATEGIES AND PROJECT COSTS FOR STATESUPPORTED INTERCITY PASSENGER RAIL: SELECTED CASE STUDIES AND COST DATA," June 2005. <<http://tti.tamu.edu/documents/0-4723-1.pdf>>

²⁸ Washington State Department of Transportation, "Long-Range Plan for Amtrak *Cascades*," December 2006, <<http://www.wsdot.wa.gov/NR/rdonlyres/E768E7BA-4788-42B1-ADC8-1BE01D1424E7/0/LongRangePlanforAmtrakCascades.pdf>>

the other two modes' infrastructure has already been paid for. On the other hand, the rail system relies on privately owned freight tracks, with a lack of infrastructure devoted solely to passenger rail. Rail is simply in a different phase of implementation compared to the other modes; one that is lagging quite a bit behind. As for operating costs, rail costs significantly less per passenger mile than air travel and close to half the cost of automobile travel. Looking at the overall costs (capital and operating combined), over the long run, rail is the least expensive option in terms of cost per passenger mile. As the capital costs slow down over the long run and operating costs become the main cost, passenger rail levels out in terms of overall cost per passenger mile. Because most of the costs of automobile are operating, they will continue to rise to become more expensive than rail.

Table 2: Capital cost comparison

YEAR	AUTOMOBILE	PASSENGER RAIL	AIR TRAVEL
2004	\$0.002	\$0.11	\$0.05
Mid-Point	\$0.001	\$0.38	\$0.06
2023	\$0.001	\$0.94	\$0.06

Source: Amtrak Cascades Cross-Modal Analysis Technical Report, 2004.

Table 3: Operating cost comparison

YEAR	AUTOMOBILE	PASSENGER RAIL	AIR TRAVEL
2004	\$0.43	\$0.31	\$1.00
Mid-Point	\$0.49	\$0.29	\$1.12
2023	\$0.76	\$0.34	\$1.77

Source: Amtrak Cascades Cross-Modal Analysis Technical Report, 2004.

Rail is also less expensive in terms of the environmental costs – at just \$0.05 per mile versus \$0.11 per mile for highway travel. Amtrak releases just under 0.6 lbs of CO₂ per passenger mile while single occupancy vehicles release anywhere from 1.2 lbs per

passenger mile for compact cars to 1.7 for SUVs.²⁹

Another component of cost is safety. Highways are dangerous – accidents are costly both in terms of equipment costs and human costs – while rail is safer. Safety costs for highways are 12 times as high as rail, at \$0.06 to rail's \$0.005 per passenger mile. Safety costs for rail make up just 1% whereas it is 8% for highway use. These are costs that users do not pay, and are therefore externalities.

Nevertheless, the user's cost-per-passenger mile is much lower for passenger rail than for highway, with \$0.20 to \$0.55 respectively. For rail, the typical cost is just the ticket, whereas auto users must consider gas, maintenance, vehicle depreciation, and insurance. The one area rail is more expensive is the system utilization cost. For highways, it is just six cents; for rail, it is 25 cents, which is a subsidy. In this respect, highways are cheaper because it is by user fees and taxes.³⁰

Another key consideration is the additional cost savings from a reduction in highway maintenance costs due to shifting auto trips to passenger rail. This analysis applies the methodology used in a study done for the Montana DOT. Highway maintenance costs are approximately \$0.32 per mile driven. Considering that the average vehicle occupancy is 1.59 people, the result is a cost of about \$0.20 per person. Though the full route from Vancouver to Eugene is 466 miles, the majority of riders travel the Seattle to Portland route, which is about 150 miles. In an effort to be conservative, the average amount of miles traveled that will be taken into account for a passenger on Amtrak Cascades is 200 miles. In 2010, there were 838,251 passengers, meaning that at \$.20 per person, the cost savings in terms of avoided highway maintenance needs is 33.7 million.³¹

²⁹ "Transportation Emissions: The short version." *How Low-Carbon Can You Go: The Green Travel Ranking*. Web. 9 Mar 2011. <<http://www.sightline.org/maps/charts/climate-CO2byMode>>.

³⁰ This does not include the external costs imposed by automobile systems. WSDOT State Rail and Marine Office

Washington State Department of Transportation, "Amtrak Cascades Mid-Range Plan," December 2008, <<http://www.wsdot.wa.gov/NR/rdonlyres/83B17378-CDC8-4D57-AA60-4CD64BAF6D94/0/AmtrakCascadesMidRangePlan.pdf>>

³¹ Calculation for highway cost savings: \$0.32 per mile/1.59 people per vehicle x 200 miles x 838,251 passengers = \$33.7 million.

Direct benefits from Sensible Rail

Rail systems buy fuel locally, pay wages to employees on the train and at stations, and pay for car maintenance. Amtrak employs over 500 people in Washington State, and in 2005, paid \$23 million in wages (an average of \$42,000 per employee). Additionally, Amtrak spends about \$18 million on fuel and train and station maintenance in Washington State each year. When you consider the \$33.7 million saved in highway maintenance in addition to the tax revenue from \$23 million in wages and \$18 million in spending, the impact is significant.

Washington and Oregon also benefit from Amtrak-related tourist spending. Amtrak provides a link to other cities for passengers who arrive and depart from only one city. For example cruise ship passenger who arrives in Seattle can easily visit another destination. In 2009, Washington State saw \$14.2 billion in direct travel spending and \$4.17 billion in travel industry earnings, though the number of tourists who arrived via train is unknown.³² A study of the direct economic impacts from spending by non-residents who traveled to Maine and New Hampshire on the DownEaster train and would not have visited otherwise showed \$3 million in additional spending.³³ Montana similarly saw \$7.6 million in spending thanks to the Empire Builder train that travels through Montana as it travels between Seattle and Chicago.³⁴

Benefit/Cost Analysis³⁵

The benefit/cost analysis for Sensible Rail was essentially conducted by WSDOT for the mid-range plan. Benefit/cost ratios and net benefit are measures to evaluate economic efficiency and the size of benefits, respectively. Of four options WSDOT

Montana. *Analysis of the Economic Benefits of The Amtrak Empire Builder to Montana.* , 2003. Web. 9 Mar 2011.

³² Dean Runyan Associates (<http://www.deanrunyan.com/impactswa.html>)

³³ Economic Benefits of Amtrak Downeaster Services (Feb 2005). Prepared for: Maine DOT. Prepared by: Economic Development Research Group, Inc

³⁴ Montana. *Analysis of the Economic Benefits of The Amtrak Empire Builder to Montana.* , 2003.

³⁵ Washington State Department of Transportation, "Amtrak Cascades Mid-Range Plan," December 2008

analyzed, “Option 2” most closely matches Sensible Rail. Option 2 is an incremental strategy with minimal amount of capital costs. It also accounts for four projects that are currently in progress:

- Tacoma – Bypass of Pt. Defiance
- Vancouver – Yard Bypass and 39th St. Bridge
- King Street Station – Track Improvements
- Cascades Train Sets – Overhaul

The WSDOT analysis considered revenue in the cost section (instead of benefits) because revenue projections did not offset estimated costs. Costs and benefits included were:

Costs

- Capital investments
- Any costs to subsidize the operations and maintenance
- Administrative and Marketing costs

Benefits

- Economic benefits (income from jobs, profits for businesses, taxes paid to government)
- Societal benefits
 - Congestion relief (savings to relieving congestion on the roads)
 - Safety improvements (savings in reduction of motor vehicle collisions)
 - Environmental benefits (greenhouse gas emissions reductions)

The results shown in Table 4 below demonstrate that Sensible Rail has the highest benefit/cost ratio, of the options analyzed by WSDOT. In comparison to options 2-4, Option 2 provides the greatest economic efficiency, producing more than two and a half times the benefit, relative to the cost. It also has the lowest total cost, mainly due to the lower capital cost investment, but has a lower net benefit than Option 4.

Table 4: Benefit/cost analysis of investment options

Exhibit ES-8: Estimated Benefit/Cost Ratio by Investment Option

Plan Option	Sum of FY2010 to FY2030* - \$ Million (2008 Dollars)			
	Total Cost** (\$ Million)	Total Benefit** (\$ Million)	Net Benefit (\$ Million)	B/C Ratio
Option 1: Maintaining Current Operation	\$310	\$625	\$315	2.02
Option 2: Incremental Strategy 1 - Minimum Capital Investment	\$733	\$1,853	\$1,120	2.53
Option 3: Incremental Strategy 2 - Supply Meets Demand	\$1,129	\$2,744	\$1,615	2.43
Option 4: No Financial Constraints	\$1,536	\$3,400	\$1,864	2.21
Note: Option 1 is the baseline.				
* The projects completed during the mid-range plan period of FY2010 to FY2017 will generate benefits for local communities and Washington State for many years beyond FY2017. Benefits are sum of FY2010 to FY2030.				
** Operation costs are sums of FY2010 to FY2030. Capital investment is sum of FY2010 to FY2017. Both benefits and costs are discounted to present value (2008 dollars).				

Source: WSDOT State Rail and Marine Office

OPERATIONS

In looking at the current state of passenger rail in the Cascades Corridor, some questions regarding operations arise. In particular, it is of interest how the current state of operations can be improved under the “shared rail” constraints that exist between freight and passenger entities. Prior to suggesting that passenger rail be given more priority, it is important to examine the relationship between freight and passenger rail more closely.

Regulating Freight to Benefit Passenger Rail

Freight train interference is responsible for almost half of the delay on the Northwest Corridor lines³⁶. Many of the freight trains do not run on schedule, and are often used as needed to haul goods to or from the ports of Seattle and Tacoma, putting pressure on rail owners to retain as much rail-time as possible. Thus, shifting priorities from freight to passenger service is not an attractive option from a freight rail perspective. BNSF argues that it is more environmentally responsible to focus on freight rail operations at the cost of passenger rail: “... you could make the case that the nation would realize significantly more environmental benefits by shifting more freight to rail than it would by shifting more passengers to rail.”³⁷ To some extent, this is corroborated

³⁶ “Amtrak performance information” Accessed, Feb 28, 2011. <www.amtrak.com>

³⁷ “RAILWAY” BNSF Team Magazine. March 2010. Accessed Mar 2nd, 2011.
<http://www.bnsf.com/employees/communications/railway-magazine/pdf/201003_ex.pdf>

by a 2007 Environmental Science Technology paper that cites rail for producing just 40 g/ton-mile of CO₂ compared to the 235 g/ton-mile and 1469 g/ton-mile of CO₂ produced by auto and air modes.³⁸ According to the Texas Transportation Institute, “travel time has a value of \$16.01 per person-hour and \$105.67 per truck-hour in 2009.”³⁹ This has serious implications – freight time is 6.5 times more valuable than passenger-time, making it even more difficult to have a sound argument for improving passenger service at the cost of freight.

Washington State’s freight system transports primarily farm products and lumber, which also shipped by truck. Most of the rail freight in Washington State is inbound, with over 55% of all rail freight ending up in Washington – a significant increase to the 36% back in 1996 and a stark contrast to a US average inbound flow value of just 12%. This is in part attributable to the large ports located in Washington State. In Washington State, over 39% of employment is related to the freight system, thus any additional constraints imposed must be done very carefully. Increased competition from a new northern port, Price Rupert as well as the expansion of the Panama Canal has created additional concerns for the region’s freight system.⁴⁰ Passenger rail improvements on freight lines must be done in a symbiotic manner. For example, infrastructure investments that improve both services, such as grade separations create a win-win scenario.

Skip-stop Operation

Travel time is one of the most important characteristics of service and many of the proposed improvements along the corridor ultimately address the travel time between cities. With evidence that performance improvements should not be made at the cost of freight operations, an alternative strategy is needed. Another potential means of obtaining shorter travel times is to skip stations. It is conceivable, even at the current level of

³⁸ Facanha, C., and Horvath, A. (2007), Evaluation of Life-cycle Air Emission Factors of Freight Transportation. *Environmental Science & Technology*, 41(20), pp. 7138-7144.

³⁹ Texas Transportation Institute Annual Congestion Report, 2010

⁴⁰ Washington State Freight Rail Plan 2010-2030 <http://www.wsdot.wa.gov/NR/rdonlyres/34925D95-4F59-44B6-90DD-6BE102B33C15/0/StateFreightRailPlan.pdf>

investment, to run two types of service on the corridor – an express service that connects the primary cities (Seattle to Portland most likely) without any stops in between and a regional service, that makes stops at all locations. A rough estimate of 5-minutes per stop (accounting for deceleration, stopping and acceleration) would yield a 30-minute travel-time savings on the Seattle-Portland corridor, while serving nearly 80% of the current rider base. Meanwhile, the remaining 20% can be served by the less frequent and slower regional service. Furthermore, it may be possible to combine some of the current Sounder operations with the slower regional train, thereby providing access to even more towns along the corridor and reducing the total amount of track time being leased from BNSF – thus potentially improving freight operations in the state.

LAND USE & STATION DEVELOPMENT

Smart growth and transit-oriented development (TOD) are important planning strategies to address a myriad of social, fiscal, and environmental issues. These include

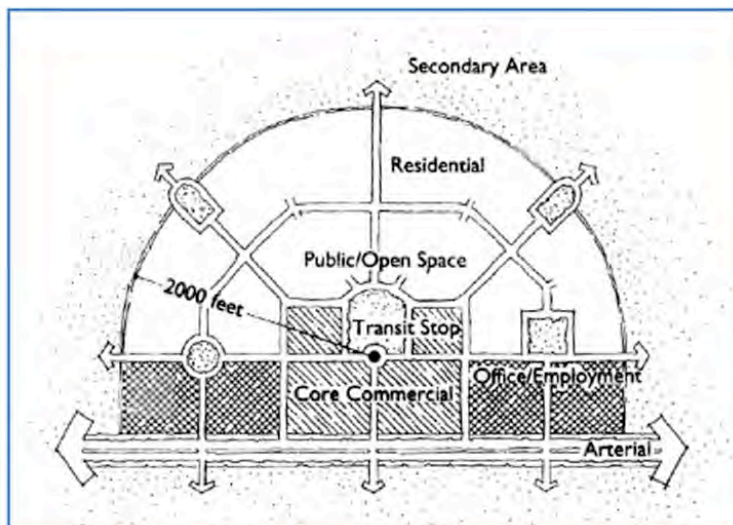


Figure 2: Transit-oriented development land use plan.

potential for compact development to become the predominant development type by the middle of this century. These techniques can be applied in conjunction with the Sensible

climate change, local air quality, automobile dependence, housing affordability, public health, and mounting infrastructure costs. While smart growth and TOD can only yield incremental change in development density and other indicators of compact development, there is great

Rail service improvements to better anchor ridership and improve the case for further rail improvements. A typical TOD land use plan is presented in Figure 2⁴¹.

Growth Management Acts

Wider recognition of the costs and negative impact of sprawl has generated greater interest in methods to control it. In Washington and Oregon, growth management attempts to address a wide range of issues and incorporate them into a consensus on the shape of the community's future. Such factors as the timing of infrastructure development and financing, the proper balance of development with environmental protection, and the provision of incentives for certain types of development are blended together to ensure that individual land-use decisions foster, rather than harm, a community's goals. Both states have legislation that requires counties and cities to plan for future growth, including goals for transportation infrastructure. An improved intercity passenger rail corridor, with investments toward transit-oriented development appropriate to each station area, would reinforce the goals of growth management legislation in Washington and Oregon.

The transportation goals in Oregon and Washington's growth management legislation call for local governments to link land use planning and transportation planning. In addition, they promote smart growth principles with the objective of meeting transportation needs within communities and improving mobility regionally. Providing site-appropriate TOD around existing stations would create dense centralized development, allowing residents easy access to an alternate mode of transportation. Improving the existing rail infrastructure would provide a viable alternative to automobile use and would allow for efficient intercity travel within the region, which is directly in-line with growth management principles.

⁴¹ Peter Calthorpe "The Great American Metropolis: Ecology, community and the American Dream". Princeton Architectural Press. 1993.

Transportation Concurrency

Transportation concurrency planning plays a major part in Oregon and Washington's growth management strategies. In terms of transportation, concurrency requires that adequate transportation capacity is available to support new development. Basically, concurrency forces us to ensure that, as a community grows, the system of roads is able to handle daily trips. When new development is proposed, it is studied to determine if it would exceed the city's established Level of Service (LOS) standards. Most LOS standards deal with how long it takes to get through an intersection or turn at an intersection. They are the lowest acceptable operating level for a given road or intersection. Before the city can approve a development, it must find that the development will not create enough traffic to overrun the LOS standards, or that the City or developer will make traffic improvements to ensure compliance with LOS standards.

Making concurrency work requires difficult decisions about how to fulfill community goals. The basic question is this: Is the community willing to face higher levels of traffic and delay, or would it rather invest tax dollars and make the sacrifices associated with improving existing roads? This question is even more difficult to make given that LOS standards might only be exceeded during several hours of the day.

In looking at what Sensible Rail supports and can accomplish, it appears to be the most viable and logical of the different high-speed rail alternatives. By decreasing headways caused by sharing the track with freight as well as adding some "express" trains, the level and reliability of service could be increased as well as a sizeable decrease in travel time. Also, the redevelopment of the areas in and around the stations can elevate the "image" of railway and help produce an environment of increased ridership.

Impacts of TOD

When transit investments are made, the real estate markets are a good way to get a feel of what kinds of benefits they are creating. As long as there is a finite supply of parcels around stations, those wanting to live, work, or do business near transit will bid up land prices. The benefits of being well connected to the rest of the region (i.e., being accessible) get capitalized into the market value of land. As the cliché goes, rail-served

properties enjoy good “location, location, location”: residents can more easily reach jobs and shops; more potential shoppers pass by retail outlets; and for employers, the labor shed of workers is enlarged.

Because the benefit conferred by being near transit is improved accessibility, looking at the land-value premiums is a good way to gauge the benefits of TOD. While research findings are varied, much of the evidence suggests that being near transit enhances property values and rents. In some cases, prices can be anywhere from 20% to 40% above market rates. In the Washington DC area, some space near the Metrorail stations exhibits even higher premiums.⁴² With the benefits, however, there are other studies that show conflicting results. A Portland MAX light-rail study only found a residential benefit within 500 meters of the station. It would make sense that being very close to a rail system could create an environment where ambient noises and activity are so much that it become more of a burden to live there. One other factor to keep in mind is the alignment of the system. Elevated systems would have a much more negative effect than those that are belowground.

Some land-value premiums can also be explained by the public policies aimed at TOD development. In Denver, at The Commons, planned use development (PUD) was instrumental in allowing property to be sold in pieces at a premium. A TOD study in Atlanta showcased policies that encourage more intensive development (e.g., parking waivers and minimum Floor Area Ratio) led to rent premiums.⁴³ What is probably the most important is the potential source of revenue these land premiums can provide. Being able to recapture some of the benefits would be equitable from a social perspective.

Recapturing value is particularly important to initiating TODs. This is especially true in distressed inner-city settings where a lot of upfront improvements and amenities are often needed to entice private investment. Already short on cash, municipalities are

⁴² R. Cervero, “Rail Transit and Joint Development: Land Market Impacts in Washington, D.C. and Atlanta,” *Journal of the American Planning Association*, Vol. 60, No. 1 (1994): 83–94.

⁴³ J. Landis, S. Guathakurta, W. Huang, and M. Zhang, *Rail Transit Investments, Real Estate Values, and Land Use Change: A Comparative Analysis of Five California Rail Systems*, Monograph 48 (Berkeley, Institute of Urban and Regional Development, University of California, 1995).

responsible for taking the lead in finding the appropriate capital for rail station areas, and enhancing the neighborhood through landscaping and sidewalk improvements.

These include maintaining the character of the existing neighborhood, providing a safe pedestrian environment, creating a flexible connect to other transportation nodes, and most importantly create a housing balance. One issue that can occur is gentrifying low-income areas. The rise in housing costs can push low- and moderate-income residents farther away from jobs and transit. This basically eliminates TOD's core benefit for these residents. If TOD is thought from an equity perspective by providing a solid balance of housing options, it can tie workers to employment nodes, create jobs, and provide an added economic boost to an area that had previously been most likely neglected. TOD also has the benefit of reducing transportation costs. This is very important to low- and moderate-income families because they pay a much higher portion of their income than their higher-income peers.

Pedestrian safety is also another important aspect to consider in TOD design. Because of the close proximity to the rail system, equitable pedestrian access is critical in the sustainability of transit development. Clarendon Hills, Illinois,⁴⁴ and Glenside, Pennsylvania, are two examples where pedestrian access has been accentuated in order for transit to server its immediate population.

Both of these examples have the benefit of the rail system crossing via a bridge helping mitigate pedestrian issues. Clarendon Hills, 20 miles outside of Chicago, also added a layer of landscaping that would also help keep the two separate. In Glenside, 11 miles outside of Philadelphia, the planning process followed a rigorous and methodical path where many different alternatives were explored. Some created a bridge over the tracks and others when under. Ultimately, two ADA compliant access ramps and pedestrian walkway under the bridge immediately adjacent to the station were used. On either side, plazas were developed to help create a continual urban area.

⁴⁴ S.B. Friedman & Company, The Lakota Group, Metro Transportation Group, *Village of Clarendon Hills Downtown Master Plan*, March 2006

Locally, the city of Centralia provides an opportunity to take a step back and look at how the benefits listed above could provide value to the community. Centralia is equidistant between Seattle and Portland, has a majority of its population at low- or moderate-income, and has desperate commercial nodes created by both an interstate and rail going through the town. In looking at the *Comprehensive Plan for Centralia*, there are many areas where transportation infrastructure needs to be enhanced due to numerous potential pedestrian, bike, and traffic accident areas.⁴⁵ The city itself has a great foundation and has a topography that is very similar to the standard TOD design as seen in the Great American Metropolis. The downside is the separate of the commercial nodes by Interstate 5. One of the major initiatives in developing further connectivity would be to join these areas effectively with either a trolley type of system (i.e., piggyback off existing rails) or its bus service. Whatever the end result, zoning changes will need to occur so more comprehensive land use and planning can occur.

CONCLUSION

As the Northwest Region continues to grow, it becomes necessary to anticipate the resulting increase in transportation demand with sound investments in infrastructure. These investments provide the necessary capacity for future growth, but must be evaluated carefully and in proper context. Prior to investing into a high-speed Northwest Corridor link, the overarching goal must be clear. The current rail system is not operating at anywhere near capacity and new needs can be met with increases in service. Running an express service can attain shorter travel times. The rail “image” can be drastically improved by renovating stations and trains. The overall uncertainty of high speed rail is evident not only in the lack of a clear goal, but also in the definition of the term itself – the current “high speeds” considered for the Northwest Corridor are half of those in Japan, China, and France. Inversely to these nations, the US has optimized the use of its rail for freight movement and highways for passengers. The movement for high-speed rail involves flipping these established priorities physically, as well as in the mindset of the general population, which is not an easy, quick, nor inexpensive task. It is on these

⁴⁵ CH2MHill, *City of Centralia Comprehensive Plan Transportation Element*, June 2007

grounds that this report makes a case for a more gradual investment into Sensible Rail. The information and arguments presented in this report are not meant to discourage investment in rail or passenger transit – it is simply meant to provide context for the significant decisions that await the region.

**Scenario 2: Cascadia Regional
Express:
A Feasibility and Impacts Analysis
for Improved Passenger Rail
Service in the Cascadia Region**

CASCAD^{ES}[®] REGIONAL EXPRESS



A Feasibility and Impacts Analysis for Improved Passenger Rail Service in the Cascadia Region

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Executive Summary

Amtrak Cascades extends through an exciting, scenic corridor that links several destinations in the Pacific Northwest, including the three major cities of Portland, Seattle, and Vancouver, B.C. To enhance the cultural, economic, and social ties in Cascadia, additional investment in the corridor is necessary to improve the existing level of service and reliability of the Amtrak train service. This report examines the potential benefits and impacts of introducing regional express service to the corridor from Eugene, Oregon to Vancouver, B.C.

Regional express service strikes a balance between existing train service and expensive high speed rail that envisions train travel in excess of 150 mph. By eliminating several low ridership stations and making track improvements that will allow the current rolling stock to travel up to a maximum speed of 110 mph, this service will provide a significant upgrade in travel for the region with a reasonable amount of investment.

The improved rail service requires a governance framework that supports the investment and specifically focuses on the mega-region. The Governance section of this report analyzes the political feasibility, a framework for accountability, and funding for capital improvements and systems operations of regional express service. Successful Regional Express service hinges on agreement and sustained commitment from two states, two nations, two nations and two private railroads. We find that one likely governance challenge will be for governments to negotiate with the railroads for access to the right of way without an unreasonable request for compensation, and that current agreements between affected states, the FRA and BNSF to spend ARRA funds can serve as a template for future agreements and secure a commitment to improved passenger rail service.

The Obama administration's interest in investment in high speed rail presents the greatest opportunity for acquiring the approximately \$6 billion in capital costs to develop an Express Rail service. However, without federal funding the infrastructure improvements for Express Rail service would likely continue, just at a slower pace. This is due to the commitment demonstrated by the State of Washington to improve reliability, frequency and speed of service in corridor.

An economical cost-benefit analysis shows the investment in Regional Express Rail service is feasible under the assumptions outlined above. Direct economic benefits include revenues recouped from ticket fares, tax revenue increases from direct and indirect employment, and savings for businesses due to improved freight train travel times on the corridor. In addition, there numerous social benefits, including reductions in greenhouse gases, travel time savings for leisure and business travelers, and increased accessibility for communities linked by regional express service.

Land uses throughout the corridor will change with the investment in regional express rail service. This report examines potential land use changes in three categories based on the character of station locations: downtown, industrial, and suburban fringe. Regional express service is not expected to drive land use changes in the region; instead it is expected to strengthen existing industries and tourism-based

businesses by enhancing travel in Cascadia.

Stations areas are anticipated to gradually transform as service reliability and frequency improves. A case study of real estate prices around rail stations in Seattle and Tacoma determined there are several thousand square feet of land available for redevelopment. The real estate case study contained in this report uses existing land values to determine the feasibility of new mixed-use developments for residents and visitors.

Our analysis and findings show that regional express service has the potential to improve travel times and the reliability of train service in Cascadia. As a result, Amtrak Cascades will positively influence land use changes in the station areas by providing an option for alternative travel between major cities in the Pacific Northwest.

The states of Washington and Oregon use statewide growth management policies to minimize the inefficient expansion of development by guiding land use development, and by ensuring public infrastructure is compatible and sufficient to meet agreed on development form and capacity. The analysis shows that Express Rail service is generally consistent with and supportive of these growth management laws. However, the service is not likely to address transportation concurrency requirements in Washington State.

Introduction

Amtrak Cascades links major destinations in the Pacific Northwest region of the United States and Vancouver, British Columbia. The 18 stations served over 1.6 million people in 2010, a significant increase in ridership over the past year. As ridership continues to grow on the corridor, further investment in rail infrastructure has the potential to strengthen connections between urban centers up and down the northern Pacific Coast.

This report examines the potential for, and potential impacts of expanding Amtrak Cascades with a higher level of service than is possible on the existing infrastructure. This improved service will continue to focus on the corridor between Eugene, Oregon and Vancouver, B.C., with stops in Seattle and Portland, among other regionally-significant cities.

Criteria Outline

The analysis, findings, and recommendations herein provide a framework for governance and funding requirements to establish regional express train service in Cascadia. The introduction of high-quality rail service to Cascadia will require increased cooperation and communication between Washington, Oregon, and B.C. As land uses evolve throughout the Cascadia corridor and station areas develop new businesses and residential areas that serve regional express service, state and regional roles will ultimately shape the connection between transportation and development. This report organizes the discussion of these elements through the following criteria:

- **Political Feasibility** –The potential for a chosen policy to be accepted and adopted by those responsible for implementation. For the Regional Express, we will examine the potential for the Express Rail and associated governance framework to be accepted, supported, and funded by the mega-region’s principal stakeholders.



Figure 01 - Amtrak Cascades corridor

- Accountability for Level of Service – Any policy should outline the stakeholders responsible for implementing and maintaining a policy requiring a sizeable investment of public resources. We will examine the Regional Express Rail project in terms of how effectively those responsible for providing service are held accountable for these expectations.
- Ongoing and Adequate Funding - It is important to take into consideration funding options when pursuing a policy that will require a sizeable investment of public resources. Policy-makers should take into consideration the current and ongoing funding needs of a chosen policy. In the case of Regional Express Rail service, we will discuss the current levels of funding as well as the needed funding to maintain operations.
- Effectiveness – A policy is considered effective if it can adequately meet the goals that have been outlined. In the case of investing public resources in Regional Express, we will examine its potential effectiveness based on how likely it is to meet the intended goals of creating an efficient and timely level of service.
- Efficiency – Generally, efficiency is measured by examining the predicted economic benefits and costs of a public infrastructure project. A benefit-cost analysis is the preferred tool used to measure the level of efficiency of undertaking a certain policy. In this case, we will use a benefit-cost analysis to determine whether implementing a Regional Express Rail project is an efficient use of public resources.
- Equity – According to the definitions of horizontal and vertical equity, transportation policies should not favor one individual group over others, consumers should get what they pay for, and access to opportunity should be considered for disadvantaged groups (Litman). Regional Express Rail requires a sizeable investment from Washington, Oregon, and British Columbia. How these benefits and costs are distributed will have important equity consequences.
- Land conversion due to track construction – Large infrastructure policies, such as Regional Express, tend to have myriad impacts on the surrounding environment. For the Regional Express policy option, we will examine the potential land-use impacts it might have on the rail corridor and evaluate the Regional Express Rail across these different impacts.
- Station area land development – To evaluate the impact on development that Regional Express will have on the area surrounding stations, we will use an analysis of current land uses and application of common real estate metrics.
- Growth Management – Both Washington and Oregon have comprehensive growth management plans that have components for helping cities and regions plan for transportation infrastructure. Regional Express Rail is a policy that outlines a very specific investment in transportation infrastructure. We will examine the potential for Regional Express Rail to comply with goals of current Growth Management Plans and the consistency of Regional Express with state land-use policies.

Structure of this Report

In this report we first clearly delineate what is meant by regional express service and what ridership assumption we are operating under. The remainder of the report is divided into the following sections:

1) Governance and Funding; 2) Economic Benefits; 3) Land Use and Station Planning; with a brief Real Estate Case Study and discussion of Growth Management.

Proposed Service

The proposed Amtrak Cascades Regional Express service can be conceptually defined as lying between the existing standard rail service, which provides a top speed of 79 mph, and proposals for more ambitious—and considerably more expensive—true high speed rail service, which may travel speeds as high as 200-300 mph. The regional express service envisioned herein anticipates speeds up to 110 mph where conditions allow, namely on the segments between Bellingham and Everett, and between Olympia and Portland. Other portions of the route are heavily-urbanized therefore it is impractical to provide similar speeds in those locations.

The alignment for this service remains within the same right-of-way as the current service, but additional dedicated passenger lines and/or track sidings will be constructed in accordance with the Washington State “Long-Range Plan for Amtrak *Cascades*”, allowing for significantly reduced congestion and competition for track space between freight and passenger trains.

Assumptions

The intent of a “regional express” service is not necessarily intuitive and could potentially take on a variety of meanings, hence before analyzing the details of the express service envisioned here, we must begin by defining the characteristics of and assumptions underlying our vision of Amtrak Cascades Regional Express Service.

Service Assumptions

We began by building off of the express level of service recommendation provided by our Portland State University colleagues. In this vision, the regional express service consists of eight stops: Vancouver, BC, Bellingham, Seattle, Tacoma, Olympia, Portland, Salem and Eugene. We believe these eight stops represent reasonable candidates for regional express service. However, in order to discontinue service to the remaining 10 cities, we felt these omissions should be justified.

One of the primary rationales behind regional express service is to provide the largest time/cost savings to the largest number of riders at the most reasonable cost. As Table 1 shows, although our regional express service limited to eight stops eliminates 55 percent of the existing stops, it loses only 17 percent of the total population of the cities currently with stops and 15 percent of the ridership in the entire system. Providing significant improvement to 85 percent of the ridership at the expense of the other 15 percent makes sense from an efficiency standpoint, however this reduction in service is not without equity concerns.

City Name	2010 Population	2010 Boardings
Vancouver BC	600,000	138,578
Bellingham	80,000	62,562
Mt. Vernon	32,000	18,662
Stanwood	5,400	4,638
Everett	103,000	24,108
Edmonds	40,000	23,114
Seattle	600,000	481,192
Tukwila	20,000	24,892
Tacoma	196,000	94,437
Olympia	84,000	48,627
Centralia	16,000	18,472
Kelso/Longview	48,000	23,962
Vancouver, WA	165,000	75,303
Portland	580,000	471,163
Oregon City	32,000	8,975
Salem	155,000	39,976
Albany	50,000	23,417
Eugene	153,000	60,232
Regional Express Totals	2,448,000	83%
Left Out Totals	511,400	17%
Overall Total	2,959,400	1,642,310

Table 01 - Profile of Corridor Ridership

Under our regional express proposal, residents of the large urban areas benefit at the expense of residents of the smaller cities along the route, thus creating horizontal equity issues. On the other hand, regional express service will be cheaper than air travel and allows those who cannot drive a much more reliable option for travel between these eight destinations. In this fashion, regional express service will furthers vertical equity (Litman 2011). In addition, regional express service could be operated primarily during peak travel hours, with complementary standard service serving smaller markets at other times of the day, thereby reducing the impact to equity.

A focus on peak travel periods is ultimately expected to capture the largest ridership. In the areas between Olympia and Portland and between Bellingham and Everett we are planning to add an extra track in order to facilitate full 110 mph service (See Figure 1). In the remaining areas we see incremental improvements being made to the ‘sensible rail’ plans with the goal of achieving speeds in these regions as high as cost-effectively possible.

Ridership Assumptions

The primary goal of regional express service is to target the locations and the specific potential ridership groups most likely to realize the largest gains from the time savings involved. To do this we must identify this set of potential riders. Given the likely cost of regional express ticketing, competition from the Sounder and the elimination of traditional commuter friendly stations such as Everett and Vancouver, WA we see our target ridership as being infrequent users, not commuters. These infrequent users range from business travelers and conference attendees to families on vacation, students, professional sports fans, and concert goers.

Another assumption includes the likely changes to ridership volumes due to the regional express service. A 1996 study shows that train travel in the United States has an elasticity of time savings of around 1.60 - 1.67 percent for business travelers and 1.58 percent for leisure travels (Morrison and Winston 1985). This means that for every 1 percent decrease in trip time duration one would expect to see 1.60 percent increase in ridership. The Washington State Department of Transportation (WSDOT) uses this figure to estimate an 18 percent ridership increase throughout the entire system when incorporating the time savings due to the currently planned changes resulting from the ARRA funding (WSDOT 2008). Applying this elasticity solely to the Seattle to Portland segment of this regional express service, we expect to see an increase in ridership of approximately 33 percent (due to the 45 minute reduction in trip time).

Looking at these values more closely we see that the Seattle and Portland stations along with the two stops between Tacoma and Olympia had 1,090,000 boardings in 2010. The 33 percent increase in ridership equates to an additional 360,000 riders on the express service. However, from this we must subtract the 140,000 riders who would have boarded at the eliminated stops in Tukwila, Centralia, Kelso and Vancouver, WA. It should be noted that we are making the conservative assumption that no riders from Tukwila or Vancouver will travel to Seattle or Portland to board the express service. Thus, in all likelihood the loss of passengers would be less than the 140,000 quoted here. In sum, after accounting for the loss of passengers we expect a net increase of around 220,000 riders, or about 20 percent.

Cascade Stakeholders

Creating a passenger rail line capable of reaching speeds up to 110 mph requires a great deal of involvement and coordination of a diverse range of stakeholders. These stakeholders include federal, state and local government agencies, private entities such as rail companies, and various organizations. We outline many of the stakeholders required to upgrade the existing rail service in Appendix A.

Governance

In order for the Regional Express option to be successful, a diverse group of stakeholders must agree on how to fund necessary rail projects and provide accountability for meeting goals, raising capital and sustaining service. Upgrading rail service to 110 mph will require billions of dollars in investment from a combination of federal and state governments and cooperation from the private entities that own much of the rail right of way. In this section we will outline and discuss the political feasibility of Regional Express service. We will also examine the challenges of holding various parties accountable for meeting standards for quality passenger rail service in a timely, cost-effective manner. And since the availability of funds is uncertain, we will examine how developments at the state and federal levels affect the prospects for Regional Express to be built using various funding sources.

Challenges

Freight

Balancing and managing a variety of stakeholders and the values and interests that accompany them within a coherent and effective governance framework is one of the largest challenges facing the creation of a regional express service. Improving the current rail service to become more reliable is a challenge in itself; boosting speeds up to 110 mph will entail additional effort from a governance framework to ensure safety in the case of rail congestion, accelerate border crossing processes, effectively plan as a whole mega-region, and allocate funds in a fair yet timely manner.

One crucial relationship that needs to be handled delicately is the balance between passenger rail and freight rail. One of the reasons BNSF and Union Pacific oppose passenger rail expansion is the regulation expected to follow. Higher speeds will invariably necessitate increased regulation from the FRA for both passenger and freight rail companies to avoid costly accidents. In the 1980s, freight rail enjoyed the results of extensive deregulation; attempts by Congress in recent years to re-implement regulation to curb rising freight rates has several freight companies fearful of the consequences of sharing track with more passenger trains (The Economist 2010). Already, freight companies have expressed their concern to the USDOT and the FRA over the latter's initial guidelines concerning stakeholder agreements between public agencies, passenger rail service, and freight. One guideline, for instance, asks that all rail capacity not being utilized by freight be reserved for future passenger rail use. Freight companies believe that their utilization of track will increase as the economy improves, and fear that the FRA will fail to provide flexibility when implementing the guidelines (Frailey 2010).¹

Both BNSF and Union Pacific strongly oppose the expansion of passenger rail if it reduces their overall

1 Another part of the new safety regulations the FRA is planning to implement by 2015 is Positive Train Control, a system designed to automatically slow trains that fail to yield at a stop signal or are traveling too fast. The freight companies estimate that the PTC would cost up to \$15 billion nationwide, and question if the cost justify the benefit. They also argue that within the last decade, freight has enjoyed only an 8 percent return on investment; hardly enough to cover their capital costs (The Economist 2010).

freight capacity and if the companies are not fully compensated for the use of their rail lines. In the case of a regional express service, BNSF is a more important stakeholder for two distinct reasons. First, BNSF owns the rail line in Washington, by far the greatest distance in the Cascadia corridor. The rail line includes the highly urban section between Everett and Olympia, where the majority of congestion is expected. Second, the regional express service proposed segments of increased speed primarily occur on BNSF right of way. Public agencies will struggle to accommodate BNSF due to their history of effectively utilizing their bargaining position during negotiations to their advantage. In 2003, when in discussions with Sound Transit over the new Sounder commuter train service, BNSF drove up easement payments to \$258 million (Sound Transit 2003).

Ultimately, a long-term shared-use agreement will be needed to ensure the success of the regional express service and working relationship with freight for rail improvements in the future. The longer the term of the agreement, the less likely it will be adjusted or canceled, therefore strengthening the relationship. Public agencies who sign on to short-term agreements often risk losing bargaining power when the agreement requires renegotiation (Prozzi 2006). Any governance framework should also look at airports as a model for effective, shared-use agreements (Nash 2003).

Additionally, there are several ways through which public agencies can regain power in negotiations with the powerful freight companies such as BNSF and Union Pacific. One is to secure funding sources, something that the American Recovery and Reinvestment Act (ARRA) is expected to cover. A second is to gain high-level political support. The Obama Administration's recent advocacy for high speed and intercity rail clearly shows the high-level support that public agencies could use to better position themselves to create a favorable agreement. Another key is to utilize experienced negotiators with an extensive understanding of freight rail and the timeline needed for both sides (Prozzi 2006). Lastly, building trusting relationships between freight companies and public agencies cannot be overlooked. While fairly obvious, this can be accomplished by setting achievable expectations and finding common objectives for both sides, such as increased capacity and performance measures for reliability. Increasing reliability predictably serves to also increase political support, thereby further solidifying political agencies' negotiation power (Prozzi 2006).

In February 2011, WSDOT and ODOT reached early agreements with FRA and BNSF in order to define a level of service for the corridor. The parties agreed to add two more trains per day by 2017 through the Portland to Seattle portion of the Cascade corridor and reach 88 percent on-time performance. Top speed of each train is not the relevant metric within the agreement; instead overall reliability and travel time are used as they provide the most benefit to passengers and garners additional political support. Public agencies will need to continue refining the shared-use agreement to accommodate BNSF while using the negotiation tactics discussed previously.

Canadian Border

Another problem that thus far has gone largely ignored is the rail line's portion that extends into Canada. As the only mega-region to cross an international border, effectively governing an increased level of service rail line requires involving and accommodating an additional number of stakeholders and complexities. As it currently stands, the trip from Seattle to Vancouver takes, on average, four hours with most of that time spent in British Columbia (Ferry 2008). This time delay is in large part explained by the freight congestion from the Port of Vancouver, one of the biggest ports in North America. The creation of a regional express service would certainly worsen congestion and possibly threaten to reduce political support of fully funding an improved passenger rail line from Seattle to Vancouver. Future plans to add a third track to this section may alleviate this congestion. Currently the funding situation for British Columbia is unclear. Regardless, an effective governance framework would require identifying key stakeholders within the province and gaining the necessary support for the express service's overall objectives.

A substantial roadblock to moving forward is procuring an international agreement with both countries' border security personnel. The Canada Border Services Agency has repeatedly frustrated B.C. officials with their lack of cooperation in expediting border crossing processes, most notably before the 2010 Winter Olympics (Ferry 2008). Both Canadian and U.S. border agencies will need to come to an official treaty that accommodates both countries' security requirements for passenger and freight rail, yet expedites the process to allow for significant time savings. The European Union offers an outstanding model for international border agreements. Other options can be found elsewhere across the U.S. – Canada border where the pre-approved NEXUS card gives frequent travelers the chance to swiftly cross into either country; expanding this program to the regional express service would likely save time and money for passengers and border agencies alike.

Frameworks

The keys to a successful governance framework for a regional, intercity express service are the combination of leadership, means, and authority (De Cerreño 2005). Leadership, primarily from prominent politicians and public officials, garners public awareness of the benefits of the rail project, from decreased airport and highway congestion to expanded tourism across the region. Public funding provides the capital necessary to construct, operate, and maintain public infrastructure and is an effective bargaining chip in negotiations with private firms. Authority gives the framework room to make big-impact decisions and the enforcement to see those decisions through to implementation. In the case of the Cascadia regional express service, two main governance options apply: the current multi jurisdictional leadership framework, and an inter-jurisdictional framework capable of managing and guiding the entire mega-region rail corridor's stakeholders and strategic objectives.

The current multi jurisdictional leadership framework is developing as the needs of the rail project arise. Thus far, WSDOT has acted as the lead agency, evidenced by their intent to improve the Amtrak Cascades rail service in the 2006 Long-Range Plan and the 2008 Mid-Range Plan. WSDOT is seen as an example of

top-down governance, organizing stakeholder involvement and developing different options for upgrading the Cascades rail line. ODOT's involvement has been less concrete, with much of their interest in improving passenger rail service driven by other stakeholders. Now, with the recent ARRA funding agreements to Washington and Oregon, USDOT may establish guidelines for all future stakeholder agreements, between public agencies and other vested parties such as freight companies.

The current governance framework has demonstrated the ability to improve passenger rail infrastructure and service, and therefore proven its political feasibility. With increased federal funding The state will likely accept a growing role for USDOT in rail corridor development.. Furthermore, with the security of federal funding, agencies and stakeholders like Amtrak will be more willing to invest their own resources. Institutions must be risk-averse, but the ARRA serves as a signal of intent that passenger rail service is a priority for the country and specifically for Cascadia. The framework does not, however, offer any certainty that funding will continue into the future. The Obama Administration's push for high speed rail has been met with criticism from some. With the 2012 election within sight, the corridor may not be able to expect federal funding if changes occur in the White House.

An alternative governance structure is an inter-jurisdictional framework that would supersede all federal, state, and local agencies and MPOs. This regional body could centralize all planning for the express service rail, thereby consolidating the corridor's objectives, problem-solve with the mega-region's economic and social prosperity in mind, and organizing stakeholders to efficiently accomplish the rail line's improvement (Ross 2008). Developing a regional governance framework would require a complete paradigm shift, with other MPOs relinquishing some of their power in order to make way for coherent policymaking for the entire mega-region. Doing so would unify the numerous fragmented policies and agendas of the region's various governance structures (Ross 2008). The framework would be better placed to receive and distribute future federal funds than state or local governments would, who continually compete with each other for those funds (Ross 2008). On the other hand, the problem of rivalry would not cease to exist as competition for funds among public organizations would presumably shift from lobbying federal agencies to within the political arena of the regional body.

Successful models of inter-jurisdictional governance and regional planning combine environmental protection, transportation, and land use policymaking to achieve region-wide objectives that are then conveyed for MPOs and local governments to carry out (Barbour 2001). In the case of Washington's Growth Management Act, the state government gives policy guidelines rather than prescribing specific strategies and allows county governments to implement the Act's objectives. Compliance is enforced through separate hearing boards that can apply sanctions from the state level (Barbour 2001). A Cascadia governance institution would need to follow models such as these to ensure accountability from the region's MPOs.

An inter-jurisdictional framework would certainly increase the level of service as all relevant stakeholders would be held accountable by the regional body. The regional institution would theoretically be attractive to potential federal funding and its big-picture planning capability would centralize the corridor's objectives and coordinate all levels of stakeholders and their interests. Politically, however, an inter-

jurisdictional framework is nearly impossible. MPOs are generally unwilling to relinquish power. Creating another level of governance is generally seen as inefficient as it places another layer of bureaucracy between the planning and implementation processes (De Cerreño 2005).

Funding

“...there is no amount of money that could build enough capacity on our highways and at airports to keep up with our expected population growth in coming decades.” (USDOT, 2011)

– Transportation Secretary Ray La Hood

Both capital costs and ongoing operating costs must be addressed in addressing the means for building and running a Regional Express service in the Cascades corridor. The sources of funding for both operations must be politically and fiscally stable. This section identifies some of the conflicts and policy changes that would enable or cripple Regional Express. When evaluating the costs and benefits of Regional Express, one should also consider the opportunity costs of planned investment in highway and airport projects.

Costs and Current Funding

In its Connecting Cascadia report, America 2050 estimates the cost of a rail service that completes Washington’s long-range plan and includes the capability of 110 mph service at \$6.5 billion (America 2050, 2011). In the time since their report was published, Washington State was selected to receive \$782 million in American Recovery and Reinvestment Act (ARRA) funds from the High Speed Intercity Passenger Rail program (WSDOT, 2011a). Oregon also received ARRA funds and used them to purchase two Talgo train sets (ODOT, 2011). WSDOT has reached multiple agreements with BNSF, FRA and other stakeholders on spending these funds. With the most recent agreement in February, 2011, WSDOT plans to complete 11 construction projects along the rail corridor using \$590 million in ARRA funds (WSDOT, 2011b). In addition to providing the governance framework, further contracts with all parties may help secure these funds and protect them from rescissions. While the Obama administration’s transportation plan dedicates an additional \$3 billion to high-speed rail, the House Republican plan would eliminate this program and rescind \$2 billion in ARRA funding for rail. Thus, the largest existing source of funding for accelerating the implementation of Regional Express service remains in jeopardy. Due to the uncertainty of funding from the federal government, state governments may need to identify and acquire additional funding.

Future funding mechanisms

In the last decade, the largest investments in passenger rail in the Cascade corridor federal ARRA funds and Washington’s “Nickel Package,” which consisted of a five-cent gas tax increase, as well as an increased sales tax on cars and weight fees. This package dedicated \$221 million to multimodal improve-

ments that include freight rail infrastructure and Amtrak Cascades (WSDOT, 2011c). As of today, WSDOT says it has spent \$331 million since 1994 on improving on-time performance and reducing travel times in this corridor (WSDOT, 2011a). However, declining gas tax revenues threaten these projects. Another major source of revenue could be a Vehicle Miles Traveled tax or system-wide tolling, at least in the Puget Sound Region.

Currently the states look to the federal government for capital funding for transit while generating operating revenue within the state. This may change if the Obama administration is able to pass its recommendations, which would tear down the firewall between capital and operating revenues (DC Streetsblog, 2011). The America 2050 report also suggests the possibility of value capture at stations, federal grants, public transit taxes, public rail districts, and national security funding as ways to augment funding for the corridor (America 2050, 2011). Rather than large investments from certain revenue sources, operating revenues could be cobbled together from small sources. WSDOT recently announced that some proceeds of lottery tickets sold on Amtrak Cascades will be used to fund operations (WSDOT, 2011d). However, these will likely not amount to the approximately \$6 billion that likely remains to be identified.

Both ODOT and WSDOT face statutory challenges in raising the large capital costs that would fund major rail improvements. Both states have limits on the gas tax that make it inflexible for modes other than the automobile, regardless of their stated policy positions. For instance in Washington, WSDOT must contend with a requirement in the 18th amendment to the state constitution to spend gas tax revenue only for “highway purposes.” The state has creatively named ferry routes as state highways to work within this law. Some transit funding comes from this since it can be justified for congestion reduction. But in the case of rail we might only expect to fund grade separations that benefit roadway users by reducing conflicts with rail traffic and allowing for free movement across the corridor.

Both states also face challenges by citizens’ initiative to transportation funding, and leaders who conservatively place funding options before the voters. While the “Nickel package” was voter-approved, Washingtonians have passed initiatives limiting license fees (the other main state source of transportation revenue) and requiring that all tax increases be passed with a two-thirds majority in the legislature. Thus any tax increase may require both a legislative supermajority and a voting majority for referenda.

Political viability of funding and funding options

Voters in the United States and the Pacific Northwest recognize the need for additional transportation investments and desire alternatives to driving, but their willingness to pay is unclear. In its 2010 Future of Transportation Survey, Transportation for America found that 58 percent of Americans believe that more federal funding should be allocated to transportation (Transportation for America, 2010). As traffic congestion was a major concern, the survey also asked respondents about how they felt the government should invest funds to alleviate congestion. 59 percent of respondents preferred investing in transportation choices rather than in widening roads (Transportation for America, 2010).

In the Pacific Northwest, the Puget Sound Regional Council commissioned a poll in conjunction with its Transportation 2040 plan. This poll concluded that providing alternatives to driving was PSRC residents' preferred way to reduce congestion, with expansion of transit ranking as their top priority (PSRC, 2009). However, the polling confirm qualified this finding by stating that this preference was not necessarily supported with the willingness to pay for those improvements. A VMT charge and gas tax increases were highly unpopular, while a vehicle emissions fee was found to be the most palatable option. No potential funding source measured in the poll received majority support (PSRC, 2009). Some existing revenue sources that could be used include a sales tax on gasoline or the gas tax tied to inflation, which would recognize the need to account for rising costs of projects.

Since either the voters or elected officials may inhibit passenger rail funding in the US, the real promise for funding Regional Express service lies in a paradigm shift among the region's residents and state and federal elected officials. The Obama administration's \$556 billion transportation plan would shift federal money towards highway system preservation and maintenance, consolidate 55 programs and gear them toward a multimodal transportation system. It would even change the name of the Highway Trust Fund to the Transportation Trust Fund (DC Streetsblog, 2011). In the current environment, tax increases to pay for this plan are unpopular even if citizens recognize the need for high-speed rail and other improvements.

If citizens become aware that US infrastructure must be upgraded, they may take into account the opportunity cost of various options. Secretary La Hood's quote above is instructive in that expanding the highway system and airports will at some point become impracticable. The current cost of flying Seattle to Portland is approximately \$140. Driving is becoming more expensive as gas prices rise. A major campaign to increase funding may succeed in the short term if it focuses on adapting familiar funding sources in ways that people understand – i.e., adjusting rates for inflation because rising costs are a familiar problem. But Regional Express and similar projects are only likely to be successful with a broader paradigm shift, which will come if citizens recognize the benefits of high-speed rail and other multimodal travel.

Summary

A successful Regional Express service hinges on agreement and sustained commitment from two states, two nations, two nations and two private railroads. We find that one likely governance challenge will be for governments to negotiate with the railroads for access to the right of way without an unreasonable request for compensation. In addition, the requirement of governments with different interests to work together raises the possibility that an inter-jurisdictional governing body could manage the rail corridor. Beyond the inconvenience of creating a new level of bureaucracy, elected officials would be unlikely to cede authority to such a body. Current agreements between affected states, the FRA and BNSF to spend ARRA funds can serve as a template for future agreements and secure a commitment to improved passenger rail service.

A Regional Express plan will depend on developments in federal transportation policy. The Obama administration intends to spend \$53 billion over six years on high speed rail, as well as make funding more flexible so that it can be used to cover operating as well as capital costs. This presents the greatest opportunity for acquiring the approximately \$6 billion needed for construction and operations. However, the majority Republicans in the House of Representatives would not only eliminate high-speed rail funding but rescind stimulus money promised for rail. If this were the case, more funding would be required than expected and Regional Express would likely be untenable.

At the state level, Washington has shown the greatest commitment to improving passenger rail service, but most sources for further revenue are unpopular or limited by law. The most promising revenue sources are increased license fees and smaller incremental funding sources that do not place a large burden on citizens who are not users of rail. However, all tax increases in Washington must pass by two thirds in the state legislature and in both states, large tax increases are likely to be challenged later by citizen initiative or placed up for referendum. Thus, popular support among Washington and Oregon voters is crucial for Regional Express service in the long-run. While increasing rail service is popular, rail advocates must address opposition to tax increases by presenting the benefits that a Regional Express can offer.

Economic Analysis

Overview

Looking at the overall economic benefits and costs when trying to make a decision about an infrastructure project of this magnitude is also important. In the previous section we discussed aspects of funding a project this size, in this section we discuss the economic benefits and costs of Regional Express Rail. Benefit-cost analysis is particularly important for public sector projects because it provides a specific indicator upon which to evaluate efficiency. Using a net present benefit calculation and benefit-cost ratio provides a clear indicator of the benefits received with the costs incurred. In this section we will describe the benefits and costs of a project this size and determine if this is an efficient use of public resources.

The WSDOT Long-range Plan provides a basis for the regional economic impacts which are incurred from investing in Regional Express Rail. The Long-range Plan includes all of the track and station improvements from Vancouver, BC to Portland, OR. It also provides information on benefits in terms of improvements, ridership, and travel times. The WSDOT Mid-range Plan provides some information on social benefits. We calculated the benefits to local economies, safety and environment, and congestion. As for the indirect economic benefits, a variety of sources were used to determine those benefits.

In terms of the assumptions we are using, many of them are from the Long-range Plan. In addition, we provide some of our own assumptions to adapt this plan to our vision of what economic impacts a regional express system would have. As previously noted, the regional express service analyzed here is not focused on providing a commuter-oriented service, but rather to make trips through the corridor more frequently and efficiently in order to attract infrequent business, tourist, and recreational travelers. For the economic analysis that we are conducting in this section, we are making the following assumptions:

- **Project Timeline:** The benefit and cost estimates for Regional Express Rail range from Fiscal Year 2010 to Fiscal Year 2030.
- **Discount Rate:** The plan includes inflation but does not include time preference of money – so we further discount future benefits and costs.
- **Conservative Estimates:** Our plan does not include several of the stops included in the Long-range Plan (thus, the Long-range Plan's costs may be slightly higher because it includes station improvements for these communities). Furthermore, because monetizing the social benefits of Regional Express Rail involves making various assumptions, when deciding about which values to include, we chose to use more conservative estimates when possible.
- **Benefit Cost Analysis:** Monetizes and evaluates direct economic and social benefits and costs, and evaluates but does not monetize indirect economic and social benefits.

Regional Express Railway Benefit-Cost Analysis

Using the assumptions outlined above, we conducted a comprehensive benefit-cost analysis of the Regional Express Rail plan. Benefit-Cost analysis techniques are used to determine the efficiency of a particular project, in terms of benefits to society per unit of cost. Because many of the benefits from a transportation project are social impacts, such as improvements to the environment, congestion relief, and increased accessibility, they are difficult to compare directly to dollar amount costs. Thus, traditional Benefit-Cost analysis uses various methods to monetize these social benefits so that they can be directly compared to the monetary costs of the project.

To effectively assign values to non-monetized benefits (such as a unit reduction in CO₂ emissions), many assumptions are required. Each time an assumption is made, risk is introduced into the analysis in the form of uncertainty. To address this uncertainty, after examining the benefits and costs of the Regional Express Rail project, we will present three scenarios: Conservative, Baseline, and Best-Case. In each, we will adjust the assumptions made in calculating both benefits and costs. Additionally, we will produce an uncertainty analysis, which will provide a probability distribution for different levels of net benefits, adjusting for levels of uncertainty in the assumptions.

Direct Regional Express Benefits

There are many social and economic benefits from a large-scale transportation project like Regional Express Rail. Direct economic benefits include farebox revenue, increases in tax revenue due to employment and business activity from project construction and operation, and savings to businesses attributed to a decrease in travel time for freight. However, there is also a myriad of social benefits, such as reduced congestion on Interstate-5 and arterial roadways, a reduction in greenhouse gases, travel time savings for leisure and business travelers, and an increase in accessibility for communities benefiting from regional express service. Various methods are widely used to monetize these social benefits so that they may be added to the economic benefits, and ultimately compared to the project costs.

The various benefits of Regional Express Rail included in this Benefit-Cost Analysis are as follows and will be discussed individually below:

• Revenues	• Environmental Benefits
• Employment & Business	• Congestion Relief
• Travel Time Savings	• Local Community Benefits
• Safety Improvements	• Freight Time Savings

Revenues: In its Long-range Plan, WSDOT forecasts an increase in farebox recovery from 45 percent in 2010 to 99 percent recovery in 2030. Based on forecasted annual ridership levels in 2030 of nearly 3 million riders, WSDOT predicts total revenues to equal approximately \$948 million (total annualized revenues in 2030 are forecasted at \$82.3 million).

Employment & Business: Undoubtedly, constructing and operating a Regional Express Rail system will bring significant numbers of new employment to the region, as well as increased business activity for firms directly involved in construction and operation. However, not all of this job creation and business activity can be counted as a net gain in benefits. For one, Amtrak already produces employment benefits, in the form of payroll taxes of its current employees. A new Regional Express Rail system should use these benefits as a baseline for determining net increase in employment revenues. Secondly, not all of the jobs created by the project will go to people who are currently unemployed. Thus, rather than new benefits, these signify a *transfer* of welfare – some people will switch from other, lower paying jobs to construction jobs, and thus we count only the net increase in tax revenue from this increase in wages. With these considerations in mind and using WSDOT’s forecasted employment benefits for the project, **we predict total employment and business benefits to be approximately \$2.2 billion.**

Travel Time Savings (Amtrak): By year 2030 and completion of the Regional Express project, WSDOT predicts an average travel time from Vancouver, BC to Portland of five hours and seven minutes (down from an average of 7 hours and 35 minutes in 2010). This will result in an average travel time savings of approximately 2.5 hours. Because WSDOT does not forecast the ridership rates to and from specific stations, we calculated an average savings in travel time from ridership at one hour.² Next, we calculated the monetized value of time. Traditional Benefit-Cost analysis uses the average regional wage rate as the opportunity cost of time saved (Forkenbrock and Weisbrod, 2001). Because business travelers will likely be otherwise working at this rate, we used the wage rate for the percentage of forecasted travelers who will be on business.³ However, for leisure travelers, most would not be receiving income for the time saved and thus using the wage rate would over-estimate the benefits. Instead, we used estimates of the opportunity cost of leisure time from Benefit-Cost research (60 percent) and calculated the **total value of time saved as \$670 million.**

Safety Improvements: It is well documented that rail travel is much safer, in terms of accident and injury rates, than automobile travel (WSDOT Long-Range Plan, 2006). WSDOT uses a sum of fatalities per million passenger miles and injury per million passenger miles to measure safety. While rail’s sum measure of safety is 0.06 fatalities and injuries per million passenger miles, highway travel’s sum is 0.78, for a rail to highway ratio of 8 percent. Because of the diversion from I-5 and arterial roads, Regional Express Rail will contribute to a reduction in the costs of accidents to both equipment repair and injuries from accidents. These figures are presented in WSDOT’s Mid-range Plan. Because significantly higher ridership is forecasted in the Long-range Plan, and thus higher diversion, we calculated the expected further reduction in accident costs under the Regional Express model. The **total monetized safety improvements** under these assumptions **is \$165 million.**

2 Because not all riders will save the total 2.5 hours from Vancouver BC to Portland, we used an average time savings of 1.0 hours (two thirds of the total time saved from Seattle to Portland) as a benchmark.

3 WSDOT forecasts the current rate of business travelers at 19 percent. This may increase as Regional Express Rail will likely increase this ratio because of higher frequency or trips and greater reliability.

Environmental Benefits: This benefit is derived from a reduction in greenhouse gas (GHG) emissions caused by a mode shift from automobiles and air travel due to the implementation of Regional Express Rail. We used environmental benefit estimates from the WSDOT Mid-range Plan, and adjusted for the higher mode shift expected from the regional express service, to calculate these benefits. Therefore, WSDOT estimates that this reduction will lead to indirect social **environmental benefits of \$406 million.**

Congestion Relief: Because Regional Express Rail is forecasted to cause significant mode shifts from I-5, arterials, and airline travel, the project will have an effect on travel times on these other modes, particularly in reducing congestion and delay. WSDOT has calculated a multiplier to use as the travel time savings due to modal shift; we use the wage rates calculated above to determine the approximate monetized travel time savings as \$1.9 billion. It is important to note, however, that due to decreased congestion and delays on these modes, overall demand may rise, particularly with population and regional growth. Many of the initial gains in travel speeds may be offset by the “triple convergence” from this demand (Downs, 2004). For instance, many people who currently avoid I-5 because of the congestion would opt to use it after Regional Express Rail is implemented. To keep our analysis conservative, we thus calculated only the congestion relief benefits for a percentage of the time saved.

Community Benefits: Regional Express Rail will undoubtedly have other impacts on local communities where stations are located. These impacts include benefits, such as local economic development, increased connectivity of goods and businesses, and enhanced accessibility to other core cities in the region. However, these impacts also include disbenefits, for example the negative impacts of construction and increased noise and safety impacts during operation. These impacts are extremely difficult to accurately monetize. Traditional Benefit-Cost analysis uses two methods to place a monetary value on these impacts: Contingency Valuation and Hedonic Property Pricing. Contingency Valuation involves surveying residents of the “impact area” to determine their willingness to pay for a benefit, and their willingness to accept an amount for experiencing a disbenefit. Because this would involve surveying and interviewing residents, we will not utilize this method for this analysis.

Alternatively, Hedonic Property Pricing determines the effect on property values that an amenity will have on a community, while controlling for other factors (Dively and Zerbe). A utility weight is thus calculated using a statistical regression and aggregated across the property values of all communities affected. Studies have shown that this utility weight for Intercity Rail is approximately 0.1. Thus, we determined the current property values of the communities receiving Regional Express service, and calculated the overall **increase in utility (social benefit) to communities to be \$548 million.** Because it is not clear from existing research when these benefits are likely to occur, we assumed that property values would not adjust and stabilize until later in the project, when most of the Regional Express Rail is operational. Thus, in our calculations these benefits are actualized in the final six years of the project.

Freight Savings: In reducing congestion on I-5, arterials, and in the air, Regional Express Rail will also have a beneficial impact on freight activity in the region. Because of this mode shift, freight will be able to operate more frequently and reliably, thus reducing the costs to businesses. This will spur additional

business activity and raise tax revenues. This is a direct economic impact from the project, and Benefit-Cost methodology notes that it should be included in any analysis. However, we were unable to find reliable and accurate information into the benefits to business from a specific reduction in freight delay, nor the travel time savings to freight from a Regional Express Rail system. Thus, to err on the side of conservatism, we excluded this from our analysis. However, these benefits should be considered by any policy-maker evaluating a regional rail system.

Benefit	Mid-point (Annual)	End Point (Annual)	Total
Revenues	\$36.5	\$82.3	\$948
Employment & Business	\$97	\$97	\$2,237
Travel Time Savings	\$28	\$60	\$670
Safety Improvements	\$5	\$10	\$165
Environmental Benefits	\$12	\$25	\$406
Congestion Relief	\$58	\$116	\$1,914
Community Benefits	\$0	\$137	\$598
TOTAL BENEFITS DISCOUNTED	\$238	\$529	\$6,939
	\$133	\$165	\$3,602

Table 02 - Mid-point, End-point, and Total Benefits (in millions)

Direct Regional Express Costs

The direct costs for Regional Express Rail can be divided into two broad categories, capital costs and operating costs. The WSDOT Long-range Plan represents capital costs as an investment in improvements to railroad infrastructure, facilities, and equipment (WSDOT Long-range Plan, 2006). The Long-range Plan is an incremental investment approach to creating a regional rail system. The plan reports on the capital costs for the collection of independent projects including station improvements, right of way appropriations, track construction, grade separation in rural areas, signalization improvements, and projected train car improvements and purchasing. British Columbia, Washington, and Oregon will undertake these projects with the largest portion occurring in Washington. It is also important to note that our analysis only evaluates certain segments of the regional express corridor which are primarily located in Washington, so the capital costs for Oregon are significantly less.

Operating costs are defined by the WSDOT Long-range Plan as a direct function of operating the regional express train annually. These costs include the labor, maintenance, insurance, marketing and sales, and general administrative costs (WSDOT Long-range Plan, 2006). It is important to note that some of these costs are offset by the revenue collected from operating the trains. The operating costs, like the capital

costs, are also broken down by state and province. Table 03 provides a direct project cost overview for British Columbia, Washington, and Oregon.

Costs	Mid-point (Annual)	End Point (Annual)	Total
WA Capital Costs	\$153	\$222	\$4,332
OR Capital Costs	\$6	\$33	\$460
BC Capital Costs	\$10	\$37	\$549
Misc Capital Costs	\$84	\$65	\$1,694
Operating Costs	\$48	\$83	\$1,185
TOTAL COSTS DISCOUNTED	\$300	\$440	\$8,221
	\$178	\$137	\$4,579

Table 03 - Mid-point, End-point, and Total Costs (in millions)

Benefit-Cost Analysis Scenarios

Because of the multitude of assumptions required to monetize the myriad of social benefits of Regional Express Rail, we next examined and compared three scenarios: the Baseline scenario forecasted by WSDOT; a conservative scenario, and a best-case scenario. Following this comparison, we conducted an uncertainty analysis to allow variability in several of the assumptions.

- **Baseline:** As presented above, the baseline scenario assumes that the parameters forecasted by WSDOT will occur as predicted and follows the assumptions outlined above regarding the social benefits of the project.
- **Worst-case:** In this scenario, we adjusted the inputs to reflect the benefits and costs of a case where ridership would be lower than forecasted (thus reduced farebox revenues), reduced mode shift from I-5 and airlines resulting in decreased safety, environmental, and congestion benefits, and cost overruns.
- **Best-case:** In the best-case scenario, we assumed that all costs remained constant (no overruns), but that ridership would be slightly higher than forecasted, resulting in increased farebox revenues and a higher rate of modal shift. This would lead to higher than forecasted benefits from congestion relief, safety improvements, and environmental benefits. Under this scenario, we also assume that many of the benefits would be realized earlier on in the project's lifetime. For instance, if gas prices rise significantly, modal shift is likely to occur at a higher rate, leading to more immediate benefits.

Scenario	Benefits	Costs	Net Benefits	BC Ratio
Baseline	\$3,602	\$4,579	(\$977)	.79
Worst-Case	\$3,069	\$4,989	(\$1,919)	.62
Best-case	\$4,767	\$4,579	\$187	1.04

Table 04. Benefit-Cost Ratio

These scenarios show that on a project of this magnitude and long-term range, there is high variability in outcomes. Appendix B further examines the impact of uncertainty, through a Monte Carlo uncertainty analysis.

Benefit-Cost Timeline

Another important aspect to consider is the timeline of benefits and costs. Our analysis shows that Regional Express Rail will become more beneficial in the later years of the project, particularly as capital costs begin to subside and the social benefits of mode shift and community accessibility are realized. Because of this misalignment of benefits and costs, it is possible that if the lifespan of the project were continued, total benefits would outweigh total costs (See Figure 02).

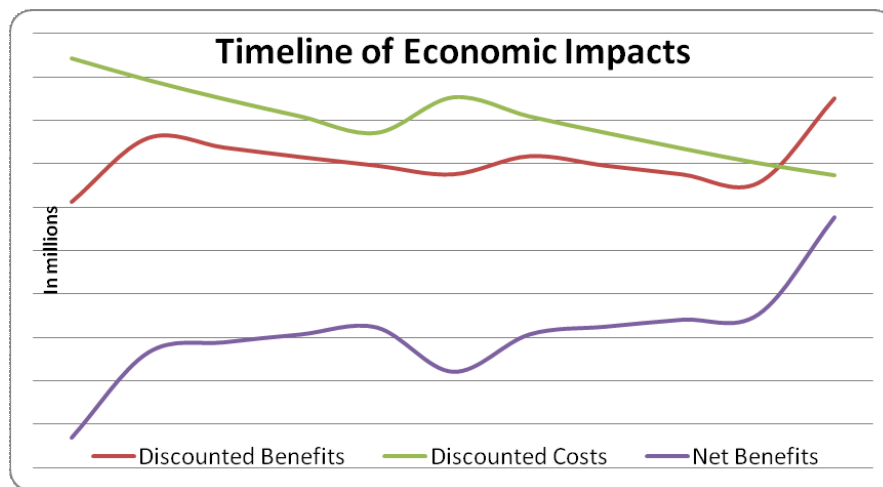


Figure 02. Timeline of Benefits, Costs, and Net Present Benefits

Indirect Economic Benefits

Regional Express Rail also provides a range of indirect economic benefits to the region. These benefits are not monetized because it is not possible to discern how much of the benefit is from the actual investment in this project. Instead these benefits are discussed as the likely impacts from an investment in an infrastructure investment of this scope. The following are the types of indirect benefits we would expect to see:

Tourism: Leaders of Washington and British Columbia have promoted the “Two-Nation Vacation” concept in order to draw more people to the region (America2050, 2010). The Cascadia mega-region boasts amenities for a variety of travelers. From vibrant urban centers to ample opportunities for outdoor exploration, Cascadia arguably has something for everyone. A Regional Express Rail system will provide a more efficient link between the three largest urban hubs allowing visitors to more easily enjoy all the region has to offer. Imagine arriving in Seattle from Portland for dinner and being able to easily go to Bellingham in the morning for some whale watching and then Vancouver for a late lunch and having the option of staying or returning to Seattle quickly and efficiently. The possibilities are endless and a faster, more efficient rail system will open up Cascadia in ways no one has imagined –the benefits from this tourism are difficult to accurately monetize for a Benefit-Cost analysis.

Regional Commerce: Three potential emerging clusters of economic growth predicted for the region are: “green building” design industry, creative industries, and high-tech. As it stands now the cities of Portland, Seattle, and Vancouver are not served very well with a regional transportation system. These emerging industries could benefit greatly from the disparate knowledge and expertise that exist in each city. However, as many of these emerging companies are start-ups travel in-between these cities on a regular basis by automobile or plane is prohibitively expensive. Regional Express Rail would provide an opportunity for business travelers to move through the corridor frequently and conveniently with less cost than via another mode. Regional Express Rail can link these urban centers making Cascadia a true mega-region capable of competing with other mega-regions both nationally and internationally.

Freight Savings: The Cascadia Regional economy also depends heavily on freight movement. Seattle and Vancouver both have large ports that receive goods from around the world. Much of these goods are placed on trains and taken to various locations throughout the US and Canada. Many of the proposed improvements in the WSDOT Long-Range Plan are track siding additions and improvements to Amtrak’s right of ways. These improvements will allow freight trains and passenger rail to more easily and efficiently operate on the shared tracks. Freight trains, it is argued, will not suffer under this plan but rather receive a boost in the speed and efficiency of delivering goods.

Modal Shift: Currently the predominate modes of travel between Portland, Seattle, and Vancouver are by automobile and airplane. According to Amtrak it takes about 3.5 hours by train from Seattle to Portland. In a car it takes between 2.5 to 3 hours and about 1 hour by plane. Even though traveling by automobile or airplane is on average faster, this is not always the case. Try traveling from Seattle to Portland during rush hour traffic and the trip could take upwards of five to six hours (personal experience). The SeaTac airport is the only large-scale international airport in Washington State and as population grows so will the need to use the airport. Regional transport will suffer as SeaTac struggles to provide for increasing demand and it is likely that delays will be more common as the airport becomes more congested. Regional Express Rail would provide the region with a travel option that is reliable, convenient, and fast. As the benefits of the Express Rail service become known, we expect more and more people will move away from current transportation modes.

Summary

As can be seen above, our analysis shows that using WSDOT projections, Regional Express Rail is not an efficient investment. However, because of the intangible economic impacts, the fact that we used conservative estimates for our analysis, and the rising trend of annual benefits, the actual net present benefits may be higher than those forecasted. Additionally, because a Regional Express Rail system enhances public value, it can be argued that indicators that do not take public value issues into consideration, such as efficiency, and should not be overly relied upon for public sector projects.

Land Use

While much of the report has thus far focused on the conceptual framework, policy, and financial aspects associated with regional express service, the focus is now directed to the tangible, physical impacts such a service could have. Land use is a particularly important related subject matter, as land use and transportation are intricately interwoven concepts. Evolutions in transportation technology, new infrastructure construction, and improved service delivery all have well-documented impacts on the land use surrounding these improvements (Hanson and Giuliano, 2004). Improved Amtrak Cascades service can also reasonably be expected to incur some degree of land use change, and this interaction in the context of proposed Regional Express service will be addressed here.

Land-Use Impact from New Line Construction

Because the proposed Regional Express service will operate within the same right-of-way as existing *Cascades* services, land use impacts directly related to new line construction will be relatively minimal. Miles of new line in the form of second tracks and sidings will be required to accommodate Regional Express service; the WSDOT Long-range Plan identifies each of the segments to be improved (WSDOT, 2006). As that plan's service is very similar to that being proposed here, its figures are used as analogous for the purpose of land use considerations. Staging and construction of these lines is expected to require the conversion of between 10 and 15 acres of adjacent, predominantly agricultural land in Clark, Cowlitz, Whatcom, and Snohomish counties (WSDOT, 2010). Both the Long-range Plan and 2010 Finding of No Significant Impact consider the resulting impacts to be "less than significant", but it remains a worthwhile point to note, particularly because of county and state regulations regarding the conversion of agricultural lands and wetlands.

Station Area Land Use Analysis

Given that increased development in station areas is often touted as one of the primary rationales for building rail services, we find that land use conditions and expectations are an important component of the Express Rail service. In this analysis we evaluated the likelihood that a Regional Express service would impact land uses and/or density in the areas immediately adjacent to the stations.

Much of the impact of new rail stations or increases in ridership at existing stations is realized in the increase in land values in the surrounding area. Research has shown that, on average, a commuter rail station will increase land values from 5 percent to 15 percent in a one quarter mile radius around the station.⁴

Another key finding was that the results are highly context- (type of service) and location-dependent. Those stations that created the largest time savings gains for riders also saw the largest increases in land

⁴ A recent meta-analysis by Debrezon et al. examines the published results of land use changes from train stations from 102 different studies around the world (Debrezon 2009).

value, following the bid-rent theory expounded by Alonso (1964). Their analysis of over 100 previous studies showed that very few studies have been conducted with regard to intercity and express train stations like those in many of the cities along our route (Seattle, Portland and Vancouver BC excluded). Most of this lack in research can be attributed to the fact that throughout the world most stations are dual purpose – they handle both commuter and regional express train traffic. What this means for our regional express is that it is difficult to disentangle the effects from commuter and regional express services in places like Seattle. As an example, in Seattle on a typical weekday five times more people arrive via the Sounder commuter train at the neighboring Union Station than do Amtrak passengers at King Street Station. What this means is that our express service will likely have lower impact on the land use than a new commuter station would.

The Debrezon study also highlighted the fact that impacts to land use and land values are location dependent. Looking at our eight express stations we can divide these into three clear locational categories: 1) Downtown; 2) Fringe; and 3) Suburban. The downtown stations include Seattle, Vancouver, BC, Portland and Eugene. Tacoma, Bellingham and Salem comprise the fringe located stations. Olympia’s station, on the other hand is located in the distant suburbs. We will now take an in-depth look at an example of one station from each of the three location types mentioned.

Downtown

Seattle’s King Street Station is a prime example of a downtown train station. As show in Figure 1, the land uses surrounding the station are composed of a good mix of uses focused on office and mixed use development (see Table 05). Connections to transit are abundant as the immediate area is serviced by Sounder Commuter Rail, Link Light Rail, and numerous local and express bus routes. The King Street Station also benefits from the immediate vicinity of Qwest and Safeco Fields, large stadium complexes which are used more than 100 days each year.



Figure 03 - Seattle Land Use Map

Improved Status	Parcel Count	%	Acreage	%
Vacant and Underimproved	72	34%	26.26	31%
Improved	141	66%	59.59	69%
Total Non-ROW Acreage	213		85.85	

By Land Use	Parcel Count	%	Acreage	%
Office/Mixed Use	57	27%	13.81	16%
Multi-Family Residential	40	19%	18.71	22%
Parking	38	18%	13.36	16%
Retail	37	17%	5.88	7%
Institutional	15	7%	20.50	24%
Vacant/Unknown	9	4%	2.21	3%
Industrial	5	2%	1.03	1%
Road	5	2%	3.63	4%
Park	4	2%	1.17	1%
Transit	3	1%	5.55	6%
Grand Total	213	100%	85.85	100%

Land Values	\$/Acre	\$/SF
Average	\$5,812,222	\$133
Median	\$6,969,276	\$160

Table 05 - Seattle Land Uses

The area around King Street station also has over 26 acres of underdeveloped or unimproved land that is suitable for redevelopment. Current land values in the area average around \$130 to \$160/sq ft. Though not necessarily driven by our regional express service, redevelopment in this area could reasonably be anticipated. An example of this is the large proposed mixed use development slated for construction at the north end of the Qwest Stadium lot.

Industrial

The current Amtrak station in Tacoma is located in an industrial location at the southeast fringe of the downtown/port area. The station is sandwiched between a large rail yard to the north and Interstate-5 to the south (Figure 2). It is located a half mile east of Freighthouse Square – the current location of the commuter train and light rail stops. Though there is a rumor that the Amtrak Station will be moving to Freighthouse Square there has been no official announcement of this change. The Tacoma station is located one mile from the much-used Tacoma Dome, however the walk between the two is not an ideal pedestrian environment.

Land uses in the vicinity of the Tacoma station are mostly industrial with a scattering of retail and transportation uses mixed in (See Table 3). Land values average around \$11 to \$12/sq ft.



Figure 04 - Tacoma Land Use Map

Improved Status	Parcel Count	%	Acreage	%
Vacant and Underimproved	42	44%	27.77	34%
Improved	53	56%	54.23	66%
Total Non-ROW Acreage	95		82.00	

By Land Use	Parcel Count	%	Acreage	%
Industrial	39	41%	26.98	33%
Retail	14	15%	3.59	4%
Vacant/Unknown	13	14%	4.19	5%
Transportation	12	13%	39.93	49%
Single Family Residential	8	8%	1.10	1%
Office/Mixed Use	3	3%	1.03	1%
Multiple Family Residential	3	3%	0.40	0%
Parking	2	2%	3.77	5%
Institutional	1	1%	1.01	1%
Grand Total	95	100%	82.00	100%

Land Values	\$/Acre	\$/SF
Average	\$543,803	\$12
Median	\$473,190	\$11

Table 06 - Tacoma Land Uses

Suburban Fringe

The Olympia Station is a somewhat an anomaly. Built by volunteers, it is located at the far edge of the Olympia-Lacey metropolitan region (see Figure 3). In fact, it is so far outside of the city that it is actually located outside of the Urban Growth Area – though only just across the street from it. The station is serviced by an hourly bus service that is a 45 minute ride to downtown Olympia. The land use is primarily single family residential with land value in the range of \$.90 to \$1.10 per acre.



Figure 05 - Olympia-Lacey Land Use Map

Improved Status	Parcel Count	%	Acreage	%
Vacant and Underimproved	19	7%	61.06	22%
Improved	238	93%	213.41	78%
Total Non-ROW	257		274.47	

By Land Use	Parcel Count	%	Acreage	%
Agriculture	9	4%	193.64	71%
Commercial - Neighborhood	1	0%	6.57	2%
Open Space	2	1%	29.17	11%
Residential - Low Density	85	33%	32.72	12%
Residential - High Density	158	61%	7.5	3%
Transportation	2	1%	4.87	2%
Grand Total	257.00		274.47	

Land Values	\$/Acre	\$/SF
Average	\$51,983.82	\$1.19
Median	\$39,700.00	\$0.91

Table 07 - Olympia-Lacey Land Uses

See Appendices C through E for land use maps of the Portland, Vancouver, and Bellingham station areas. Land use data could not be obtained for Eugene and Salem station areas within the timeframe of this report.

Summary

The expected land use impacts of a Regional Express Service are likely to be much less significant than the impacts of a busier commuter rail station. At stations where noticeable increases in foot traffic will occur, such as Seattle, Portland, and Vancouver BC, the Regional Express Service will augment the viability of commercial uses catering to occasional travelers; uses such as specialty retail and hotels. Near stations with lower expected ridership such as Tacoma, Olympia, and Salem, land use changes are expected to be minimal.

Redevelopment of Station Areas

It is often assumed that redevelopment will occur around infrastructure investments, such as transit stations. Often times infrastructure investments do spur new development or redevelopment, however this is not always the case. There are a number of elements that make making redevelopment around infrastructure investments feasible, one of the most important being market demand. However, one of the first measures of feasibility that can be determined is the financial feasibility.

Redevelopment only occurs if a developer is willing to pay a price for a property that a seller is willing to accept. The price a seller is willing to accept is assumed to be anything more than the current value they are getting from the property. The price a developer is willing to pay is assumed to be whatever they can afford after accounting for project costs and profit. The price a developer is willing to pay is also called residual land value.

A simple test of redevelopment feasibility is to compare current land value, or what a seller would be willing to sell their property for, and residual land value, or what a developer would be willing to pay for a property. If the current land value is greater than the residual land value, redevelopment will most likely not occur. If current land value is less than residual land value, redevelopment most likely will occur. Seattle and Tacoma will serve as the case studies for a redevelopment analysis around rail stations given the improvement of an express rail line using the above described methodology.

There are 215 parcels within a quarter mile radius of the current Seattle rail station. Most of these parcels are located in the International-District-Mixed (IDM) zoning. IDM zoning restricts all parcels to a 3.0 FAR, except for hotels which are allowed a 6.0 FAR. FAR is the Floor Area Ratio, or the square feet of building allowed as a ratio to the square feet of land. After valuing the development potential of the subject parcels at a 3.0 and 6.0 FAR, it is determined that 90 parcels would qualify for redevelopment based on the land value equation outlined above. Of these 90 parcels, the majority would likely be redeveloped as a hotel use, given the less restrictive zoning for hotel uses. About half of the parcels would

also qualify for retail redevelopment. These uses are complimentary to the expected users of the station. As the express rail is more geared towards infrequent visitors instead of resident commuters, hotel and retail uses would be best served around the station.

There are 95 parcels within a quarter-mile radius of the current Tacoma rail station. Tacoma recently up-zoned a large portion of this area, so the zoning is flexible around the station. Around the station, parcels are either zoned at a 6.0 FAR, which would be a mid-rise building, or 12.0 FAR, which would be a high-rise building. About half of the land area around the station is still zoned industrial, which provides no redevelopment potential. 61 parcels around the site qualify for redevelopment. Given the high zoning capacity, apartment, office, and hotel uses are equally viable around the station.

Summary

In total, there is redevelopment potential for 29.2 acres of land around the Seattle station and 14 acres around the Tacoma station. The likelihood of this redevelopment will depend on market dynamics, availability of financing, and the ultimate value lift of the station and rail improvements, which at this point in time can only be speculated.

Growth Management

The states of Washington and Oregon use statewide growth management laws seek to minimize the inefficient expansion of development by guiding land use development, and by ensuring public infrastructure is compatible and sufficient to meet agreed on development form and capacity. Because improved rail service would provide public infrastructure, and has the potential to effect land development around station areas, we evaluate whether or not the Express Rail service would support or conflict with the legislative growth management goals.

Washington

In Washington, the Growth Management Act, RCW 36.70A.010 was passed in 1990 followed by a second phase in 1991 which occurred in response to significant population growth in the state. The primary goal of this legislation was to provide the local governments land use planning tools to enable comprehensive, statewide coordination (League of Women Voters of Washington Education Fund 2006).

Within the GMA of Washington State there are 14 goals listed, these guide the plans and regulations for those required to or voluntarily plan using the GMA tools. The specific goals that pertain to a high speed rail project include:

- Goal (1) Urban growth;
- Goal (2) Reduce sprawl;
- Goal (3) Provide efficient transportation;

- Goal (10) Protect the environment; and,
- Goal (12) Ensure adequate public facilities and services.

Goal (1) may be supported by high speed rail through encouraging development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner. The urban growth boundaries that have been drawn for the areas around the Regional Express Rail stations may be supported through the ability to travel within this corridor, thereby attracting those who enjoy traveling and providing an incentive to live within those boundaries. Goal (2) is a highly contested point for various transportation goals due to the difficulty experienced in measuring the effects of transportation on urban sprawl. But, similar to Goal (1), the Express Rail stations can encourage more concentrated living for those who enjoy traveling north and south along the Cascadia Corridor. Goal (3) is supported by high speed rail through the development of an efficient multimodal transportation system. It is important that this system is based on regional priorities and coordinated with county and city comprehensive plans.

Goal (10) is supported by high speed rail if the efficiency and use of rail allows for the enhancement of the environment and quality of life, including air and water quality, and the availability of water. With proper installation, rail can be environmentally beneficial through a modal shift from autos and air to rail, in addition to potentially avoiding the need to expand the highway and airport infrastructure (Washington Department of Commerce 2011). Express Rail service would provide important public infrastructure as identified in Goal (12). However, current methods for assessing adequate transportation infrastructure are limited to local service areas, and often are auto focused. Therefore The Express Rail Service would likely not address local transportation concurrency requirements.

Oregon

In Oregon, the Department of Land Conservation and Development (DLCD) has developed 19 statewide planning goals to address land use planning. Most of these goals are accompanied by guidelines, but these are not mandatory steps to follow. Each city and county is required to adopt comprehensive plans which are consistent with the state's LCDC goals. The goals most pertinent to high speed rail include:

- Goal (2) Land use planning;
- Goal (6) Air, water, and land resources quality;
- Goal (12) Transportation; and,
- Goal (14) Urbanization.

Similar to the goals listed in the Washington GMA, linking transportation and land use planning is an important aspect to this high speed rail project. Goal (2) may be supported by high speed rail through the comprehensive planning the various land uses around station areas. As suggested in the section on Land Use, Stations may encourage retail and residential development under the right conditions. Goal

(6) may be supported through the reduction in pollution in the event that rail creates a modal shift away from autos and air travel, thereby reducing much of the air pollution currently produced as population increases. It was noted in the Cost-Benefit analysis, that a modal shift from automobiles and air travel will produce economic benefits through a reduction in environmental impacts.

Goal (12) is supported through instituting high speed rail by creating a multimodal transportation system. It also provides more transportation options and can create redundancy in the transportation system which allows the population to choose a preferred mode. Therefore, they are not being limited to relying on automobiles or planes to travel this corridor. Goal (14), which institutes urban growth boundaries, may or may not be supported by a Regional Express Rail service. High speed rail may allow for concentrated growth around station areas and reduce sprawl directly around urban centers, but this may encourage movement from one city station to another. So it could be considered “concentrated” sprawl along a line of transport (Oregon.gov 2010).

Summary

Express rail service is generally consistent with and supportive of growth management goals in the states of Washington and Oregon. The rail service provides mobility infrastructure and multi modal capacity, supports higher density development in urban environments, and reduces pollution generated per capita. However, the Express Rail service is not likely to assist Washington State communities in meeting transportations concurrency requirements, because concurrency requirements are focused on local service areas and the metrics are often auto focused. In addition, the increased time efficiency and service may support relocation of residents to station areas.

CONCLUSION

While the Amtrak Cascades service is attractive to existing riders, it has the potential to draw new groups of tourists, business travelers, and special event attendees throughout the length of the corridor. In addition, the train service could further brand the identity of the Cascadia region as a vacation destination. Travelers would be able to visit Oregon, Washington, and British Columbia by train and enhance the economic ties between cities in the region. While this service also has the potential to improve business connections in the region, it is expected that investments would be targeted towards visitors and infrequent travelers.

A Regional Express service on the Cascades corridor would reduce travel times and increase reliability of the service through a series of measures, including limiting the number of stops and increasing speeds on certain segments of the line. Based on 2010 station boardings, the six major stops on the corridor serve approximately 85 percent of existing riders. By eliminating the remaining ten stations, a Regional Express service could reduce the total travel time on the corridor by 50 to 70 minutes. In addition, while current service has a top speed of 79 mph, a Regional Express service has the potential to reach speeds close to 110 mph on significant portions of the corridor.

Summary of Criteria

- Political Feasibility – Because the Regional Express Rail would involve significant inter-jurisdictional planning, operations, and maintenance, it may be less politically feasible than “sensible rail” options. However, the governance framework currently under development would likely be feasible to implement. We also explored the possibility of developing an inter-jurisdictional framework. While this inter-jurisdictional framework would help Regional Express operate more efficiently, this framework is not politically feasible, as too many powerful stakeholders would be required to relinquish power.
- Ongoing and Adequate Funding - The Regional Express option will require nearly \$6 billion in investment of capital and operating costs beyond the improvements currently underway. Regional Express Rail project funding is tenuous and uncertain – federal funding delays might delay the project. Thus, the potential for sustained funding at adequate levels is relatively low. However, because Washington State has demonstrated a commitment to regional rail service, the potential to explore alternative funding streams in the future may increase the potential for adequate funding.
- Effectiveness – If implemented, the Regional Express Rail plan proposed by WSDOT would undoubtedly improve service in the Cascadia corridor. However, because it is ambitious in its forecasts of funding availability, construction schedules, and governance structure, it is likely that it would be delayed in reaching service targets. Thus, the Regional Express Rail is likely less effective than forecasted, but more effective at reaching system improvements than current sensible

rail options.

- Efficiency – The benefit-cost analysis revealed Regional Express to be a fairly inefficient investment. However, because of the conservative assumptions built into the analysis, and the other important economic considerations, as a public project investment, Regional Express Rail would likely be more efficient in comparison to other projects. Additionally, because Regional Express can be considered a public good, it can be argued that efficiency does not take these public value issues into consideration and should not be overly relied upon for public sector projects.
- Equity – Regional Express Rail does consider some important equity considerations. It would likely increase accessibility to communities receiving stations, produce positive economic impacts, and reduce dependence on car ownership. However, it is not clear how Regional Express Rail would positively affect accessibility-disadvantaged populations. Additionally, the plan might not address important equity considerations: because it is largely funded by the federal government, those who pay the funds through federal taxes may not reap the benefits. Additionally, those in the Eastern portion of the State who would benefit from funding to highways and cross-State accessibility would not benefit as much from Regional Express.
- Land conversion due to track construction – Our analysis found this likely to be minimal because most of the track fits into existing right of way. The construction of new track, despite operating within the same right-of-way, will require some land conversion for staging and construction purposes. Transportation infrastructure policies that incentive transit oriented development around station areas should be pursued...
- Station area land development - though it is uncertain precisely how intercity passenger rail impacts station-area development patterns, there is reason to believe that some development can be anticipated as a result of improved service. However, our analysis shows that the potential for transit-oriented development and high economic development growth rates in station areas may be minimal due to lack of private development demand and current zoning.
- Complies with GMA and LCDC – Our analysis shows that Regional Express would likely be consistent with broad GMA goals, but may not address specific concurrency requirements, particularly at the local level.

Appendices

Appendix A - Cascades Stakeholders

The following list is in no way exhaustive but offers a brief overview of some of the major players and vested parties required to upgrade the existing rail service:

Agencies

United States Department of Transportation (USDOT) – the federal agency responsible for overseeing the nation’s transportation systems and enhancing national interests and the life of American citizens through those systems (USDOT 2011a). In the case of the Cascadia Railway Corridor, USDOT has been charged with allocating American Recovery and Reinvestment Act (ARRA) funds for rail improvements.

Federal Railroad Administration (FRA) – an agency within USDOT, the FRA is primarily concerned with the safety of the nation’s railways and enforcing existing rail safety regulations. Currently, the Amtrak Cascades passenger service reaches speeds of up to 79 mph, the highest speed allowed for the railway under existing regulations and conditions. Increasing the speed of passenger rail service would require increased regulation and coordination with freight operators.

Washington Department of Transportation (WSDOT) – state agency whose mission statement is to “keep people and business moving” through the state’s transportation systems (USDOT 2011b). WSDOT has taken the initiative in incrementally developing the mega-region’s passenger rail service, in part due to the fact that the Cascadia rail corridor travels through the entirety of Washington State. As evidenced by both the Long-Range and Mid-Range plans, WSDOT has been planning for over a decade. Washington is slated to receive \$590 million in ARRA funds.

Oregon Department of Transportation (ODOT) – state agency responsible for the creation and operation of a safe and efficient transportation system. Currently, ODOT is in the midst of signing an agreement with WSDOT over the construction of a new Columbia River bridge. It remains to be seen whether the crossing will be utilized by rail. Oregon is expected to receive \$8 million in ARRA funds.

British Columbia Ministry of Transportation and Infrastructure – the agency responsible for managing the province’s transportation policies and projects. In 2009, British Columbia and Washington signed a framework agreement to improve cooperation on transportation initiatives including high speed rail (British Columbia 2009). But with the 2010 Winter Olympics in the rearview mirror, it is unclear how much effort and funding the province will contribute to improve the railway.

United States Customs and Border Protection – part of the Department of Homeland Security, U.S. Customs is charged with enforcing immigration and trade laws at international borders. An agreement will be needed with Canadian border officials if customs checks are to be expedited in the future.

Canada Border Services Agency (CBSA) – Canada’s border guards carry out customs checks on all entries into the

country on the Vancouver – Seattle rail stretch. The CBSA have and will impose significant costs on any additional rail service and remain a substantial roadblock in the way of streamlining passenger rail between the U.S. and Canada (Ferry 2008).

Rail Operators

Burlington Northern Santa Fe Railway Company (BNSF) – the owners of the existing track (and right of way) in Washington. BNSF is against any policy that will reduce capacity for freight, but with federal funding on its way, the company is willing to work with passenger rail to achieve both sides' aims. Regardless, BNSF will want to impress their strong bargaining position whenever possible.

Union Pacific – owners of the existing track in Oregon. Similarly to BNSF, Union Pacific opposes expansion of passenger rail service on their railway as it will lead to increased congestion and regulation from the FRA, cutting into their profit margin. According to the Association of American Railroads, BNSF and Union Pacific represent the nation's two largest freight rail companies, both in terms of miles of track operated and total revenue (The Economist 2010).

Amtrak – the national provider of passenger rail service in the United States. Amtrak stands to significantly gain from a faster and more reliable passenger rail service. The company is, however, already signed up to contribute funding for rail improvements (Long-Range plan)

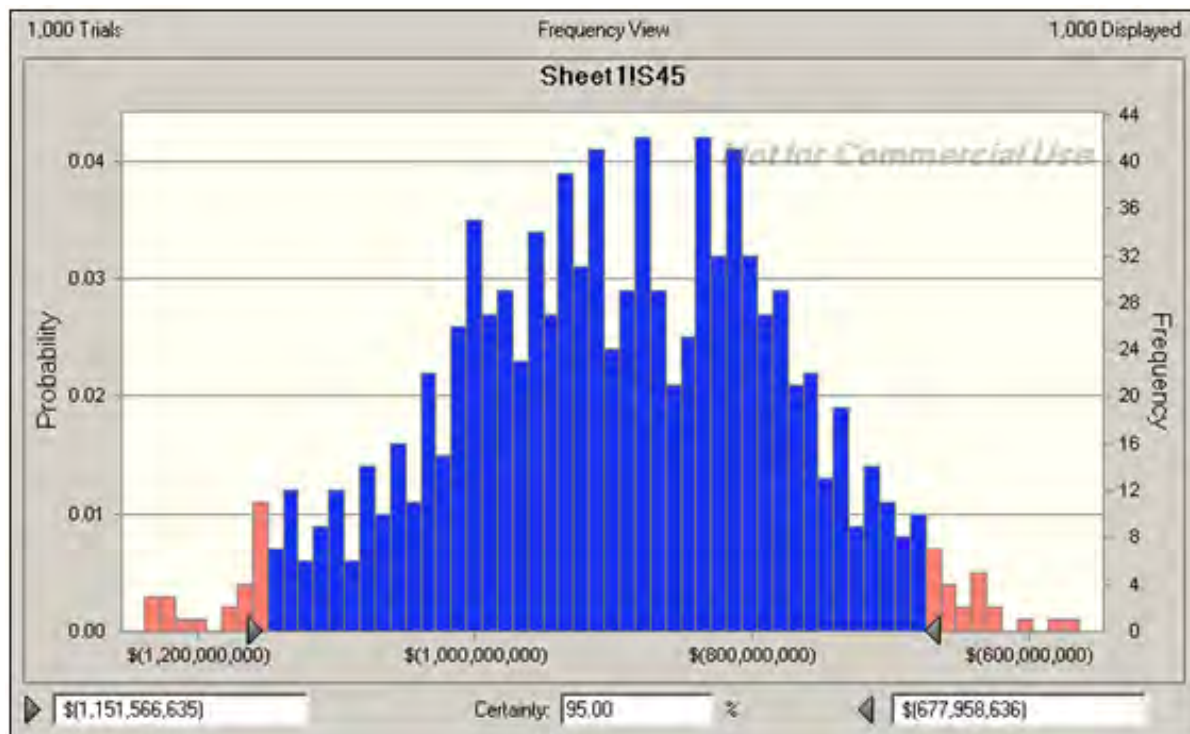
Municipal Government

Cities (Vancouver, Bellingham, Seattle, Tacoma, Olympia, Portland, Salem, Eugene) – each municipality has similar interests in maximizing the rail line for economic benefit and connection to each other. Differences exist in the manner that each city will make land use, transportation, and other policy decisions based on the improved rail service.

Appendix B – Monte Carlo Uncertainty Analysis

Rather than focusing on a single indicator of efficiency, such as Benefit-cost Ratio it is thus useful to examine several indicators and scenarios. To further examine the impact of uncertainty, we conducted a Monte Carlo uncertainty analysis. A Monte Carlo analysis samples from random assumption levels based on a set of defined probabilities and runs the project across 1,000 trials. In this analysis, we allowed the following variables to fluctuate based on a normal probability distribution: Discount Rate, Ridership Levels, Farebox Recovery Rate, Social Benefit Multipliers for Safety Improvements, Congestion Relief, and Environmental Benefits, and Hedonic Property Utility Weight.

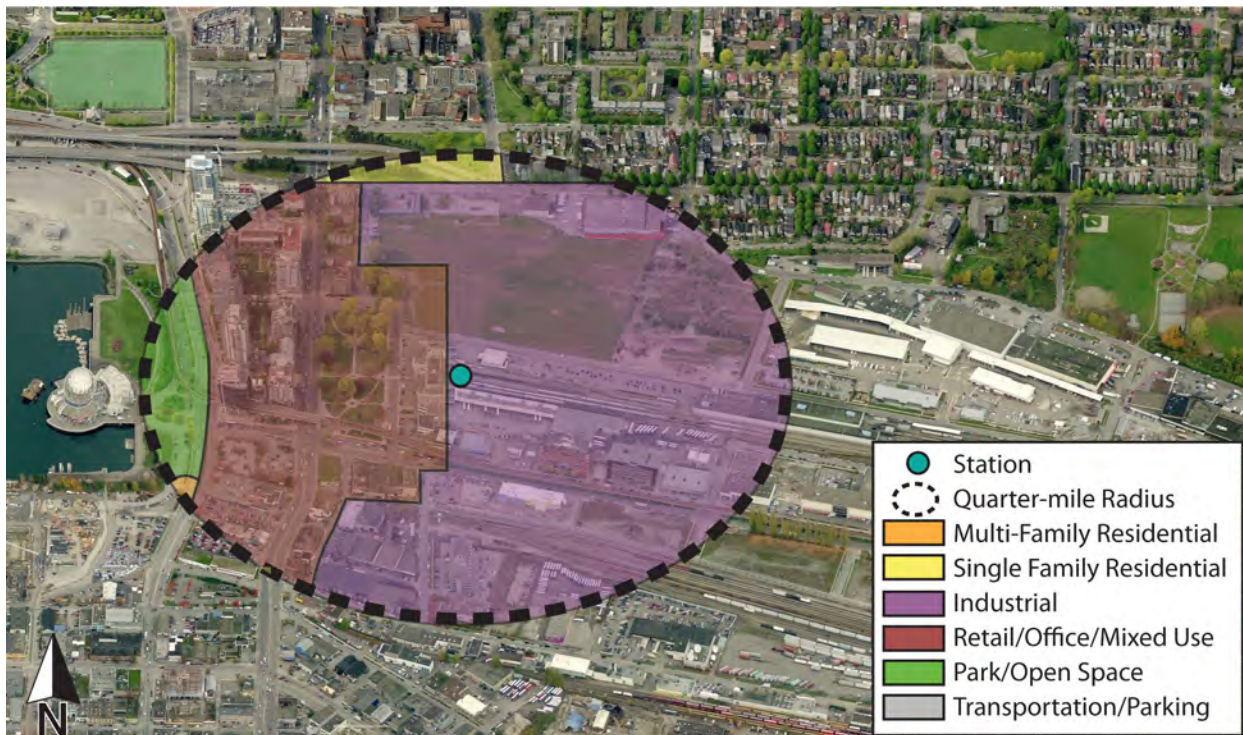
The Monte Carlo uncertainty analysis produced a distribution of net benefits. This distribution was calculated to be negative in all scenarios, denoting that even allowing for wide variability in assumptions, we can say with 99 percent confidence that net benefits will be negative (Please see graph below). Additionally, during 95 percent of the trial projects, the range of net benefits fell between (\$1.2) billion and (\$678) million. Thus, WSDOT should not expect positive net present benefits from implementation of Regional Express Rail, under these assumptions. However, as we will see below, there are many other economic and project considerations that should be understood to avoid making a decision about this project solely based on the economic bottom line.



Appendix C – Portland, OR Zoning Map



Appendix D – Vancouver, B.C. Zoning Map



Appendix E – Bellingham, WA Zoning Map



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Scenario 3: True High-Speed Rail in the Cascadia Region

High-Speed Rail in the Cascadia Region

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Executive Summary

The United States Federal Rail Administration (FRA) has implemented a plan to create regional High Speed Rail (HSR) systems throughout the nation, with the hope of connecting megaregions into a national rail network. This plan will run in phases in the hopes that local successes can be scaled into regional networks, which can then be connected to one another. After evaluating the potential for successful rail systems throughout the country, the Pacific Northwest (Cascadia Region) was chosen as one of 11 megaregions to receive funding for HSR in the second phase of the program.

This report analyzes the potential for HSR in the Cascadia Region as it relates to governance structures, economic vitality, growth management, and environmental impacts. Research shows that carefully connecting Portland, OR, Seattle, WA, and Vancouver, BC, can lay the foundation for regional interconnectivity that will provide long-term benefits that cannot be paralleled otherwise. Through such innovation as transit-oriented development, public-private partnerships, and a regional governance authority, the Cascadia Region can surely establish itself as a hub of collaboration and innovation whilst providing an efficient and dependable mode of environmentally-friendly transportation.

HSR: An Introduction

Before embarking on a major infrastructure investment like a national High Speed Rail (HSR) system it is necessary to have clear working definitions of such a project. This section will highlight both national and international definitions of HSR. This will establish a basis for the analysis conducted throughout this paper and limit alternatives that fall outside of the traditional boundaries of HSR.

The main defining characteristic for HSR is the speed at which the trains operate. The Federal Railroad Association (FRA) in the United States states the minimum speed to be considered HSR is 240 km/h (150mph)¹ while the International Union of Railways and European Union requires speeds of 250 km/h (155 mph) for new lines and up to 200 km/h (125 mph) for existing lines.² All of these organizations recognize there are many factors that may limit speeds, including geographic constraints, safety regulations, and local ordinances.

A second characteristic of HSR is that it operates on dedicated tracks and has a minimal number of at-grade crossings. The FRA definition goes a step further, requiring “Top speeds of at least 150 mph on completely grade-separated, dedicated rights-of-way (with the possible exception of some shared track in terminal areas).” Overhead electric lines typically power HSR; magnetic levitation (aka maglev) is under development in China and Japan, but these are by the far the minority. Since

¹ Vision for High Speed Rail in America. FRA. April 2009.

² “General definitions of highspeed.” International Union of Railways. March 12 2011.
<http://www.uic.org/spip.php?article971>

maglev trains cannot run on conventional rail tracks, they will not be considered for implementation in the Cascadia region.

Finally, according to the FRA, HSR occupies a very specific but important niche in a country's national transportation system. HSR is most efficient at connecting major metropolitan areas at distances between 200 and 600 miles. At shorter distances, an automobile or commuter rail is a more efficient means of transportation. Beyond 600 miles, airplanes are typically the mode of choice. Since there is very limited HSR in the United States currently, the introduction of HSR is intended to relieve highway and airline congestion in the mid-range.

The following sections provide a brief overview of some existing HSR systems around the world that provide insights into what HSR in the Cascadia Region could look like.

Japan (Shinkansen)

Japan has the distinction of opening the first HSR link between two major cities. The Tokaido Shinkansen, operating between Tokyo and Osaka, opened in October of 1964 and has been in operation since. Since that line opened, HSR has spread across Japan, as can be seen in the figure at right. Unlike many other HSR lines around the world, Japan's system is almost entirely linear with very few spokes running off the main line. This is due almost entirely to the geographic makeup of the islands of Japan.

Japan's HSR is operated by six different private entities. These private companies were formed in 1987 when the government-owned Japanese National Railways disbanded and distributed its assets and liabilities. The companies are organized under the label Japan Railways Group. Although the companies are independent, they share trains, which transfer from one company's route to another without interruption.

The Tokyo-Osaka line has been upgraded several times but the current rolling stock is capable of making the trip between the two cities in about 2 hours and 25 minutes at top speeds of 270 km/h (170 mph). One unique aspect of this link is that three different levels of service are operated along this route. Although High Speed trains operate all trips, smaller cities are served intermittently throughout the day, which



Figure 1. Japan's HSR System (Wikipedia)

increases the accessibility of towns along the route. This naturally increases the travel time between Tokyo and Osaka but demonstrates the possibility of operating different levels of HSR service on the same tracks.³

France (TGV)

Following Japan's success with HSR, France was the second country to operate a High Speed link between two cities. The first TGV (Train à Grande Vitesse) line opened between Paris and Lyon in September 1981. Since that first line, the French HSR system has expanded in a typical hub and spoke fashion that has become common in many countries, especially in Europe. There are currently nine lines in operation, three under construction and eleven planned.

Speeds on France's TGV currently reach maximum speeds of approximately 320 km/h (200 mph). The hub and spoke design allows TGV trains to connect to other major European cities which enables convenient transfers to other HSR systems around Europe. The system is operated by the French government's rail program, SNCF.

One unique aspect of HSR in Paris is that true high-speed service starts outside the city center. TGV trains don't reach high speeds until they are approximately 16 km (10 mi) away from the city center. This design was necessitated by lack of available real estate for track construction in downtown Paris. TGV trains operate on traditional tracks inside the city at traditional speeds and only achieve HSR service once outside the city on dedicated tracks specifically designed for HSR service.⁴



Figure 2. France's HSR System (Wikipedia)

China (CHR)

China, as a nation, has only recently undertaken HSR development but has quickly become a leading authority. There are several HSR links currently in operation and many more planned. The average speed of China's HSR is about 310 km/h (190 mph) with approximately 8,000 km of track providing service at these speeds. Another 2,000 km of track operate with top speeds around 350 km/h (220 mph).

China achieved these impressive results from the implementation of six government sponsored "Speed-Up" campaigns that began in 1997 with the most recent one

³ "About the Shinkansen." Central Japan Railway Company. March 1, 2011.

⁴ Trainweb. "TGV Basics." Accessed March 2, 2011

concluding in 2007. Though China does operate a maglev train, the majority of China's HSR rolling stock is electrically powered. The entire system is operated by China's Ministry of Railways.⁵

Northeast U.S. (Acela Express)

The United States has implemented HSR in the Northeast Corridor (NEC) of the country. The Acela Express service operates between Boston, MA and Washington, D.C. and opened in December 2000. While not true HSR service, it is the only attempt at HSR in the United States. Amtrak operates the service along the corridor using existing tracks with minor improvements.

With these improvements, trains can operate at maximum speeds of 240 km/h (150 mph) with average speeds closer to 130 km/h (80 mph). The purchase of rolling stock with greater tilting capability in turns is the greatest contribution to the speed improvements, however, this does not qualify as true HSR because the speeds are not fast enough and the trains operate on traditional track without dedicated rights-of-way.⁶



Figure 3. Northeast U.S. HSR System (Amtrak)

Northwest U.S. (Cascadia HSR)

After investigating HSR around the world, the first question that arises is whether the Cascadia mega-region can support a true HSR system. The graphic below compares the metro area populations in cities with HSR to the distance between HSR stations.

⁵ Xinzhen, Lan. "Riding the High Speed Rails." Beijing Review, May 27, 2010.

⁶ Vantuono, William C. "Amtrak's vision: Today, the Northeast. Tomorrow, America."

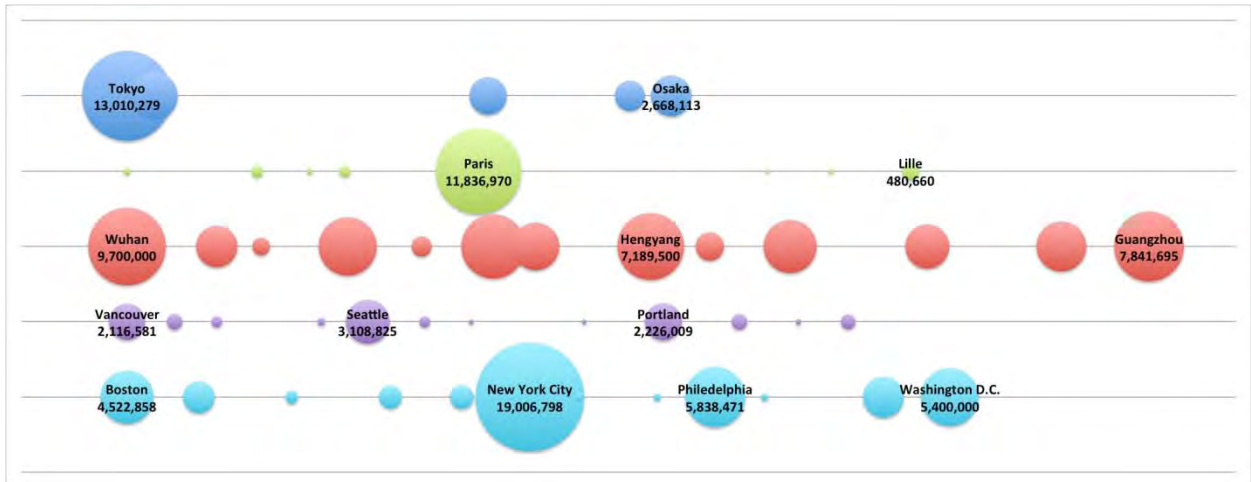


Figure 4. Comparison of HSR Systems around the World

Two conclusions can be drawn from the above graphic. First, based merely on the image above, there is definitely potential for HSR within the Northwest Corridor. The regional populations and distances between Vancouver B.C., Seattle, WA and Portland, OR are consistent with those along other HSR systems. On the negative side, the difficulties in connecting a Cascadia HSR system with the remainder of the United States are great, limiting the potential for connectivity to major population and economic centers.

The evidence presented in this paper will demonstrate that HSR is a viable option in the Cascadia region and should be pursued. When considering how HSR service would look, the following assumptions were developed, based on comparisons with HSR around the world and with input from research conducted by Portland University students:

- HSR will first run between Vancouver, Seattle, and Portland;
 - Potential expansion to smaller cities can imitate the Shinkansen;
- True HSR speeds will begin outside of the city centers much like the TGV; and
- The system will initially run at top speeds of approximately 320 km/h (200 mph) and will operate 12 runs every day between Seattle and Portland.

Governance

Amtrak Cascades Ownership & Management

Amtrak Cascades is managed in a disconnected manner: tracks are currently owned by the BNSF and Union Pacific railway companies while trains are owned separately by the states (2 by WA, 1 by OR) and Amtrak.⁷ The states and British Columbia each

⁷ WSDOT, "Amtrak Cascades Long Range Plan"

have separate operating contracts with Amtrak, which are renewed annually and specify:⁸

- Amtrak's responsibilities for providing high-quality Amtrak Cascades service;
- Each state's share of the operating losses incurred by the trains;
- The maximum amount each state pays Amtrak to run service; and
- The states' roles in Amtrak Cascades marketing efforts, fare structure, scheduling, food service, and other on-board service delivery

The multiple-contract approach creates a disconnected regional rail system that forces each partner to negotiate with one another on separate terms. Not only is this detrimental to the general functionality of Amtrak Cascades, it does not create the strong ties required for regional interdependence or coordinated infrastructure investment.

International Boundary

The Amtrak Cascades route operates over an international boundary, forcing all of the route's partners to undertake additional coordination of customs and travel policies. The Framework Agreement, signed in 2009 by WA State Governor Christine Gregoire and BC Premier Gordon Campbell, established a commitment between the two states that ensured each country would work to streamline the border crossing process and abstain from imposing fees on passengers and authorities⁹. This agreement led to the British Columbia-Washington State joint Transportation Executive Council, established in the Fall of 2010. The Council's role is "to facilitate co-operation on initiatives of mutual interest related to multi-modal regional transportation planning and coordination, and related bi-national transportation issues." What is most applicable, though, is that the first of the Council's four central goals is "developing and advancing a shared vision of high-speed passenger rail service"¹⁰.

One effective measure undertaken on the WA/BC boundary is the Swift Customs Facility, which briefly diverts goods moving across the boundary to improve the schedule reliability of Amtrak Cascades passenger trains (see Figure 5).¹¹ Construction started in 2006 and completed in 2009 for \$6 million.¹²



Figure 5: Swift Customs Facility (Source: WADOT)

⁸ Ibid.

⁹ Framework for Transportation, Competitiveness & Prosperity.

¹⁰ Province of British Columbia. Ministry of Transportation and Infrastructure. *B.C., Washington State Improve Cross-Border Travel*.

¹¹ WSDOT, WSDOT Projects - Rail, Rail - Blaine - Customs Facility Siding -, "Project Map"

¹² WSDOT, WSDOT Projects - Rail, "Rail - Blaine - Customs Facility Siding -"

Similar efforts must build on the relationships established in this endeavor.

Need for Regional Governance

The complex structure of rail ownership and operation, including international concerns, indicates that the success of HSR depends upon a cohesive governance strategy. The region should create the Northwest High-Speed Rail Authority (NWHSRA), akin to California's HSR Authority¹³, but building from the successes of partnerships throughout the Region.

The proposed authority, NWHSRA, should be an entity established and operated with cooperation between WA, OR, and BC, and be authorized through Joint Power Agreements, a contract between administrative bodies in which each partner lends its authoritative powers to the designated administrative body. For example, the Northwest Power and Conservation Council is a regional organization organized by Joint Power Agreements whose member states are ID, MT, OR, and WA.¹⁴ This council develops and maintains a regional power plan and a fish and wildlife program to collaboratively balance the Northwest's environment and energy needs.¹⁵

Additionally, current funding for Amtrak Cascades is unbalanced, with Washington State bearing the majority of the burden. While this may continue to be the case in the future, as the majority of the rail line lies in WA, this governing body should be based on equal stature and each state/province should fund the Authority proportionately.

Structure of NWHSRA

Based on the composition of California's HSR Authority, the NWHSRA should consist of an Executive Council, ad hoc working groups, and a full staff tasked with supporting the Authority's work. The Executive Council would be made up of the Washington and Oregon governors, the Premier of British Columbia, and the secretaries and minister of each Dept/Ministry of Transportation. The inclusion of executives and department heads will guarantee that the region's authority figures are present and capable of making decisions.

Working groups, created on an ad hoc basis to guide specific initiatives, would be subject to the direction of the Executive Council and consist of:

- 1 executive from each DOT, each major city's transit authority, and each MPO
- 1 representative from each major city's Chamber of Commerce
- 1 representative from every affected tribe through the corridor
- 5 advocates appointed by each major City Council

¹³ California High-Speed Rail Authority, "Report to the Legislature December 2009"

¹⁴ Northwest Power and Conservation Council, About US

¹⁵ Ibid.

The creation of a regional authority that is equally empowered and funded will lay the foundation for the level of regional collaboration necessary to fully realize the benefits HSR can bring to the Cascadia Region.

Shared Vision Process

The Cascadia Region is particularly experienced in community engagement techniques and has learned through decades of initiatives that shared visions not only inform regional decisions but also uncover and cultivate regional assets and priorities. Some successful programs that have proven these results include the Vancouver Livable Region Plan, Waterfront Seattle, and Portland's new Public Involvement Advisory Committee (PIAC).

In particular, Portland's PIAC has reported on seven guiding principles for effective public involvement: partnership, early involvement, relationship building and community capacity, inclusiveness and equity, good quality process design and implementation, transparency, and accountability. These principles intend to define expectations from city governments while retaining flexibility in the way individual bureaus carry out their work.¹⁶

To discover and solidify a shared vision, an initial working group will be appointed and tasked with facilitating a process intended to build a shared vision among elected officials, administrators, and citizens. The authority should create a process that is:

- Holistic & "bottom up" with interactive techniques to elicit ideation
- Supported by digestible data and visualization
- Transparent in addressing funding, levels of service, future stations, etc.
- Based locally in Portland, Seattle, and Vancouver
- Accessible to those who cannot attend (e.g. live-streaming, recording)
- Conducted in waves to build on input gathered in each principality

After the shared vision process, stakeholder communities must continue to be engaged in the process. Through public involvement, directed by each DOT in collaboration with the Authority's Council, working groups, and staff, stakeholder groups will have the ability to provide feedback and potentially participate in certain phases of the project. Besides the shared vision process, public involvement should occur prior to most major planning, construction, and operation phases.

Economic Benefits and Impacts

HSR has the potential to create substantial economic benefits throughout the Cascadia region. On a social level it can ensure safe and efficient transportation choice, contribute to economic development and redevelopment, reduce dependence on foreign fuel, lower carbon emissions, and support more

¹⁶ PIAC First Annual Progress Report, February 2010:

interconnected, livable communities.¹⁷ HSR in the Cascadia region can also increase mobility and reduce congestion in the I-5 corridor and at regional airports. Lastly, HSR supports tourism, one of Washington's top industries.¹⁸ The economic benefits and impacts of a HSR system in Cascadia are discussed below.

Job Creation

HSR Creates Temporary Construction Jobs

The Pacific Northwest Corridor HSR project, has the potential to create many short-term jobs. Based on jobs-per-mile estimates from California HSR studies, new short-term, full-time construction jobs over the course of building this project could range from 65,000¹⁹ to 240,000 jobs.²⁰ Most of the jobs would be created around the HSR stations and would generally include planning, engineering, and construction.²¹

HSR Creates Permanent Jobs

HSR operation is estimated to require at least 2,400 new positions, including:²²

- Train maintenance and overhaul, including system and electrical engineers and technicians and other high-tech positions
- Drivers, conductors and on-board service
- Management, administration, ticketing, and security
- Operations, control, and power management
- Track, ballast, power system, signaling/telecommunications, and structure maintenance

Additionally, based on jobs-per-mile estimates from California studies,²³ this project has the potential to create up to 180,000 permanent new full-time jobs. These include jobs that are created indirectly by population and economic growth over the next 20 years. Since HSR can reduce transportation costs and increase accessibility, the project has the potential to further induce population growth over this period.²⁴

Direct Mobility, Environmental, and Economic Benefits

Regional HSR can be an alternative to expanding freeway and airway networks. It has proven to be an effective transportation option around the world to reduce auto and airline traffic and integrate new geographic regions into the market.²⁵ For HSR, economic cost savings fall into four benefits categories: mode-shift, congestion reduction, air pollution reduction and accident reduction.

¹⁷ AAR (Association of American Rail Roads), "Freight and Passenger Rail: Finding the Right Balance."

¹⁸ WSDOT, "Amtrak Cascades Mid-Range Plan."

¹⁹ CHSRA, "California's Economic Stimulus."

²⁰ CHSRA, "The Big Picture."

²¹ Peterman, David, John Fritelli, and William Mallet, "High Speed Rail in the United States."

²² CHSRA, "The Big Picture."

²³ CHSRA, "California's Economic Stimulus."

²⁴ WSDOT, "Population Growth."

²⁵ Kantor, Shawn, "The Economic Impact of the California High-Speed Rail in the Sacramento/Central Valley Area."

Mode-shift benefits can take two forms²⁶. First, mode-shift benefits are savings that travelers receive simply by shifting their current travel mode to HSR. For example, a person who has been driving to Portland for business would save valuable time and reduce out-of-pocket expenses (i.e. gas, vehicle wear and tear, tolls, parking fees) even after the cost of a ticket. In addition, using HSR exposes the person to less safety risk than driving and enables the person to be more productive during the ride. The second form of mode-shift benefits is generated by providing efficient travel options to those whom otherwise might not have the means to travel.

Congestion-reduction benefits are defined as the social time savings that travelers experience due to both choosing HSR over other modes and the reduction in road or air traffic caused by some people shifting to HSR²⁷. Reducing congestion increases the efficiency of existing highways and reduces pressure to build new highways, relieving governments from spending billions in maintenance and construction.²⁸ However, while a number of travelers may change their travel modes, reduced highway congestion can attract new users²⁹. This is often called induced or latent demand, and should be considered when making transportation decisions.

Air pollution reduction benefits come from the reduced number of people driving and flying. This improves air quality because HSR trains in this region would likely use clean energy. These benefits are discussed further in the Environmental section.

Safety benefits occur because HSR is an extremely safe mode of travel. Around the world, HSR's safety record is extraordinarily high. Excepting the recent earthquake and tsunami in Japan, there has never been a fatal accident on either Japan or France's high-speed rail systems, despite carrying billions of passengers over the course of several decades.³⁰ Conversely, automobiles are the leading cause of death of people aged 1 to 24 years in the US.³¹ Automobile accidents result in 40,000 fatalities, 3.4 million injuries, and \$200 billion of damages annually in the US. A shift to HSR is therefore expected to save lives and reduce property damage.³² To realize this safety, HSR corridors must be sealed and must contain no at-grade crossings.³³ Table 1 shows the estimated value (\$160.1 million) for the benefits discussed above:

Type of Benefits	Mode-shift	Auto delay reduction	Accident reduction	Air pollution reduction	Air delay reduction	Total
Total	\$40	\$100	\$17	\$3	\$0.1	\$160.1

²⁶ *ibid*

²⁷ *ibid*

²⁸ AAR, "The Economic Impact of America's Freight Railroads."

²⁹ Downs, Anthony, "Still stuck in traffic: coping with peak-hour traffic congestion."

³⁰ OSPIRG, "A Track Record of Success: high-speed rail around the world and its promise for America."

³¹ Frumkin, Howard, "Injuries and Deaths from Traffic."

³² Kantor, Shawn, "The Economic Impact of the California High-Speed Rail in the Sacramento/Central Valley Area."

³³ AAR, "The Economic Impact of America's Freight Railroads."

Table 1: Estimated Direct Benefits of HSR in the Cascadia region (in millions of dollars), based on total direct benefits estimated for the California HSR project by Cambridge Systematics. Assuming that total benefits are directly based on total ridership, total direct benefits are \$160.1 million for HSR in the Cascadia region.

These are rough estimates, as there is not a simple linear relationship between direct benefits and number of riders. To assess benefits more accurately, an extensive study must be conducted to account for differences in the size and structure of the region. Still, this direct benefits analysis does give a general idea of the size of benefits that would accrue with HSR. In general, a state-of-the-art HSR system offers more reliability and better travel times, and would therefore attract more ridership and have more direct benefits than a slower system.

Opportunity for Building a Regional Utility Corridor

Constructing a new HSR corridor creates the opportunity to install an underground, high-voltage, direct-current electrical transmission line in the HSR right of way.³⁴ Sharing hydroelectric, and potentially wind-generated, power throughout the West Coast could help stabilize the regional power grid - doing so under HSR lines could minimize maintenance costs.³⁵ Providing this transmission line would also generate revenues for the HSR system, but revenue estimates are currently unavailable.³⁶

Increased Freight Capacity and Reliability

By moving most passenger trains off of the freight tracks the project would increase freight capacity and reliability.³⁷ Further benefits to freight would be realized through improvements to rights-of-way where freight would share tracks with HSR. In addition, freight could use the HSR tracks at night, when HSR is not running.³⁸ Timing and dispatching would be crucial, as the HSR trains would share tracks with freight in some cities, as is done in France, Germany, and other European countries. If increasing freight reliability and capacity results in making freight rail a more attractive alternative for shippers, this freight shift from roads to rail would lead to additional environmental, energy, and congestion relief benefits.³⁹

Induced Economic Development in Station Areas

The findings on whether or not HSR increases economic development are mixed. Albalade and Bel state that “It is consistently reported that HSR does not generate any new activities nor does it attract new firms and investment, but rather it helps to consolidate and promote on-going processes [and facilitates] intra-organizational journeys for those firms and institutions for whom mobility is essential.”⁴⁰

³⁴ GAO, “Issues Associated with High-Voltage Direct-Current Transmission Lines along Transportation Rights of Way.”

³⁵ Personal communication with Bruce Agnew, February 25, 2011.

³⁶ GAO, “Issues Associated with High-Voltage Direct-Current Transmission Lines along Transportation Rights of Way.”

³⁷ De Rus, Ginés and Gustavo Nombela, “Is Investment in High Speed Rail Socially Profitable?”

³⁸ OSPIRG, “A Track Record of Success: high-speed rail around the world and its promise for America.”

³⁹ Ibid

⁴⁰ Albalade, Daniel and Germà Bel, “High-Speed Rail: Lessons for Policy Makers from Experiences Abroad.”

Conversely, the Economic Development Research Group for the U.S. Conference of Mayors studied the economic impact of high-speed rail on four different urban regions and found many economic benefits.⁴¹ They found that HSR:

- Helps drive higher density, mixed use development at train stations
- Increases business productivity through travel efficiency gains
- Expands visitor markets and generates additional spending
- Broadens regional labor markets
- Supports the growth of technology clusters

Some transit-oriented development (TOD) in station areas is possible with appropriate station placement and careful planning.⁴² This development can provide jobs and services for people living in and traveling through the area. Station area development is discussed further in the Station Area Planning section.

HSR Increases Regional Tourism

Tourism is one of the first sectors to grow following the inauguration of a HSR line.⁴³ However, while the number of tourists in cities along the HSR network tends to increase, the number of overnight stays falls due to easier same-day travel.

HSR can also be more reliable than air travel. A volcanic eruption in Iceland disrupted global air traffic in the spring of 2010, but many travelers were able to get to their destinations in a timely way by HSR.⁴⁴ Virgin Trains reported carrying an extra 2,000 passengers between Glasgow and London. Other HSR systems reported similar ridership increases after planes were grounded due the volcano's activity.

While HSR has the potential to shift demand from other modes of transportation, the various modes of travel can work together to attract tourism to the region. For instance, the Victoria Clipper is marketing its "2 nation vacation", a package in which travelers from Seattle ride the Victoria Clipper to Victoria BC, take a BC ferry to Vancouver, and ride an Amtrak Cascades train back to Seattle.⁴⁵

Increases and Shifts in Business Travel

Currently, only about 19 percent of Amtrak Cascades customers are traveling for business, leaving much room for growth in this market segment.⁴⁶ HSR can provide a highly reliable service with limited delays.⁴⁷ Additionally, HSR can offer considerable advantages in terms of comfort, convenience, and productivity.

⁴¹ Development Research Group, "The Economic Impacts of High-Speed Rail on Cities and Their Metropolitan Areas."

⁴² OSPIRG, "A Track Record of Success: high-speed rail around the world and its promise for America."

⁴³ Albalade, Daniel and Germà Bel, "High-Speed Rail: Lessons for Policy Makers from Experiences Abroad."

⁴⁴ BBC News, "Icelandic volcanic ash disruption prompts rush to rail."

⁴⁵ Victoria Clipper, "2 Nation Tour: Seattle, Victoria and Vancouver"

⁴⁶ WSDOT, "Amtrak Cascades Mid-Range Plan."

⁴⁷ Albalade, Daniel and Germà Bel, "High-Speed Rail: Lessons for Policy Makers from Experiences Abroad."

Economic Impacts of HSR

Construction Costs

According to the California HSR Business Plan⁴⁸ and a report from the Congressional Research Service,⁴⁹ the cost-per-mile can vary from \$20 million up to \$85 million. At a per-mile cost of \$30 million, the entire 320 miles of the Cascadia HSR line would cost approximately \$9.6 billion.

Operational Costs

Yearly operational costs are estimated to be between \$0.8 and \$1 billion, based on a study of the HSR segment from San Francisco to Merced to Los Angeles in California.⁵⁰ In this comparison, the operational costs “...consist of train operations and equipment maintenance. Both of these are very labor intensive and depend highly on the number of trains and the operating schedule. Maintenance-of-way and replacement costs for infrastructure and train sets are included...These costs also include a variety of long-term costs, including advertising, reservations, station services and general support. Electric power consumption accounts for the remaining major component of operations and maintenance costs.”⁵¹

Other Impacts

These include loss of business during construction, traffic congestion and noise caused by construction activities, and energy use from construction. Impacts from operation of HSR not taken into account previously could include effects such as train noise affecting communities along the rail line, losses to airlines and businesses serving airline travelers, and losses to businesses serving auto travelers. For instance, a year after the inauguration of HSR in France and Spain, a third of their air traffic switched to rail, highly depleting the air-traffic economy.⁵²

There is also the opportunity cost of focusing on constructing and maintaining HSR. Resources could be spent on projects such as local light rail systems and social services improvements and would depend on the source and restrictions of funding. This may not be true for federal funding because funds not spent on HSR in this region could potentially go to other regions. David Levinson acknowledges the opportunity costs of HSR in his recent paper, stating that opportunity costs are seldom mentioned in economic analyses of HSR.⁵³

Equity Implications of HSR

From an income perspective, the HSR project is not vertically or horizontally equitable. Horizontal equity considers the potential for each alternative to treat

⁴⁸ CHSRA, “Business Plan 2008.”

⁴⁹ Peterman, David, John Fritelli, and William Mallet, “High Speed Rail in the United States.”

⁵⁰ CHSRA, “Business Plan 2008.”

⁵¹ Ibid

⁵² Albalade, Daniel and Germà Bel, “High-Speed Rail: Lessons for Policy Makers from Experiences Abroad.”

⁵³ Levinson, David, “Economic Development Impacts of High-speed rail.”

different groups of people equally.⁵⁴ Vertical equity considers the effects on people who differ in needs and abilities, including income. Moderate to higher-income earners will likely travel more on HSR than low-income earners whom are less able to afford to long distance travel. The taxes Low-income earners would likely pay to fund HSR may be disproportionate to the low level of benefits they receive. On the other hand, job seekers can benefit from the employment opportunities created by HSR, and these jobs could help lower-income earners.

Large Subsidies in the Short-Term

At currently estimated ridership, operational costs are much higher than revenues. Consequently, the system will need a subsidy in the short-term. Ridership was estimated using demand elasticity for intercity passenger rails that was taken from studies by Steven A. Morrison and Clifford Winston.⁵⁵ In that study elasticities for cost and travel time were on average -0.8 and 1.6 respectively. The ridership for Fiscal Year 2023, according to the Amtrak Long-Range plan, is estimated to be 3 million riders (based on 110 MPH trains)⁵⁶. Assuming Cascadia HSR will reach 200 mph and the cost of a one-way trip is 80% of the average cost of airfare from Seattle to Portland, ridership would be around 5 million passengers and revenues could amount to \$600 million. Table 2 below helps illustrate these differences:

Table 2: Estimated ridership (one-way trips) for Cascadia Corridor Rail Alternatives, FY 2023.

Corridor	Ridership on 110 MPH	Ridership on 200 mph
Seattle to Vancouver, BC	945,700	1,532,980
Seattle to Portland	1,916,400	3,106,484
Portland to Vancouver, BC	133,200	215,917
Total*	2,995,300	4,855,381

*Calculations are based on a study of Chicago's project ridership in 110 and 200 MPH scenarios.

Assuming that the operation and maintenance costs will average \$900 million dollars, as assumed in the operational cost section, the gap between yearly fare box revenues and operational cost will be around \$300 million dollars. Other revenues that could cover at least part of this gap are advertising and retail sales on trains and at stations, as well as utility corridor rental. Although it is difficult to estimate these revenues, they would not likely exceed \$200 million per year, so a subsidy of at least \$100 million would be needed each year under this scenario. Assuming the same ticket price, the ridership needed to close a \$100 million gap is approximately 1.1 million riders, or 6 million riders total. It should be noted that all of the calculations are estimates based on assumptions, including the elasticity of demand analysis.

Placing light rail in a region can increase growth and transit ridership, but only under the right conditions and policies, including the right structure and neighborhood design.⁵⁷ This implies that projecting accurate ridership is a much

⁵⁴ Litman, Todd, "Evaluating Transportation Equity."

⁵⁵ Morrison, Steven A. and Clifford Winston, "An Econometric Analysis of the Demand for Intercity Transportation."

⁵⁶ WSDOT, "Long-Range Plan for Amtrak Cascades."

⁵⁷ Handy, Susan, "Smart Growth and the Transportation-Land Use Connection: What Does the Research Tell Us?"

more complex calculation than the simple elasticity calculation provided above and it is obvious that further studies are needed. These estimates do, however, provide a rough, yet reasonable, picture of the costs and benefits of HSR and require decision makers to grapple with the question: Is it worth \$100 million per year (until ridership increases) plus the cost of construction to have a HSR system in Cascadia?

Financing High-Speed Rail

General financing strategies

In the practice of local government capital budgeting and finance, there are four types of tools that are commonly used to finance infrastructure projects: pay-as-you-go capital financing, debt financing, public-private partnerships (P3s), and outside capital financing.

Pay-as-you-go is a financing tool that typically funds small capital assets from the annual operating budget while placing major capital projects and acquisitions in the Capital Improvement Plan (CIP), securing debt and other capital financing for them.⁵⁸ This technique is most useful for small projects, as it places a large demand on immediate resources.

Debt financing is an approach to issue different types of bonds or debt to finance capital projects and acquisitions. Such debt is distinguished primarily in terms of pledged security. The most common types of bonds are general obligation (GO) bonds and revenue bonds.⁵⁹ The California HSR system will be heavily funded by the sale of GO bonds (\$9.95 billion).⁶⁰

P3s are usually in the form of a long-term lease of municipal assets. This type of lease, which can last up to 99 years, is governed by a concession agreement that can be tailored to meet the needs of public partners as well as the interests of private partners. One well-known example of P3s in the United States is the Chicago Skyway project. Cintra-Macquairie, a consortium of European investors, agreed to provide the city with a one-time cash payment of \$1.83 billion and assume responsibility for all operations and maintenance on the Skyway in exchange for the right to collect and manage tolls and concessions collected on the road until 2104.⁶¹ This contract also included specific methods and timeframes for initial toll raises.

Outside capital financing includes federal and other intergovernmental grants, as well as contributions from other local governments from interlocal arrangements. The most important federal funding sources dedicated to high-speed rail projects are those from the American Recovery and Reinvestment Act (ARRA).

⁵⁸ Marlowe, Justin and Rivenbark William C., *Capital Budgeting and Finance: A Guild for Local Governments* (Washington D.C., ICMA, 2004).

⁵⁹ Ibid.

⁶⁰ California High-Speed Rail Authority, "Report to the Legislature December 2009"

⁶¹ Skyway Concession Company, "History about the Skyway".

Major infrastructure projects like HSR require such substantial investments that they are seldom funded by one of the four tools alone. In practice, financing plans for HSR are usually a complex combination of these tools, varying by political, financial, and cultural factors of a country or region.

Challenges in Funding HSR

As a result of the 2008 financial crisis, equity fundraising for infrastructure projects has dropped significantly. Virtually all states are facing severe budget shortfalls. Combined U.S. state budget shortfalls exceed \$300 billion in both state fiscal years FY 2009 and FY 2010, and further deficits are anticipated in FY 2011 and FY 2012.⁶² While states are seeking ways to close these funding gaps, constitutional and legal constraints limit many states' abilities to borrow to fund their deficits. Usage of federal funding and certain taxes is also frequently restricted.⁶³ In other words, states' ability to use common funding tools to finance expensive infrastructure projects has been largely restricted.

The ongoing California HSR project is a good example in addressing these challenges. The total cost of the project is estimated to be \$42 billion. The project has received \$9.95 billion from state bonds and \$2.3 billion from federal HSR stimulus funds.⁶⁴ The project will also receive part of the federal funds that were rejected by the Wisconsin, Ohio and Florida corridors. However, these funds cannot solely finance the entire project. California Governor Arnold Schwarzenegger recently traveled to East Asia, appealing directly to Chinese and Japanese leaders for direct investment in the HSR project. The Cascadia Region will face similar funding issues.

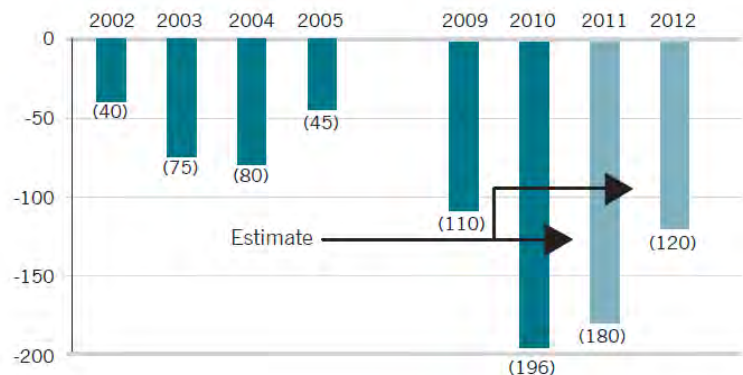


Figure 6: Total State Budget Shortfalls (in \$Billions, Per FY)¹

P3s— A Promising Approach for Funding HSR

Budget shortfalls around the country largely limit states' abilities to finance infrastructure projects using pay-as-you go financing, debt financing, and federal funding. Especially after the 2008 financial crisis, many local governments are turning to P3s to finance infrastructure projects. In fact, with the exception of Hong Kong, no HSR system in the world has been built with private or public means alone. Below are some examples:

⁶² Runde, James, J. Perry Offutt, Stacie D. Selinger, and Jennifer Sarah Bolton, "Infrastructure Public-Private Partnerships Re-Defined: An Increased Emphasis on "Partnerships.""

⁶³ Ibid.

⁶⁴ See note 3.

- Japan: Shinkansen system was funded by the joint effort of the Japan Railway Company (50%), National Government (35%) and local governments (15%).⁶⁵
- Trans-European: The total cost of these projects is estimated to be 400 billion ECU, and it was mostly financed with public resources until 2000. As budget constraints have become increasingly severe, private funds are playing a more important role in financing the HSR networks.⁶⁶
- Taiwan: The total project cost was approximately \$14.5 billion. Taiwan High Speed Rail Corporation, a consortium of private investors, provided \$11 billion in exchange for a concession period from 1998 to 2033. The remaining \$3.5 billion was funded by the Taiwan Government.⁶⁷
- China (Beijing—Shanghai Line): The 750-mile HSR costs about \$33 billion. It will be co-financed by the Ministry of Railway (through Railway Construction Funds and selling railway bonds) and Beijing Shanghai High Speed Rail Corporation which is a consortium of private investors.⁶⁸
- Hong Kong: Approved on January 16, 2010, this controversial project will connect Hong Kong to China's national high-speed rail networks. The 26-kilometer high-speed rail costs 6.69 billion HKD (i.e., approximately 0.86 billion USD) and it will be exclusively funded by the Hong Kong SAR Government through tax revenues.⁶⁹

Land-Use Planning in HSR

The increased accessibility and connectivity provided by HSR directly affects regional economic structures, land values, and spatial patterns. In order for HSR to result in desired changes, it is essential that local and regional governments plan for the effects of HSR on land use, both directly around the station, as well as at a regional scale.

Agglomeration Economies

Researchers theorize that HSR's ability to provide rapid intercity trips, under specific conditions for success, can unify regional labor markets to act as a single city.⁷⁰ These "co-cities" typically exist when travel times are less than one hour. While Vancouver, Seattle, and Portland may be too far to be effective co-cities, they can still benefit from coordinated, or clustered, economies and exchange

	Seattle	Portland
	7.56%	7.02%
Wholesale Trade	9.71%	11.83%
Retail Trade	5.57%	6.29%
Transportation and Warehousing	11.32%	12.29%
Information	3.98%	3.87%
Finance and Insurance	6.27%	2.82%
Real Estate Rental and Leasing	4.67%	5.04%
Professional, Scientific and Technical	Employment Sector	2.22%
Management of Companies and Enterprise	Construction	7.36%
Administration and Support	Manufacturing	3.31%
Educational Services	7.77%	6.55%
Health Care and Social Assistance	2.09%	3.46%
Art, Entertainment, Recreation	12.36%	12.59%
Accommodation and food Service	2.38%	1.46%
	8.98%	9.59%
Total Jobs	1,566,241	939,429

⁶⁵ Financial Affairs Division, Railway Bureau, Ministry of Land, Infrastructure and Transport, Japan, in discussion with the author, February 2011.

⁶⁶ Roll, Martin and Verbeke, Alain, "Financing of the Trans-European High-Speed Rail Networks: New Forms of Public-Private Partnerships", *European Management Journal* 16:6 (1998).

⁶⁷ Taiwan High Speed Rail Corporation, "About THSRC."

⁶⁸ Powell, Bill. "China's Amazing New Bullet Train."

⁶⁹ Ibid

⁷⁰ <http://www.cityofseattle.net/oir/datasheet/economy.htm>

industries. Some economic advantages of the Cascadia Region are its focus on the information technology sector, close proximity to the Pacific Ocean for foreign trade, availability of renewable energy, and many aligned interests.

Foreign Trade Hub

Cascadia's location gives it special advantages as a trans-Pacific shipment point between the U.S. mainland and Alaska, Japan, South Korea, Hong Kong, Taiwan, and other points around the Pacific. Today, Seattle's modern port facility handles approximately 1.75 million cargo containers a year.⁷¹ The northwest freight rail service, the Port of Tacoma, the Port of Seattle and the Seattle-Tacoma International Airport create a strong connection within the Seattle metropolitan region which strengthens the region's presence as a global economy. With strong employment in information technologies, biotech, tourism, agriculture, and the forest products industry, the Cascadia regional economy is very export-oriented.

Managing Sprawl

Suburbanization, the growth of the edges of the urbanized area at a rate faster than the already developed interior, has been a characteristic of metropolitan America since the advent of the automobile.⁷² A time-distance radius of approximately 45 minutes is regarded as the maximum commute time most are willing to travel. As transportation modes become more efficient yielding faster travel, it creates opportunity for further suburbanization or "sprawl". There is a legitimate concern that HSR could create sprawl by offering faster commute times at farther distances.

Though HSR has never been demonstrated as capable of creating regional growth on its own, it has been demonstrated to increase economic integration between two mega-regions or between secondary cities and a primary city connected by HSR. It has also been shown that HSR can create population growth in the areas directly around stations, therefore station location is the primary factor determining whether HSR will contribute to sprawl. The TGV Sud Est from Paris to Lyon, and the surrounding Rhone-Alps region, was the first European HSR project beginning service in 1981, and included stops in suburban and rural locations.⁷³ The significant reduction in travel times between Paris and its outlying hinterland led to many greenfield developments. Small towns like Vendome experienced rapidly rising property values and have become bedroom communities of Paris.⁷⁴

In contrast, HSR can discourage sprawl by strengthening economic vitality of urban centers. Locating HSR stations in city centers as opposed to outlying areas will concentrate regional activities near stations. Limiting free parking will make driving

⁷¹ http://www.amlife.us/seattle/economic_trends.html

⁷² Susan Hanson and Genevieve Giuliano (2004). Spatial Evolution of the American Metropolis. The Geography of Urban Transportation Third Edition pg. 61

⁷³ San Jose University, High Speed Rail's Effect on Population Distribution in Secondary Urban Areas, An Analysis of the French Urban Areas and Implications for the California Central Valley. Pg. 7

⁷⁴ Brian D. Sands 1993. "The Development Effects of High-Speed Rail Stations and Implications for California." University of California Transportation Center, No. 115. Pg 27.

to stations from outlying areas more difficult and encourage public transit usage and denser development patterns. HSR services have been an integral part of several successful city regeneration efforts. The Lyon Part-Dieu station in France resulted in demand for new office space and hotels in the decades after TGV service began extending the center. The German Intercity Express (ICE) HSR only serves primary cities, with lower speed rail connects the system to regional cities. It has been linked to increased retail service, hotel, residential, and office space, in the areas around stations, and has attracted high-tech industries that benefit from HSR to cities with ICE service.⁷⁵

Station and Alignment Selection

The Amtrak Cascades currently has 17 stops between Vancouver, BC, and Eugene, OR, that are located on the existing freight tracks. It is infeasible and impractical to

Station City	City Population	Metro Population (MSA)
Vancouver, BC	628,621	2,318,526
Bellingham, WA	76,130	200,434
Mount Vernon, WA	30,800	119,534
Stanwood, WA	5,590	--
Everett, WA	103,500	3,407,848
Edmonds, WA	40,900	3,407,848
Seattle, WA	602,000	3,407,848
Tukwila, WA	8,170	3,407,848
Tacoma, WA	203,400	3,407,848
Olympia/Lacey, WA	45,250	250,979
Centralia, WA	15,570	74,741
Kelso/Longview, WA	145,441	101,966
Vancouver, WA	164,500	2,241,841
Portland, OR	582,130	2,241,841
Oregon City, OR	30,710	2,241,841
Salem, OR	156,955	396,103
Albany, OR	49,165	116,584
Eugene, OR 1	57,100	351,109

Fig 8: Population in Cascadia. Source: www.census.gov

include all of these stations on a HSR line. Only three cities on this line have the population and economic base to support a true HSR system: Vancouver, BC, Seattle, WA, and Portland, OR. Initially these should be the only stops on the new HSR track, though it may be justifiable later to integrate regional cities like Bellingham and Tacoma with partial service, like smaller cities on Japan's Shinkansen line. Tacoma's relatively large population and potential connectivity to the Olympic Peninsula and Military Bases make it

a potential addition, but its proximity to Seattle would reduce travel speeds.

Despite the difficulties imposed by the international border, Vancouver, BC is crucial to the viability of HSR in the Cascadian Corridor. Vancouver is the third largest metro area in Canada, and is one of the three major population and economic hubs of Cascadia. Employment and economy is heavily influenced by the international trade, and the port has a total employment impact of 69,200 jobs. As discussed in the economic benefits section, relieving passenger rail from existing rail tracks will improve capacity for freight, and linking these major west coast ports can encourage increased trade.

Tourism may be the single biggest driver of usage initially. In the 1.5 to 2.5 hour travel market, HSR very successfully competes for business and leisure travel against both autos and airplanes. Trip times of 2.5 hours or less allow for same day

⁷⁵ James A. Dunn and Anthony Perl. 1994. "Policy Networks and Industrial Revitalization: High Speed Rail Initiatives in France and Germany."

business travel between cities which would otherwise be impractical, and HSR will take trips between Seattle and Vancouver or Portland under this threshold. The French cities of Lyon and Nantes and the Spanish city Seville are all regional cities that experienced high ridership growth after HSR brought them within the primary market time band of Paris or Madrid.⁷⁶ The destinations near high-speed rail stations will benefit the most from proximity to the station.

Any alignment that requires obtaining new ROW will be extremely expensive and would significantly negatively impact property owners. Portland State University made two strong recommendations for potential alignment: adding a designated third rail in the existing ROW or aligning the new track along the I-5 ROW.

Development Effects

Property values around stations are likely to rise while values between stations are unlikely to change much. Noise and visual impacts from the trains may negatively affect properties adjacent to the HSR line, as has been demonstrated in some areas in France.⁷⁷ HSR often attracts retail, service, and hospitality industries around stations, and can attract industry to region. The development incurred by HSR means cities will need to assess land use and zoning, particularly around station areas. Station Area Planning will be discussed in the next section.

Statewide growth management policies, like the Oregon Land Conservation and Development Act (1972), Washington Growth Management Act (1990) and British Columbia Growth Strategies Act (1998), will help limit any sprawl that may be incurred from HSR. These acts all require long range planning and interjurisdictional coordination. Furthermore, the transportation, development, and environmental impacts of HSR are consistent with the goals laid out by these plans.

Station Area Planning

There is little empirical evidence that the development of super fast train service is an effective community building endeavor that provides direct benefits to outlying cities. In fact, cities that are not destinations included in the web of regional connectivity that HSR creates do not overtly benefit from the construction of HSR. Rather, HSR networks seem to be most successful when stations are located in dense center city areas or regionally important cities, rather than suburbs or outlying airport centers.⁷⁸

⁷⁶ San Jose University, High Speed Rail's Effect on Population Distribution in Secondary Urban Areas, An Analysis of the French Urban Areas and Implications for the California Central Valley.

⁷⁷ Brian D. Sands 1993. "The Development Effects of High-Speed Rail Stations and Implications for California." Pg 27.

⁷⁸ USPIRG Foundation. "A Track Record of Success: high-speed rail around the world and its promise for America."

HSR Stations

The planning of HSR stations requires a commitment to urban quality during the development and growth of regional networks. As stated previously, fast trains can reduce driving trips and highway congestion between cities while also reducing demand at congested airports.⁷⁹ Locating stations in dense, central city areas already connected to existing services increases intermodal demand and ridership of public transportation.⁸⁰ The immediate urban fabric in these core HSR stations is rich enough in both proximity and density to absorb the increased demands of travelers. At the same time, careful station area planning is needed in order to maximize benefits from increased pedestrian traffic, higher demand for intermodal connections, and commercial opportunities aimed to capitalize on the demands of travelers in transit.⁸¹

For reasons stated above, the HSR Station Area Planning group proposes station locations (based on PSU students work⁸² and recommendations cited in the OSPIRG report)⁸³ in dense urban centers—Vancouver, BC (Waterfront/Canada Place), Seattle, WA (King Street Station), and Portland, OR (Union Station).

Urban Quality Considerations

Urban quality is primarily defined as people-oriented space that is human scaled and responds intelligently to its urban context, offering functional diversity, texture, comfort and protection. Research such as Jan Jacob Trip's analysis of urban quality in relation to HSR station area development indicates that "besides their importance as business locations and often residential areas, station areas are also entrances to the city, important public spaces, and act as meeting places."⁸⁴ Functional diversity at all hours results in an enlivened public realm after hours, which in turn leads to increased social diversity and pedestrian traffic, as well as safety and new business opportunities.⁸⁵

The next two sections focus on the opportunities of HSR station development in the two core cities of Seattle and Portland. Although the analysis is specific to King Street and Union Stations, the principles and core concepts are applicable to any successful HSR station.

⁷⁹ *ibid*

⁸⁰ *ibid*

⁸¹ USPIRG Foundation. "A Track Record of Success," 39-42.

⁸² Sadie Carney, April Cutter, Ryan Michie, David M. Ruelas, & Bridger Wineman. "Cascadia High Speed Rail Alignment and Operations." Powerpoint presented at Portland State University, Portland, Oregon, February 4, 2011.

⁸³ USPIRG Foundation. "A Track Record of Success," 39-42.

⁸⁴ Trip, Jan Jacob. "Urban Quality in High-speed Train Station Area Redevelopment: The Cases of Amsterdam Zuidas and Rotterdam Centraal." *Planning Practice and Research* Volume 23, Issue 3 (August 2008): pg 399. Accessed February 18, 2011. doi: 10.1080/02697450802423633.

⁸⁵ Trip, Jan Jacob. "Urban Quality in High-speed Train Station Area Redevelopment," pg. 387-389.

Seattle: King Street Station

Urban quality consultants Gehl Architects of Copenhagen promote similar goals as Jan Trip. Gehl Architects work directly with cities throughout the world to improve the physical environment for pedestrians and cyclists, promoting alternative forms of transportation



through an integrated design approach.⁸⁶ Employing a particular methodology to build the urban fabric, the architects promote protection, comfort, delight and proximity (as opposed to density).⁸⁷ Four guiding principles of that methodology are to assemble (not disperse), to integrate (not segregate), to open up (not close in), and finally to invite (not repel). Hired by the City of Seattle in 2009 to devise a public realm strategy, Gehl Architects provided a detailed public space analysis that includes recommendations, visioning, and specific goals for King Street Station, including:⁸⁸

- A well functioning, integrated transit hub: clear information and convenient connections
- Strong sense of place and a series of welcome spaces with strong identity
- Adjacent spaces with recreational qualities and commercial opportunities
- Emphasized pedestrian and bicycle links
- Improved legibility and wayfinding
- High quality materials and design to transform the spaces into places

Portland: Union Station

In a comparable yet less intensive effort, Portland's own Office of Sustainability and Planning outlined basic goals for Union Station and the surrounding urban context in the River District Design Guidelines (2008). The interventions outlined in the report reinforce the identity of the station area. Unfortunately, a thorough pedestrian analysis is lacking and subsequent goals are brief, promoting only the lighting and articulation of the Union Station clock tower and the development of multiple track crossings to visually connect areas and protect important views. The River District Design Guidelines fortunately outline specific design elements that should be used to buffer pedestrians from the railroad tracks, such as wrought iron fencing, low masonry walls with open railings and deciduous trees.⁸⁹ Meanwhile, a

⁸⁶ Gehl Architects. Accessed February 25, 2011. <http://www.gehlarchitects.com>

⁸⁷ Hermansen, Bianca. "How to build urban fabric." Gehl Architect powerpoint presented at the University of Washington, Landscape Urbanism Seminar, Fall 2010.

⁸⁸ Gehl Architects. City of Seattle Public Spaces Public Life Part I-II." City of Seattle Department of Planning and Development. Accessed February 22, 2011.

http://www.seattle.gov/dpd/Planning/Center_City/Projects/default.asp

⁸⁹ "River District Design Guidelines." City of Portland's Bureau of Sustainability and Planning. November 2008. Accessed February 22, 2011. <http://www.portlandonline.com/bps/index.cfm?c=52126&>

more thorough public space analysis and visioning for the area is needed to encourage functional and social diversity around the station area.

Window of Opportunity for Design

The primary takeaway from literature and design professionals is that urban quality of life depends upon the details of human-scaled public places with strong identities, strong connections to adjacent uses, and attractive spatial design elements (such as lighting, seating and trees) that engender positive experiences for diverse sets of people of all ages at all hours. Because HSR development requires a large initial capital investment to build track infrastructure and stations with appropriate connections for fast trains, station area planners have a rare opportunity to direct investment in support of urban quality. HSR and the resulting physical coordination of TOD, international airport terminals, and local access facilities contribute to agglomeration benefits in knowledge and service-based sectors. Station area *location* has the greatest impact on the success and failure of these potential benefits. Station area *design* has the greatest implications for urban core areas.

Environmental Impacts

The environmental implications of building a new train and right-of-way for high-speed rail in the Cascadia corridor vary in terms of benefits and costs. As a viable, affordable transportation alternative to automobiles or airplanes, high-speed rail can reduce greenhouse gas emissions that would otherwise come from automobiles or airplanes. However, high-speed rail also poses some concerns in terms of wildlife, habitats, and noise. Also, the environmental benefits of high-speed rail greatly depend on ridership, access from high-speed rail stations to other sustainable transportation modes, and electricity from clean, renewable energy sources. We evaluated the environmental impacts of high-speed rail in the Cascadia corridor by focusing on the following criteria:

- Energy efficiency and reducing greenhouse gas emissions
- Wildlife and ecological concerns
- Environmental justice

Clean, Renewable, Efficient Energy

Since high-speed rail trains are powered via electricity or magnetic levitation, renewable sources cleaner than diesel or gasoline, high-speed rail provides the region with an opportunity to wean itself off of fossil fuels. However, electricity generation is no cleaner than using an automobile or an airplane if the power source is not clean and renewable. Correspondingly, over 3/4 of Washington's electricity and nearly 2/3 of Oregon's energy comes from hydroelectric generation - a clean, renewable power source.⁹⁰ Approximately 78 percent of electricity in British Columbia comes from hydroelectric generation.⁹¹ Therefore, high-speed rail's

⁹⁰ U.S. Energy Information Administration. "U.S. States." <http://www.eia.doe.gov/state/>.

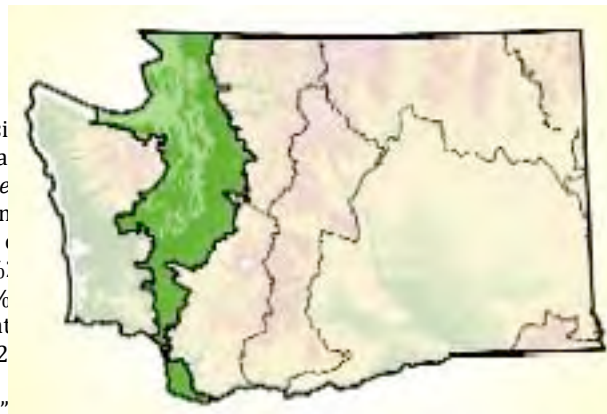
⁹¹ BC Hydro. "Generation System." http://www.bchydro.com/about/our_system/generation.html.

energy consumption in the Cascadia region would generate minimal pollution and decrease the smog and other air pollution.

In addition, carrying one passenger one mile on HSR uses less energy than automobile or air travel. In California, high-speed rail is expected to require only 1/3 of the energy required by an airplane trip and only 1/5 of the energy required by a commuter automobile trip.⁹² Japan's highly successful Shinkansen high-speed rail is even more energy efficient with the high-speed rail system consuming only 1/4 of the energy required by an airplane and only 1/6 of the energy required by an automobile.⁹³

As a comparison of the status quo train system in Cascadia, Great Britain's diesel-powered Hitachi Super Express train is similar to Amtrak Cascades (though Hitachi is a little faster) while the electrified Shinkansen 700 series train is closer to the proposed high-speed rail for Cascadia in terms of speed.⁹⁴ While the total energy consumption per seat for the Hitachi and the Shinkansen is similar, one major difference between the two trains' energy sources is that the diesel-powered Hitachi train produces a considerable amount of greenhouse gas emissions in contrast to the Shinkansen train.

High-speed rail also gives the Cascadia region an opportunity to reduce its reliance on expensive, polluting fossil fuels. While there will be an uptick in carbon emissions derived from construction of the high-speed rail infrastructure, once completed, high-speed rail will greatly reduce greenhouse gas emissions caused by the behavior change away from cars and airplanes. For a 240-mile trip, high-speed rail produces only 32.1 pounds of carbon dioxide compared to 157 pounds for cars and 133.7 pounds for airplanes.⁹⁵ Therefore, high-speed rail produces nearly five times less carbon dioxide than automobiles or airplanes. Similarly, the Shinkansen produces twelve times less carbon dioxide per seat than an airplane.⁹⁶ In addition to carbon emissions, petroleum fuels such as gasoline, diesel, and jet fuel "...produce a variety of other pollutants as a result of incomplete combustion and the oxidation of other components of air (especially nitrogen)."⁹⁷ These other pollutants lead to smog and can cause or exacerbate respiratory problems.



⁹² California High-Speed Rail Authority. "Project Vision." http://www.cahighspeedrail.ca.gov/project_vision.aspx

⁹³ Hiroki Matsumoto. *Shinkansen (Bullet Train) System*. Transportation and Infrastructure, Subcommittee on

⁹⁴ Network Rail. "Comparing environmental impact of high-speed rail." <http://www.networkrail.co.uk/documents/About%20the%20environmental%20impact%20of%20conventional%20railways.pdf>

⁹⁵ Glaeser, Edward L. "How Big Are the Environmental Benefits of High-Speed Rail?" *Environment* 41, no. 4 (August 2009). <http://economix.blogs.nytimes.com/2009/08/04/how-big-are-the-environmental-benefits-of-high-speed-rail/>

⁹⁶ Shinkansen: Modern Japan Line. "Environmental." <http://www.shinkansen.jp/en/environmental/>

⁹⁷ Hanson, Susan and Genevieve Giuliano. *The Geography of Urban Transportation*. (New York: The Guilford Press, 2004) 285.

Wildlife and Ecological Concerns

Cascadia corridor's proposed high-speed rail is located entirely within the Puget Trough and Willamette Valley ecoregions, ecological regions with distinct flora and fauna. The Puget Trough comprises much of Western Washington and lower British Columbia from Vancouver, British Columbia to Vancouver, Washington. Oregon's Willamette Valley spans Western Oregon from Portland to Eugene. Within these ecoregions, a variety of wildlife and ecology thrive and rely on specific resources.

Overall, HSR could have a slight negative impact on local wildlife and ecology.

Figure 9: Puget Trough Map
(Source: Washington Biodiversity Project)

However, HSR pollute far less than conventional trains, airplanes, and automobiles, so the natural environment will benefit from better air quality. Also, if precautions are taken, HSR authorities can mitigate potentially negative impacts with several courses of action such as ensuring habitat connectivity for Cascadia's wildlife and recognizing the delicate bionetworks (of plants and animals) in the region when determining where to construct the new right-of-way. Habitat connectivity refers to building physical linking structures for plants and wildlife in places where high-speed rail splits the habitat and therefore acts as a potential barrier preventing movement or pollination. For example, on Interstate-90 through Snoqualmie Pass in Washington State, several structures⁹⁸ permit animals to cross the highway protected from oncoming traffic.⁹⁹ Disrupting species' movements can lead to local extinctions or isolation of interdependent or related populations. Therefore, wildlife and ecology concerns must be taken into consideration when strategizing and constructing a high-speed rail right-of-way.

Environmental Justice

Building a new high-speed rail line through the Cascadia corridor may reduce and offset some of the environmental justice concerns created by the negative externalities from previous transportation projects. Unfortunately, much of the pollution or other negative externalities caused by transportation-related pollution often disproportionately affects low-income and minority communities living in urban centers with lower land values.¹⁰⁰

For example, despite widespread protests from local, predominantly low-income communities of color, planners in Los Angeles constructed Interstate-105 (I-105) connecting Los Angeles International Airport (LAX) with the Gateway Cities region. As a result, many locals blame the interstate's construction for "blighting entire communities".¹⁰¹ Additionally, the presence of a busy interstate adjacent to residential neighborhoods implies that those neighborhoods disproportionately

⁹⁸ Structures including underpasses, bridges, viaducts, and overpasses

⁹⁹ Singleton, Peter H. and John F. Lemkuhl. "I-90 Snoqualmie Pass Wildlife Habitat Linkage Assessment." U.S. Department of Agriculture, Forest Service: Pacific Northwest Research Station, Wenatchee Forestry Sciences Lab. Submitted to Washington State Department of Transportation: March 2000.

¹⁰⁰ Ibid, 332.

¹⁰¹ Ibid, 341.

suffer from the noise and air pollution of the interstate. Many of the drivers using I-105 to access LAX live further out in suburban neighborhoods and therefore are less affected by the pollution they cause by using I-105.

Throughout the Cascadia corridor, many of the freeways, primarily Interstate-5, go through or bisect low-income and minority communities in Seattle, Tacoma, and Portland. High-speed rail will likely decrease vehicle miles traveled, the number of automobiles on the road, and the number of automobile-related accidents or injuries in highway-adjacent communities. In addition, since high-speed rail stations will be located within urban centers, the influx of investment and new riders has the potential to revitalize, develop, and connect urban neighborhoods in the region. Rather than build more highways and as a result, disrupt, pollute, and degrade urban communities, creating a high-speed rail system could encourage more environmentally sustainable, transit-oriented development and promote the value of Cascadia's city centers.

A New Eco-Era

Adding high-speed rail to the Cascadia corridor builds upon the region's already robust canon of environmentally sustainable practices and infrastructure. Emphasizing this reputation as a sustainability leader could increase worldwide attention and show the region's commitment to quality of life.

Ernest Callenbach once referred to the Pacific Northwest as "Ecotopia" in a novel by the same name. However, while Callenbach's novel describes Ecotopia as an exclusionary utopia, building high-speed rail could eventually lead to new connections with other high-speed rail corridors in California and the Eastern United States. New connections could encourage economic development and create new urban centers. Maintaining this image of a sort of ecological paradise, the Cascadia corridor could resonate with outsiders and attract tourists and act as a model for other countries' and municipalities' planning and development principles.

Conclusion

There is great potential for HSR in the Cascadia Region and much can be learned from the lessons of other rail projects. In addition to rail infrastructure, though, regional stakeholders at all levels must take into account transit-oriented development initiatives, modern funding strategies, and inclusive governance structures. By connecting the region with efficient, dependable, environmentally sustainable, and growth-focused travel options, Cascadia can set itself apart in the United States and throughout the world as a hub for innovative and collaborative progress.

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