The Politics and Practice of Carbon Footprint Analysis in Seattle's Alaskan Way Viaduct Debate: Summary Report and Recommendations

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Abstract

In recent years cities have emerged as a central front in the fight against climate change. Transportation poses one of the most difficult challenges that cities face in their efforts to reduce local greenhouse gas emissions. Therefore scholars and practitioners are keenly interested in understanding how climate change mitigation policies are implemented in the context of contentious transportation infrastructure decisions. I examined this issued in the context of a protracted debate regarding how to replace Seattle's Alaskan Way Viaduct. Two questions motivated this case study. 1) How did activists appeal to state and local greenhouse gas reduction policies in their campaign to remove the viaduct and reduce driving through downtown Seattle? 2) How did state and local transportation departments implement these policies in the context of the viaduct replacement planning process? I found that activists succeeded in establishing climate change as a significant issue of concern in the viaduct debate. Paradoxically, this success was subsequently undermined by the state and local transportation planners' efforts to measure the "carbon footprint" of viaduct replacement alternatives. Through a critical analysis of the new carbon footprint assessment methodology I show how it served to reinforce the status-quo in transportation planning practice while undermining efforts to envision different futures. I argue that recognizing the possibility for future conditions that diverge from current trends is an essential element of successful climate change mitigation planning. I conclude with four recommendations regarding how to more effectively implement local and state greenhouse gas reduction policies in the context of contentious transportation infrastructure decisions: *Always evaluate transportation projects in the context of regional greenhouse gas reduction strategies*; *Consider multiple future scenarios in project-level greenhouse gas evaluations*; *Evaluate project lifecycle emissions*; and *Address automobile dependency through community impact mitigation*.

Introduction

Cities have recently emerged as a central front in the fight against global climate change. While federal and international climate policy negotiations have faltered, hundreds of cities across the U.S. have pledged to reduce greenhouse gas emissions in accordance with the Kyoto Protocol. One of the biggest challenges these cities face is transportation. However, to date there have been few case studies that examine how state and local departments of transportation (DOT) are adapting to implement new greenhouse gas reduction plans and policies. Such studies have the potential to shed light on the constraints (both real and perceived) that state and local DOTs face in their efforts to develop systems of planning that can effectively reduce greenhouse gas emissions from vehicular travel.

My dissertation examines this issue in Seattle, WA. As the birthplace of the U.S. Mayors Climate Protection Agreement, Seattle is often represented to be at the forefront of the movement to take "climate action" locally. Ambitious greenhouse gas reduction commitments are now in place at both the city and state level. In addition, the state legislature ordered the state DOT and major metropolitan planning organizations to develop regional strategies for reducing greenhouse gas emissions from transportation.

These policies all emerged during the course of a protracted debate regarding how to replace Seattle's Alaskan Way Viaduct—an elevated highway that runs along the city's downtown waterfront. The viaduct was damaged by an earthquake in 2001. State engineers determined the structure to be at risk of collapse in another quake. Nonetheless, over 100,000 vehicles continued to use the viaduct each day while elected officials debated two options for replacing the structure. The governor and key state legislators initially called for building a new elevated highway. Most political leaders in Seattle, including the mayor, favored a more costly tunneled highway for its promise to open views and revitalize the downtown waterfront. Finally, a small group of activists jumped into this fray by rejecting both of these options. Instead they promoted a "Streets and Transit" option that removes the highway and replaces it with surface street improvements, transit infrastructure, and waterfront environmental amenities.

I conducted an ethnographic case study of the viaduct debate to better understand how new climate change policies are negotiated and implemented in the context of a contentious transportation infrastructure decision. My study focused on two themes. First, I analyzed how Streets and Transit activists and supporters appealed to the new climate change policies as they promoted their vision for Seattle's transportation system. Second, I observed a 13-month stakeholder advisory process that included key Streets and Transit activists as well as business, labor, and neighborhood representatives. Here I examined the development and implementation of a new methodology for measuring the "carbon footprint" of proposed viaduct replacement alternatives.

This report begins with a summary of my case study findings. I then discuss the implications of these findings for local efforts to reduce transportation-related greenhouse gas emissions. Finally, I offer a set of recommendations for how to assess the potential greenhouse gas emissions of transportation projects. These recommendations are designed to support the important social and political process of re-imagining how urban life could be organized to function in a more carbon-constrained world.

Findings

Climate change emerged as a significant policy concern in the viaduct debate

I analyzed local news stories, government documentation, and activist literature between 2001 and 2009 to identify all references to "climate change", "global warming", and "greenhouse gas emissions". The issue of climate change was never mentioned during the early years of the viaduct debate (2001-2004). Likewise, when the Streets and Transit campaign launched in 2004, climate change was absent from their rhetoric. This began to change in 2005 after mayor Greg Nickels announced Seattle's commitment to reducing greenhouse gas emissions. Thereafter, Streets and Transit supporters began insisting that encouraging people to find alternatives to the automobile through the reduction in roadway capacity is essential to achieving Seattle's emission reduction goals.

This campaign to reduce vehicular capacity through the viaduct corridor directly contradicted the position of state and city elected officials. While these officials continued to debate what kind of highway should replace the viaduct, they were united by the belief that the vehicular capacity of the viaduct must be maintained or expanded with a new limited access highway. To do otherwise, they argued, would introduce gridlock and cripple the region's economy. This frightening vision[1] of a future stuck in traffic was faithfully and uncritically reproduced in the mainstream local news media.[2]

Streets and Transit activists worked to undermine this vision. They argued that people will readily find other ways to get around if more transportation choices are made available to them. Their campaign was initially rejected by both the mainstream media and elected officials as overly idealistic. However this knee-jerk rejection began to soften as the viaduct debate drew on and the issue of climate change rapidly grew in national prominence.

During 2006 it became clear that state and local elected officials were not going to agree on a viaduct replacement plan. At this time some local elected officials and the editorial staff of one daily newspaper began publically calling for the study of the Streets and Transit option.[3] Climate change was the most prominent theme that emerged in these statements of support. Furthermore, these statements did not merely call for assessing the greenhouse

gas emissions of proposed viaduct replacement options. Rather, they called for questioning the continued dominance of the automobile in our imagination of how people and goods can move through Seattle. In doing so, they also called into question the vision of inevitable gridlock that shaped the early viaduct debate.

By the end of 2006 local news stories regularly represented the "gridlock" storyline as contested. This is evidence of a significant shift in the policy debate. Such a shift was necessary for enabling the serious consideration of alternative solutions for moving people and freight through the viaduct corridor. The issue of climate change played an important (but far from exclusive) role in bringing about this shift.

The new approach to "carbon footprint" measurement proved to be contentious

By late 2007 climate change was firmly established as a significant issue in the viaduct debate. As a consequence, state and local transportation department leaders were compelled to explicitly address new climate change policies in forthcoming viaduct replacement planning activities. Progress on these efforts was shared during the monthly meetings of a newly formed viaduct stakeholder advisory committee. As noted above, this committee consisted of key Streets and Transit activists as well as business, labor, neighborhood, and nonprofit representatives.[4]

Between November 2007 and December 2008, committee members met regularly with the Alaskan Way Viaduct and Seawall[5] Replacement Project Team (hereafter: project team). The project team consisted of managers, consultants, and transportation planning staff working for Washington State DOT, King County DOT[6], and Seattle DOT. The project team consulted with stakeholders as they developed eight new alternatives for replacing the Alaskan Way Viaduct. Five of these alternatives called for building a new limited-access highway. Three called for relying instead on surface streets, transit, and/or transportation demand management (TDM). The performance of each alternative was to be evaluated based on a series of measures that reflected the range of policy concerns invoked by stakeholders and officials.

One of the selected evaluation measures was *Assess change in carbon footprint*. To calculate this change, project team members used a transportation model to predict the quantity and speed of vehicles on all roads in the Seattle region for each of the viaduct replacement alternatives in the year 2030. They then estimated the quantity of CO_2 emissions that would be emitted by those vehicles based on assumptions about average fuel efficiency. Finally they calculated the percentage change between the 2030 predictions and current-day CO_2 emissions estimates.[7] Using this methodology, the project team found that all eight viaduct replacement alternatives would result in a 14-15% *increase* in CO_2 emissions.[8]

It is notable that this methodology assessed the performance of viaduct replacement alternatives in isolation of important elements of Seattle's regional greenhouse gas reduction strategy. Most significantly, it did not consider the impact of various region-wide road pricing/tolling plans proposed by the Puget Sound Regional Council.[9] Instead, project team members modeled the future performance of viaduct replacement alternatives (and resulting vehicular CO_2 emissions) with the assumption that no such tolls would be implemented. Yet these regional tolling plans play a central role in PSRC's greenhouse gas reduction strategy and would likely have a significant impact on how the regional transportation system functions. By choosing to ignore this and other tools for regional transportation demand management, the project team developed skewed carbon footprint predictions.

The transportation model used by the project team to develop their carbon footprint predictions was also an object of contention during the stakeholder meetings. Specifically, there was a great deal of disagreement among stakeholders regarding the assumptions embedded within the transportation model. These assumptions included the cost of gasoline, the future behavior and preferences of transportation system users, and how each of the viaduct replacement alternatives would impact land use and economic activity across the Seattle region. Such assumptions have a strong impact on how the model simulates travel activity. Therefore these assumptions had the potential to dramatically impact the predicted quantity of CO_2 emissions from each viaduct replacement alternative.

Despite disagreement over the modeling assumptions, the project team chose to develop only one scenario to serve as inputs for the transportation model. Furthermore, the assumptions embedded within this single scenario were almost entirely off limits to public review. Stakeholders only received assurances from project team leaders that the assumptions were "objective", "reasonable", and "based on historic trends". Furthermore, the project team leaders argued that, given the potential for inaccuracies in model predictions, it is all the more important to adopt only a single set of modeling assumptions to ensure that the comparison between alternatives is (at least) consistent. As a consequence of these decisions, the model results and carbon footprint predictions failed to shed light on how viaduct replacement alternatives would perform in a range of possible future circumstances.

Climate change disappeared from the public debate following the stakeholder advisory process

At the conclusion of the stakeholder advisory process, the majority of stakeholders cast their support for the continued study of a bored tunnel highway to replace the viaduct. The project team had predicted that this tunnel alternative would result in the same amount of greenhouse gas emissions as other alternatives while also opening views on the waterfront

and reducing traffic on surface streets. This combination of predicted outcomes enabled some stakeholders to represent the tunnel alternative as pro-environment—despite the fact that the option invested significantly less in transit improvements and TDM compared to the surface street options.[10] Weeks later, state, county, and local elected officials announced an agreement to move forward with a bored tunnel replacement for the viaduct.

Following the bored tunnel announcement the issue of climate change nearly disappeared from news coverage and public statements about the viaduct replacement project. I found only a single reference to climate change in Seattle's two daily newspapers during the following months—an opinion editorial[11] by two displeased stakeholder advisory committee members. Thereafter, Streets and Transit activists refocused their campaign on questioning the tunnel's high price tag and potential for cost overruns. By late 2009 there was very little discussion in the major newspapers regarding the benefits (or drawbacks) of a Streets and Transit option, much less its implications for Seattle's greenhouse gas reduction efforts.

Discussion of findings

Prior to the stakeholder advisory process Surface and Transit activists succeeded in significantly expanding public discussions regarding the relationship between the viaduct replacement project and climate change. They promoted the idea that this transportation project could contribute to a broader urban transformation—a transformation that many experts argue is essential to achieving necessary greenhouse gas reduction targets. While the viability of the Surface and Transit alternative as a way to reduce greenhouse gas emissions is debatable, that debate was worth having. Indeed, such debates can help expand the imaginations of Seattle residents, planners, transportation department leaders, and even elected officials regarding what kind of city Seattle can become.

Unfortunately, my findings indicate that the stakeholder advisory process had the opposite effect. Associating each viaduct replacement alternative with singular carbon footprint imposed a sense of inevitability that undermined the potential for meaningful public discussion on the topic.[12] Taken at face value, the project team's conclusions presented the public with one seemingly unavoidable future in which the decision regarding how to replace the viaduct could have no impact on the problem of climate change.

I don't wish to imply that there was a direct cause and effect relationship between the release of carbon footprint findings and the dramatic reduction in public debate

The project team defended their carbon footprint methodology by claiming it would produce "objective" information to inform the decision process. My findings indicate that such appeals to objectivity—whether genuinely or strategically deployed—can reinforce the status-quo while undermining the ability of planners and residents to envision alternative futures. This is extremely problematic given that a more energy-efficient transportation system will inevitably look quite different than the one we have today.

Planners and civic leaders who are serious about climate change mitigation must work to expand the public's imagination of what constitutes a viable and desirable future when it comes to transportation, land use, and urban life. Such efforts are undermined by carbon footprint measurement techniques which fail to recognize the possibility of a future that looks significantly different than today. The following section offers practical recommendations for assessing project-level greenhouse gas emissions in a way that avoids this pitfall.

Recommendations

Based on this study I offer three recommendations regarding how to more effectively implement local and state greenhouse gas reduction policies in the context of contentious transportation infrastructure decisions.

1. Always evaluate transportation projects in the context of regional greenhouse gas reduction strategies

Reducing the greenhouse gas emission of motor vehicle travel in cities requires regional transportation and growth management planning. Therefore, it makes sense that greenhouse gas reduction strategies (such as land use planning, user fees, transportation demand management programs, and investments in transportation alternatives) be formulated and implemented at the regional scale. Yet there is a great deal of public interest in evaluating how individual projects, such as the Alaskan Way Viaduct replacement, will impact regional greenhouse gas emissions. This study indicates that planners are challenged in the ability to provide meaningful information regarding the 'carbon footprint' of proposed transportation projects. One way to address this problem is to ensure project-level greenhouse gas assessments are always conducted in the context of regional greenhouse gas reduction strategies. The following recommendations are meant to guide planners in their efforts to conduct such analyses.

Project-level greenhouse gas evaluation should begin with a *qualitative* assessment of how well project alternatives support the regional greenhouse gas reduction strategy. For instance, Seattle's metropolitan planning organization (Puget Sound Regional Council, or

PSRC) developed a regional strategy that calls for supporting transit oriented land use and development, reducing vehicle miles traveled through user fees, and providing travelers with alternatives to single occupancy vehicles. Transportation planners can rank each project alternative based on its potential to support this strategy. Alternatively, this strategy may be better served by the least expensive project alternative (or foregoing the project all together), as this choice may maximize the capacity of the region to allocate funds/attention to other projects that have a higher potential to further the regional greenhouse gas reduction strategy. Quantitative greenhouse gas emissions assessments could help to determine which approach is more appropriate in this instance. However, rushing to project-level carbon footprint analysis before such issues are raised significantly increases the risk of neglecting these questions altogether.

Quantitative project-level carbon footprint measurements must consider the impacts of all actions proposed in regional greenhouse gas reduction strategies. For instance, while the viaduct replacement project team did consider the latest regional land use and transportation plans made available by the PSRC, they chose to ignore the regional tolling scenarios. Doing so resulted in an analysis that failed to consider a key strategy for reducing single occupancy vehicle travel and emissions in the Seattle area. Project team leaders argued that it would be inappropriate to include tolling scenarios because they were not in the scope of the viaduct replacement project and required legislative approval. Such dependencies should not arbitrarily limit the analysis of a project's potential climate implications.

2. Consider multiple scenarios in project-level greenhouse gas evaluations

We cannot predict the future with certainty. This is particularly true in the case of transportation planning. Simply too many different factors shape how people will use the transportation system and the amount of carbon emissions that vehicles will produce. These include the price of gasoline, the kinds of policy interventions elected officials will choose to implement, shifts in land use and economic activity, the rate and direction of technological change (e.g., shifts towards electric vehicles, alternative fuels, etc.), and public preferences for adopting more energy efficient urban lifestyles. Therefore, it is impossible to get a full picture of the potential social, economic, and environmental impacts of a transportation project without considering how it performs in the context of multiple future scenarios.

'Scenario planning' is a technique widely used by business executives, risk managers, military leaders, and metropolitan planning organizations. It allows decision makers to analyze the implications of a chosen course of action in a range of different future circumstances. It involves the creation of a small set (usually 2-5) of plausible and

internally-consistent scenarios. Each scenario presents a different possible story or vision of the future that builds off of what is already known about current trends and driving processes. State, regional, and local governments often create scenarios to examine how different future land use patterns and policies may affect the performance of the transportation system. However this technique is rarely used in the evaluation of individual transportation projects—even major highway projects such as replacing the Alaskan Way Viaduct.

This case study suggests that the consideration of multiple scenarios is essential to understanding how different 'variables' of interest—fuel prices, land use, policies, cultural preferences, etc.—affect the anticipated greenhouse gas emissions of proposed transportation projects. There are several benefits of this approach. First, it would provide insights regarding whether these variables have different effects on different project alternatives. For example, a scenario-based evaluation of the activists' preferred Surface and Transit alternative could have revealed that it performs unremarkably in all scenarios except one that includes tolling on all regional highways as well as higher fuel prices. Such a finding may have prompted a more meaningful discussion of how the viaduct replacement project is related to regional transportation and greenhouse gas reduction strategies.

A second benefit of scenario planning is that it draws explicit attention to two important facts that sometimes get overlooked in the work of urban/regional planning. On the one hand, scenario planning clearly illustrates that we cannot definitively predict the future outcomes of a course of action. Rather it shows that there could be multiple outcomes depending on different future circumstances. On the other hand, scenario planning draws attention to 'variables' that are under our control. In other words, it shows that we have the ability to steer towards particular kinds of outcomes based on the policies, programs, and economic incentives we choose to implement. Single-scenario approaches to evaluating transportation project alternatives imply that the only variable under our control is project selection. Scenario planning shows that the outcome of a selected project is not inevitable, but rather shaped by many factors that we can control—at least to some extent. Such information can play an important role in expanding public debates that are too often shaped by conservative assumptions about the potential for behavioral and societal change.

3. Evaluate project lifecycle emissions

There are several types of emissions associated with transportation projects. *Operational* (or "tailpipe") *emissions* are those associated with vehicles that use the transportation project roadways. *Construction emissions* refer primarily to the emissions of construction equipment. *Embodied emissions* include the extraction of construction materials as well as

their transfer to the project site. *Lifecycle emissions* include embodied as well as demolition and disposal emissions. The viaduct replacement project team predicted and measured the change in *operational* emissions at the regional scale. They did not consider construction, embodied, or lifecycle emissions. For major transportation projects, construction emissions alone can be equivalent to many decades of operational emissions. Therefore it is important not to leave them out of the analysis. This recommendation is consistent with Washington State DOT's own guidelines for project-level greenhouse gas evaluations.[13]

If time and resources are not available to do a rigorous and quantitative accounting of construction, embodied, and/or lifecycle emissions, an informed qualitative assessment is appropriate. The point is to prompt meaningful public deliberation regarding the tradeoffs between greenhouse gas reduction and other social, environment, and economic objectives.

4. Address automobile dependency through community impact mitigation

Transportation planners often consider different forms of community impact mitigation to compensate for the detrimental impacts of transportation projects. Common examples include highway lids, pedestrian overpasses, and sound barriers. Far less common are efforts to study and address localized issues of automobile dependency in affected communities. This kind of mitigation gains relevancy when considering projects that seek to reduce motor vehicle emissions in part through the removal or reallocation of right-of-way for general purpose traffic. Such projects have the potential to significantly shape patterns of mobility and accessibility in neighborhoods that are most reliant on travel through the project corridor. Working with local community members, planners could identify community impact mitigation projects/programs that enhance the ability of residents to access jobs and services without also increasing single occupancy travel. These project/programs could be tailored to the unique qualities of the neighborhood under study. For instance neighborhoods with a large number of school age children would have different needs than one dominated by young working adults.

These kinds of community impact mitigation projects and programs may call for disciplinary expertise that transcends transportation planning. Instead they may call for interdisciplinary teams involving social workers, public health professionals, economic development experts, and/or urban design professionals. Most importantly, however, neighborhood residents themselves must play a central role in the design and implementation of mitigation projects seeking to undermine automobile dependency.

[1] For instance, see: http://web.archive.org/web/20030413184600/http://www.wsdot.wa.gov/Projects/Viaduct/

[2] For examples, see: http://community.seattletimes.nwsource.com/archive/?date=20041212&slug=viaduct12m ; http://www.seattlepi.com/opinion/207433_viaducted.html ; http://www.seattlepi.com/opinion/191976_viaducted.html

[3] For examples, see: http://www.seattlepi.com/opinion/252675_focus25.html ; http://www.seattlepi.com/opinion/286182_trahant24.html ; http://www.seattlepi.com/opinion/303120_trahant11.html ; http://www.seattlechannel.org/videos/video.asp?ID=5080701

[4] A roster of stakeholder-participants is available here: http://www.wsdot.wa.gov/NR/rdonlyres/EA8D93BF-A5A7-44C8-8501-4D4EEF3BFDB1/0/SAC_Roster_Oct08.pdf

[5] For brevity I do not explain the significance of the seawall in this summary. Like the viaduct, the seawall along the downtown waterfront is aging and at risk of failure. Replacing the viaduct requires also replacing the seawall. Therefore the two projects have often been included in a single planning process.

[6] King County DOT is the agency responsible for transit planning and operations in Seattle.

[7] Note that this methodology only considered *operational* emissions. I discuss how these emissions are distinguished from construction, embodied, and lifecycle emissions in the recommendations section.

[8] These findings are described in this document: http://www.wsdot.wa.gov/NR/rdonlyres/285601DF-0009-41EE-A3AF-E1D7FB51D681/0/AWV_SAC_Presentation_Nov_20_Env.pdf

[9] The project team argued that it would be inappropriate to consider PSRC's regional tolling scenarios because the decision regarding whether to implement these tolls was not within the scope of the viaduct replacement project.

[10] Of course climate change was just one of many issues discussed during the stakeholder advisory meetings. Implications for Seattle's port, industrial, and manufacturing industries, neighborhood and local business impacts, construction-related impacts, and the potential for revitalizing the waterfront were all significant concerns for many stakeholders. So it cannot be said that the committee would have been swayed if the project team came to different conclusions regarding the future greenhouse gas emissions of the tunnel and surface alternatives. What can be said is that the approach to carbon footprint measurement adopted by the project team allowed for the issue to be cleanly swept from the table in policy deliberations.

[11] http://seattlepi.nwsource.com/opinion/396272_tunnelrebut16.html

[12] To be clear, I don't mean to imply that there was a direct cause and effect relationship between the release of carbon footprint findings and a decline in attention to the issue of climate change in the media and activist rhetoric. There were certainly other contributing factors. For instance, some opinion polls showed a slight decline in public concern over about the issue of climate change between 2007 and the end of 2008 (when the project team released their carbon footprint findings). The financial crisis had firmly taken the center stage in local and national news reporting. When the bored tunnel was selected as the viaduct replacement in early 2009 Streets and Transit activists adapted their campaign strategy to these new circumstances. Irrespective of these other factors, I argue that the way in which the project team presented their carbon footprint findings and methodology undermined the potential for meaningful public discussion on the topic.

[13] These guidelines were released in 2009, after the conclusion of the viaduct stakeholder advisory process. See http://www.wsdot.wa.gov/NR/rdonlyres/73ADB679-BDA6-4947-93CA-87C157862DD7/0/WSDOTprojectLevelGHG.pdf