NATIONAL TRANSPORTATION POLICIES, FINANCING, AND CO2 POLICIES OF THE UNITED KINGDOM, CANADA, AND SWEDEN: LESSONS FOR THE UNITED STATES?

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ABSTRACT

For the United States, rising costs of the transport system and dwindling revenues from traditional but unpopular fuel taxes present a challenge to transport policy. An even greater challenge is to make the transportation system more sustainable, particularly against the rise in carbon dioxide emissions from road vehicles. Most agree that significant changes to transportation policy and revenue sources are needed if the country is to balance revenues and expenditures while reducing transport's CO2 emissions This will require the re-examination of US transport policy goals, the way CO2 reduction is incorporated into policy, and the assignments of responsibility for action to the national, state, regional, and local levels.

As part of a study for the National Transportation Policy Project of the Bipartisan Policy Center, we examined how the United Kingdom, Sweden, and Canada have addressed the same set of transport policy challenges, comparing their policies and practices to current US approaches. We show how transportation objectives, programs, projects and funding levels flow from national policies in each country, and document how each country has embedded climate change concerns within transport policy. Finally, we compare the four countries on economic growth, surface transportation activity by mode, and CO2 emissions to assess the potential impact of specific transport and climate change policies.

The three comparison countries have made sustainable development the centerpiece of current policy, and this influences their transport policies in several ways. We document a number of their national policies to support sustainable development, and conclude that these policies have made a significant and positive difference in outcomes. National transport goals place equity and social development as top concerns along with safety, economic growth, and environmental protection and stewardship. Departments of transport are attempting more vertical and horizontal coordination with other agencies and levels of government to fund major housing and infrastructure projects. Pricing and investment policies are intended to promote travel behavior and revenues that are both more sustainable. The three countries raise 137 percent to 291 percent more revenue per capita from fuel taxes. While not hypothecated to transport, these taxes are closer to each country's total national and local expenditures for surface transport. Their transport budgets also devote a greater share of total investment to transit and rail. Partly as a result, the three countries have a lower share of land passenger miles by auto; auto fleets with higher fuel economy; and lower CO2 emissions per capita from surface passenger transport.

Keywords: transportation policy, CO2, sustainability, transport finance, transportation planning, intergovernmental coordination, intermodal connectivity

ACKNOWLEDGEMENTS

The Bipartisan Policy Center provided partial funding for the work presented here, which was conducted under the auspices of the Global Metropolitan Studies Center at UC Berkeley. Research assistance was provided by Nicole Horn and Emily McGuire of UC Berkeley and Jakob Branger and Mustafa Wakid, both students from ABB High School in Vaesteraas, Sweden. We are grateful for this support. Any errors or omissions are solely those of the authors.

INTRODUCTION

Background

The US transport system is facing major challenges as rising costs for the maintenance, operations, and expansion of the transport system overwhelm the dwindling revenues from traditional but unpopular fuel taxes. At the same time, action to reduce the risks of climate change both requires funding for new transportation projects, and is likely to reduce the intake in fuel taxes.

Despite these recognized challenges, as of summer 2010, the multi-year federal transportation legislation that funds 20 percent of surface transportation projects across the U.S. is still pending in Congress, more than a year past its original end date. Federal transportation programs continue under short term extensions to the 2005 legislation. Shortfalls in the highway trust fund are being covered by transfers from general funds; projects are being funded under economic stimulus programs. No clear direction for the new bill has yet emerged, despite numerous recommendations from studies that were commissioned years before the bill's expiration (National Surface Transportation Infrastructure Financing Commission, February 2009; National Surface Transportation Policy and Revenue Study Commission, 2008; US Department of Transportation, 2008).

The concern over the need for a way forward is heightened by a growing recognition of very real problems of the U.S. transport system for which the solutions are not obvious or politically palatable: a rise in carbon dioxide emissions from a growing population with a concomitant increase in vehicles and transportation activity; an aging and dispersed population living in areas with few transportation alternatives; increasingly congested metropolitan areas that continue to expand outward; inefficient and congested freight movement that threatens economic profitability and regional liveability; and deteriorating infrastructure for all modes. Transforming the projected $60 billion transportation spending bill from a 'reauthorization' with an aggregate list of projects with little coherence, paid for by a declining if dedicated source of revenue, into the authorization of a national transportation policy with a strategic vision, sustainable financing, and a corresponding set of programs and performance measures, is a major challenge.

Research Overview

This paper summarizes work we conducted for the Bipartisan Policy Center's National Transportation Policy Project (NTPP), launched in anticipation of the need for new federal transportation legislation (National Transportation Policy Project, 2009; Schipper, Makarewicz, & Deakin, January 2009). We were commissioned to look for lessons for the US from other developed countries, and in particular to identify effective national government policy and funding approaches to transportation that improve economic competitiveness,

reduce reliance on petroleum, lower CO2 emissions, and improve access for all users. We also were asked to examine the comparison countries' institutional arrangements for transportation decision-making and funding, and in particular the assignments of responsibility and authority for transport to local, state, and national governments.

The three comparison countries we selected are the United Kingdom, Sweden, and Canada. Although the countries vary significantly in land area, population, and size of their economies, they all exhibit high levels of urbanization, a sizeable share of land passenger miles by car, high GDP per capita, and democratic political structure (see Table 1). Further, the two European countries' participation in the European Union offers some comparison to the relationship between US states and the federal government. Canada is a useful comparison because its development occurred over roughly the same period as the US's, and its provincial-central government structure has parallels to the US state-federal government structure. The shared border and high trading volumes between the US and Canada also influence Canada's economic and transport policy decision making, but while in some cases Canada seeks to match US policy, in other cases it has sought to surpass US policy and instead align with goals and objectives of other countries (Harrison, 2007).

Table 1. Comparison of Countries by size, population, and national and household wealth

	Canada	**Sweden**	**UK**	**US**
2008 Population Estimate[1]	33,212,696	9,045,389	60,943,912	303,824,646
Total Land Area (sq. mi)[1]	9,984,670	449,964	244,820	9,826,630
GDP (Billions, $2000 PPP)[2]	$1,017	$290	$1,749	$11,265
GDP Per Capita (US$, 2000 PPP)[2]	$31,613	$31,875	$28,243	$37,225
National Budget (In billions 2000 US$ PPP)[3]	$134	$73	$810	$2,342

Sources: 1 CIA World Factbook, 2 OECD. 3 National 2006 budgets from each country's Department of Treasury.

Prior comparative studies of the US, Canada and Western Europe have documented many differences in transport policy and travel behavior (Committee for an International Comparison of National Policies and Expectations Affecting Public Transit, 2001; Pucher, 1995), and our research, which updates the comparison data to 2006, confirms that these differences persist.

The US continues to have the lowest rate of transit use of the four countries; it also has a high percentage of household expenditures for transportation, the highest carbon emissions per passenger, the lowest on-road fuel economy per vehicle, the greatest number of miles travelled by auto, the highest level of auto ownership, and the highest government expenditure per capita on transportation (see Tables 2 and 3). These differences are not just a matter of differences in culture, the age of countries, or household wealth, though those factors are clearly at play; they also reflect intentional local, state and national policies of the comparison countries that encourage more sustainable forms of transportation and urban development. Owning and operating a car has higher costs in these countries due to higher fuel taxes, vehicle sales taxes, licensing, and registration fees. Vehicles are more fuel efficient as a result of national policies that require higher performance standards than the US. Public transit, walking and biking, are more feasible in cities and suburbs because land use policies have resulted in more compact development. Public transit systems are more reliable, convenient, and time competitive with the auto as a result of continued investment in

and the promotion of public transit. Citizens are more willing to pay higher vehicle and fuel taxes and to take public transit because public marketing, education campaigns, and policy discussions openly discuss the social and environmental costs of individual travel decisions and the importance of changing travel behavior.

It is also true that like the US, these countries have experienced a rise in auto travel and vehicle ownership, a decline in transit use, and more suburban sprawl. However, the changes in these countries have not been at the same rate as in the US. We document a number of national transport policies to support sustainable development in the comparison countries, and conclude that these policies have made a significant and positive difference in outcomes. The comparison countries are improving the sustainability of their transport systems and travel activity, and each is continuing to update and implement new policies intended to further reduce their carbon footprint, increase accessibility for all users, provide value for money from transport projects, and support regional and national economic competitiveness. The comparison countries' stronger performance, in our assessment, is the result of clear commitments to these sustainable development policies.

The comparison countries' commitment to more sustainable development began in the 1970s, when the US also enacted stronger air, water, and energy policies. Sweden continued to enact environmental policies through the 1980s, when the other countries retrenched. The UK and Canada regained momentum toward sustainable development (as indicated by carbon policy) after the Brundtland Commission in 1987 and yet again after the 1992 Earth Summit in Rio, and cemented their commitment by signing on to specific greenhouse gas reduction targets through the 1997 Kyoto Protocol (Button, 2007; Harrison, 2007; O'Riordan & Voisey, 1997). In comparison, with a few exceptions, the US was unable to gain support for additional sustainable development policies or for the Kyoto protocol and its successors during the same 20 year period.

We found the following in the comparison countries:

1. National goals for sustainable development steer transport's policy vision, goals, performance objectives, and specific measures.

2. Strong and clear national transport goals and objectives influence the transport policy of lower levels of government through national funding for local investments, and requirements to coordinate with other government departments, e.g. housing, energy, and infrastructure.

3. Departments of transport use a variety of tools and policies to address climate change concerns, including emissions and fuel efficiency regulations, vehicle technology research, travel behavior incentives and disincentives, and land use policies.

PREVIOUS STUDIES AND POLICY FRAMEWORKS

Comparative studies of transportation policy, funding, and outcomes

Comparative research on national policy of developed countries is most commonly found in the political science literature, but, few political scientists include transportation in the set of welfare state policies they evaluate, focusing instead on education, healthcare, pensions, and sometimes housing. Stephen Hill's analysis of Europe's unique version of social capitalism is a current exception (Hill, 2010). Hill argues that Europe's, and Canada's, expenditure on public infrastructure and transportation, contributes to a social safety net that provides substantial economic security for citizens. He counters the argument that Europeans are overtaxed by showing that what citizens receive in return for their higher taxes is more than what US citizens receive in return for their non-tax expenditures via out-of-pocket costs, fees, and numerous other charges for health care, education, and transportation. Policies such as sick leave, universal health care, and efficient mass transportation, he argues, contribute to a higher quality of life and are essential components to their workfare system. Because the European Union is committed to reducing dependence on foreign oil and its contribution to greenhouse gas emissions, its member states have made investments and innovations in transportation that have resulted in more efficient autos, more transit use, more walking and biking, and a network of high speed trains. As a result of higher fuel standards and lower auto travel per capita, most European countries have had significant drops in oil consumption since 1980, while the United States has increased oil consumption 21 percent in the same time period (Hill, 2010, pp. 179-180).

An extensive urban planning and transportation literature compares specific aspects of transportation policies, such as privatization, financing (Nakagawa & Matsunaka, 1997), modal availability and choice (Pucher, 1995), urban form and transport (Cervero, 1988), city-specific strategies for sustainable transport (Beatley, 2000; Schiller, Bruun, & Kenworthy, 2010), and more recently, national policies and laws to promote transport equity (Lucas, 2004). However, the set of countries in these studies is not consistent, some only cover specific cities, and many do not include a comparison of national policies and how they shape the reported practices, programs, and outcomes. However, two studies provide a comparison to this paper: a 2001 TCRP report which compared US "public polices and preferences about urban form, transit, and highways with those of other industrialized nations" (Committee for an International Comparison of National Policies and Expectations Affecting Public Transit, 2001), and John Pucher's 1995 study of public policies in the US and Europe and their influence on travel behavior, urban development, and auto use (Pucher, 1995). The two studies drew similar conclusions on policies that affect travel behavior in the US, Canada and Western Europe:

- Price of land: Land outside central cities is cheaper and more accessible in the US than Western Europe. This has led to more compact development patterns in Western Europe.

- Socioeconomics: The US standard of living and rate of population growth when autos were developing were higher than in Europe, and these factors led to the dominant land use pattern in the US: low density suburban areas that are difficult to serve by transit. In contrast, most Europeans still live in public transportation corridors established before widespread use of the automobile.

- Inner cities: More US inner cities suffer from social and economic problems that have influenced the movement of work and households to suburbs. More central cities in Western Europe remain attractive places for work and residence and they have maintained the quality of their public transport systems.

- Cost of driving: The costs associated with driving in Europe are higher from higher fuel and vehicle taxes, registration and license fees, and parking costs. In the US, parking is free in 99% of locations and the tax system encourages employer paid parking.

- Traffic policies: European cities often discourage auto use through mobility management and traffic calming strategies that "tame the auto", such as car-free zones. This partially reflects a desire by government and citizens to protect historic areas from auto congestion, but it also reflects their commitment to promote more sustainable forms of transport, e.g. walking, biking, and public transit.

- Housing and urban development policy: Greater housing construction in the US is fuelled by cheaper land, the mortgage interest income tax deduction, and subsidized suburban infrastructure for new developments. Advances in production processes and communications have led to the decentralization of jobs in all developed countries, but other countries' suburbs are more compact and better able to support public transit, walking and biking.

- Transportation investment policy: The US public sector has made a vast investment in its highway and street network, and a much lower investment in public transit in comparison to other countries

- Planning authority: The US does less social and economic planning than European countries and land use planning developed later in the US, is weaker, and is mostly controlled by local governments. European countries have strong national and regional governments, allowing for greater coordination of urban land use and transportation, and Canadian provinces exercise more control over land use and transport than US states.

- Ideology and attitudes: Individual attitudes in Western Europe and Canada about personal freedoms and community and social costs are more accepting of restrictions and higher costs in order to meet community goals or to account for social and environmental problems caused by individual actions. Governments openly discuss policies intended to change travel behavior directly, even if that has meant restrictions on individual freedom.

- Public transit culture and policies: The public and policymakers have a positive attitude about the role and value of public transportation. Transit managers are highly competent, well-respected, and granted greater authority to improve the system and to innovate.

For the US to achieve better environmental and economic performance of its transport system, both Pucher (1988, 1995) and the TCRP committee (2001) concluded that it would require a long time, and significant changes to government institutions, land use controls, and public attitudes and preferences. Yet even at that time, many cities in the US were already taking action similar to those in Europe, channelling development to areas served by public transit, adopting creative transit marketing and fare policies, giving transit priority in mixed traffic, enacting stricter parking regulations, and increasing the cost of auto usage. As many cities and regions in the US have implemented such policies some authors assert that mobility management strategies are no longer seen as a new innovation (E. Deakin, Ferrell, Mason, & Thomas, 2002; Schiller, et al., 2010). Regional coordination of transport and land use also is happening in many places at the local level, and state wide in a handful of states (Deakin, 2006). However, US national transportation policy continues to lack clear objectives and policies to achieve sustainable development (Panagopoulos & Schank, 2007).

Policy Documents Framing Sustainable Development for the European Union

Government policy documents in the EU in particular form a major framework for sustainable transportation. We provide a brief review the European Union's adoption of sustainability as background for the UK, which joined the European Community in 1973, and Sweden, which joined in 1995. However, we note that these policies have had a worldwide influence including an influence on the actions of a number of US states and cities.

Following the establishment in 1983 of the World Commission on Environment and Development, known as the Brundtland Commission, and the commission's 1987 report on sustainable development, *Our Common Future*, the European Commission and European countries began to incorporate sustainability principles in their policy statements (Beatley, 2000). The Brundtland Commission report and subsequent world forums on sustainability, including Agenda 21, the report from the Earth Summit of 1992 in Rio, has launched an extensive body of research on sustainable development policies and green initiatives in the countries that signed on to these principles and then later to the Kyoto Protocol in 1997. In 1990, the European Union released a *Green Paper on the Urban Environment,* written by a team of environmental experts as a first step to guide the EU, national, and city policies. Sustainability was incorporated in the EU's 1992 Treaty of Maastricht (formally the Treaty on the European Union resulting in the single currency, the Euro, and the change from the European Economic Community to the European Union), and it was the focus of the EU's Fifth Environmental Action Program in 1993, *Towards Sustainability* (Beatley, 2000; O'Riordan & Voisey, 1997), which also updated the EU's Common Transport Policy (Button, 2007). The final report from the green paper, *European Sustainable Communities*, in 1996 developed four principles that continue to guide national policies on sustainable

development, namely: urban management, policy integration, ecosystems thinking, and cooperation and partnership (Beatley, 2000, p. 17).

METHODS

We evaluated government transport policies and expenditures for the four countries primarily through an analysis of government documents and analysis of published data. For each country, we relied on published and unpublished policy documents, peer-reviewed articles, books, and a wide range of comments on policies that each government solicited and published in connection with the issuance of policy documents, new laws, or major financing bills. We were assisted informally by Canadian, UK and Swedish officials who provided links to documents available electronically or in some cases provided hard copies. Online data from Transport Canada, the UK Department for Transport, the Swedish Institute for Communication Research (SIKA) and each country's national statistical agencies covered our needs for national characteristics, vehicles and mobility, budgets, and energy uses for each country at the national level. For international comparisons we used OECD data.

We assembled ten years of expenditure data for each country to determine the trend of expenditures by level of government and by mode of transport. However, we must issue several caveats about these data since transportation finance figures for each country are not straightforward. First, national transport funding is half or less of the total funding for transportation in the comparison countries; the national share varies from a low of 8% in Canada to around 50% for both the UK and Sweden. While knowledge of sub-national funding is critical to understanding the whole financing picture, compiling figures for each sub-national level is a daunting task since there is little standard reporting. Fortunately each country's national authorities (or certain interest groups) have made the compilation for at least one year. Even so, some details remained sketchy; in particular, separating interest on loans for transport from new investments or maintenance and repairs was not always straightforward or possible. The countries also vary on whether or not they include aeronautic and maritime transport expenditures along with surface transport. We separated these two categories to the extent possible in order to be consistent with the US.

Financial comparisons among countries using exchange rates are sometimes misleading. That is principally because the market value of a US dollar in any country does not reveal its true purchasing power. To facilitate comparisons, Heston, Summers and co-workers at the University of Pennsylvania (Heston, 2006) developed a method for comparison of currencies using the cost of a standard market basket of goods in each country to evaluate purchasing power of each currency compared to one US Dollar. Such a comparison yields the value of each local currency in US dollars at purchasing power parity, or PPP. The actual PPP conversion factors, i.e., local currency to US dollars, are published by the OECD, the World Bank, and other authorities.

Using this approach, our comparison followed these steps. First, expenditures or values in a given year were devaluated to real local currency using 2000 as a base year and each country's GDP deflator (or CPI) base 2000. Actual data are from the OECD national accounts. The real local currency figures are then converted to US Dollars at the 2000 PPP equivalents. These work out to be $1.23 CDN, SEK 9.51, and UKL 0.63 to the dollar. The values for Canada and the UK are not far from the market currency exchange rates, while that for Sweden is some 35% higher than the current market rate. This means that when the Swedish GDP is converted to US dollars, the PPP conversion gives a lower US dollar GDP than the market rate, reflecting the higher cost of living in Sweden than in the US.

FINDINGS

We begin this section with our analysis of the differences among the countries' travel behaviors and system characteristics. We then attempt to explain these differences through each country's overarching transportation policies and how those policies are implemented through their transportation expenditures and revenues, the coordination among levels of government, and specific programs for urban development and greenhouse gas reduction.

Transportation Systems and Travel Activity

Transport systems and travel activity are directly related to urban form. One measure of urban form, at a national level, is the percentage of residents living in urban regions. At 77%, the US is the lowest among the four countries, but Canada is close to the US at 79%, whereas Sweden, at 83%, and the UK, at 90%, are more urbanized. The urbanized percentage alone is unlikely to explain the larger differences in travel behaviors between the US and the other countries, each of which have less auto-related travel activity than the US (see Table 2). What matters more than the percentage of urban area, is the form of the urbanized area, including residential density, the location of employment, and the quality, extent and type of transport system in the urbanized areas. These factors are not natural advantages of any country; they are the result of historic development pathways, and intentional transport, land use, and environmental policies. In particular, the UK's dense development and extensive transport network is evident in its top position among the countries in terms of railways: at 68 km of railway per 1000 square kilometres, it has three times the length of rail per area as the US. On the other hand, the UK has the lowest number of paved roads per capita and per square mile.

The US does not have the greatest length of paved roads per capita or per area, yet its citizens travel the highest number of land miles by auto annually, 21,396 km, nearly twice as many kilometers as residents in the UK and Sweden, and fifty percent more than Canadians. Part of the difference reflects land use decisions that influence density, the distance between origins and destinations, and the need to travel; and transport decisions that provide alternatives to the auto. We know from extensive research that land use and transport

supply are not the only influences on travel behavior; household income, and other incentives or disincentives, such as higher costs to own and operate a vehicle, also influence individual decisions. The small difference in per capita income among these four countries does not suggest income is a major influence, but the larger differences in transport costs are likely a source. We review these costs in the following section.

Table 2. Transportation System and Travel Activity (2006)

	Canada	Sweden	UK	US
Transportation System Characteristics				
Share of population living in urban regions	79%	83%	90%	77%
Paved Roads (km) per capita	12.92	15.29	6.27	13.76
Paved Roads (km) per 1000 sq. km	409	480	222	370
Railway Length (km) per capita	1,494	1,265	268	749
Railway Length (km) per 1000 sq. km	5	26	68	23
Travel Activity				
Share of work commute by auto	81%	75%	72%	88%
Total land passenger travel by auto per capita (km)	15,262	11,522	11,080	21,396
Share of land passenger travel by auto	91%	86%	86%	96%
Road Transport GHG/Capita, 2006, metric tonnes CO2 (includes automobiles, light trucks, buses, and freight trucks.*)	3.80	2.32	1.95	5.09
Vehicle on road fuel economy, (MPG, 2006)	22.96	26.28	30.32	20.84

Sources: *International Energy Agency on-line data on energy and carbon-dioxide emissions at http://data.iea.org/IEASTORE/DEFAULT.ASP

Transportation Expenditures and Revenues

We compared the national, regional/provincial, and local transportation budgets of each country for the most recent 10 years available, 1997-2006. In our analysis, we differentiated national from local expenditures, and identified spending by mode, budget trends, and primary sources of transport funding. We also compared household expenditures on transport (Table 3).

Table 3. Transport Expenditures and Revenues (2006)

	Canada	Sweden	UK	US
2006 Government Transport Budgets				
Expenditures				
National surface transport budget (2000 bn$)	$1.32	$2.99	$14.42	$36.63
Local surface transport budget (2000 bn$)	$14.04	$3.60	$14.34	$146.53
Total surface transport budget (2000 bn$)	$15.37	$6.60	$28.76	$183.16
National transport budget per capita ($US 2000 PPP)	$35.49	$325.92	$232.90	$157.84
Local transport budget per capita	$442.20	$392.54	$231.67	$631.36
Total transport budget per capita ($ US 2000 PPP)	$477.69	$718.47	$464.57	$789.20
Share of total transport expenditures by national govt.	8%	45%	50%	20%
Share of national program budget on surface transport	1.0%	4.1%	2.6%	5.1%
Share of GDP on national transport budget	0.1%	1.0%	0.8%	0.3%
Share of GDP on total transport expenditures	1.5%	2.3%	1.6%	1.6%
Share of total transport investment on transit and rail	22%	78%	52%	20%
Transport Generated Revenues				
Road fuel tax revenues per capita	$330	$440	$690	$240
Fuel tax revenue to total transport expenditures per capita	69%	61%	140%	30%
Road fuel tax per km of road	$25.93	$29.06	$109.68	$17.33
Tax share of gasoline price	33.7%	63.4%	66.6%	17.9%
User Expenditures on Transport				
Auto Ownership per 1000 people (incl. household SUV)	575	475	450	750
Share of total household expenditures on transport	13.4%	18.2%	14.5%	17.6%

Transport Revenues

Sweden, the UK, and Canada to a lesser extent, use pricing as an instrument for enforcing transport and sustainability goals and for raising revenues for transport and other programs. While each of the four countries levy a fuel tax along with various vehicle taxes, licenses, and fees, the fuel taxes raised in the comparison countries are much higher than in the US; $690 per year per capita in the UK, $440 in Sweden, and $330 in Canada, compared to $240 in the US. In the comparison countries, all fuels are also subject to the national value added or sales tax (which is included in the taxation rates cited). The lower per capita revenue in the US is due to its much lower per liter tax, about 11 US cents (2000 PPP) versus 24 cents in Canada, 70 cents in Sweden, and 89 cents in the UK. The US is also the only country that hypothecates almost all of its fuel tax revenues to transportation via its Highway Trust Fund; each of the other countries collect the fuel tax as part of General Revenues and determine the transportation budget according to need and available general funds for all departments. Canada now directs a portion of fuel tax funds to an infrastructure fund in order to increase its investment in various infrastructures, including but not limited to transport. Yet, despite having a dedicated source of revenue for transport, the US does not cover its expenditure on transport via the fuel tax, only 30% of all transportation expenditures are covered. In comparison, the fuel tax revenues in Canada, Sweden, and the UK would cover 69%, 61%, and 149% of the total per capita expenditure on transport, if hypothecated.

Diesel taxes in the US are similar to those for gasoline in Canada, and the UK, and are only slightly lower than gasoline taxes in Sweden. Sweden and the UK broke with European traditions of lower taxation on diesel than gasoline because of diesel's greater air pollution damage. The UK and Sweden introduced environmental taxes on transport fuels and new vehicles, with higher taxes on the less-clean variants. Sweden also introduced a carbon specific tax on road fuels in the 1990s (now approx. $1.40 US per gallon.). Canada has recently followed Europe's lead of taxing less efficient vehicles by enacting an Inefficient Vehicle Excise Tax in 2007, to replace the heavy vehicle tax. Sweden and the UK are considering switching some of the duties on fuel to taxes on kilometers travelled to further reduce miles travelled, especially as autos become more fuel efficient.

In addition to levying fuel and environmental taxes, the UK and Sweden have used pricing to manage congestion in their largest cities, London and Stockholm, and to use the additional revenues to improve public transit. Many economists and transport planners consider these experiments successful strategies for reducing congestion, improving access, and raising revenue, leading at least some to criticize the UK, other countries, and the EU for not adopting such strategies more broadly (Button, 2007). The US has used congestion pricing very sparingly on its transportation facilities, mostly in the form of higher peak period tolls and high occupancy toll (HOT) lanes.

Transport Expenditures

National government expenditures on transport vary widely among the four countries. The national government's share of expenditures for surface transport is 50% for Sweden and 45% for the UK but only 8% for Canada, where provinces play the major role and levy a separate fuel tax, and 20% for the US. One of our tasks was to explore whether the US should shift a greater burden to the states and local governments and reduce its share of expenditures on transport. From our analysis of Canada's low share and the UK's and Sweden's much higher shares, we did not find cause to recommend that Congress reduce the US national share. In fact, though Canada's national share is still quite small, ranging from 6% to 12% from 1997-2007, the central government has been working with the provinces to increase its share toward transport. According to discussions with Canadian transport officials, and statements in government reports, this higher share is seen as being in the interest of provinces and the central government. Without central government funding, there was disparity among provinces in terms of transit, roads, and other infrastructure as a result of differences in provincial resources as well as differences in priorities. For the country to meet goals for sustainable development, all provinces need to be able invest in appropriate infrastructure. The central government funding commitment also allows it to promote more coordination among provinces, especially for shipping routes.

On the other end, the higher shares invested by the national government in UK and Sweden has not been noted as a problem in the research. Like Canada, the UK has increased the amount of funding for transport throughout this decade. The stated reasons for the increase are to catch up from years of underfunding transport; recognition of the importance of transport to the competitiveness of regions and the nation and the liveability of communities; and the need to improve the environmental sustainability of the transport system.

The funding issue is also not as much about the shares contributed by each level of government as it is about how much is collected versus how much is spent (Pucher, 1995). It is ironic that US residents travel the most by auto and necessitate the most expensive system to maintain—an extensive system of roads, bridges, and highways for mostly single occupant vehicles—yet are apparently unwilling to endorse higher fuel taxes to cover the costs of these facilities. This discrepancy in use versus willingness to pay has led to a situation where the US federal government is supporting highways from general funds, while maintaining low fuel taxes, and as a result US residents have little incentive to reduce their road use. In addition, US households have a further disincentive to use transit given the high percentage of their incomes already committed to mostly auto transport, 17.6%, compared to Canadian and UK households which spend 13.4% and 14.5%. The high cost for US households is primarily for the purchase of multiple vehicles per households, and secondarily for the gas and maintenance associated with higher mileage per vehicle. Very little household transport spending in the US goes toward transit (Haas, 2008). Sweden has the highest household expenditures on transport, again because of vehicle purchase, but also because of higher taxes and fees on purchasing, licensing, and driving them, and greater expenditures on transit.

Thus, although US households and governments are spending a high amount on transportation, individually and combined, their expenditures are not supporting a more financially, environmentally, or socially sustainable transport system. What appears necessary from our research is for the national government to set clear guidelines and performance measures so that local and regional governments are able to prioritize and plan appropriately, and for governments to be able to evaluate the effectiveness of their spending against agreed upon goals and values. The national government also needs to help coordinate spending and planning across agencies, levels of government, and geographic areas.

Toward Sustainable Development: Vision, Goals, and Roles of Government

Transportation is a major cross-cutting concern for all four countries and recently, each has undertaken at least one major study to address the various challenges confronting their transport system. Funding sources, financing mechanisms and partnerships, climate change, freight, congestion, regional and national networks, aging infrastructure, and social equity are top concerns. However, in comparison to government sponsored studies in the US, the comparison countries are more focused nationally on sustainable development.

Each country's commitment to sustainable development, prior to and since signing on to the Kyoto Protocol in 1996, influences their national and departmental goals. National transportation policies, programs, and projects focus on access and quality of service, but also on the role transport plays in regional economic development, social inclusion, and environmental quality, including climate change. Sweden included sustainable development objectives in its transport policies in the 1980s, the UK in the early 1990s, following the EU commitments, and Canada in 1995. Sweden's transportation goal is a socio-economically sustainable transport system in which funding decisions account for the full social costs and benefits of each project, including costs and benefits to the environment, the economy, and equity. The UK emphasizes the need to balance economy, environment, and equity without comprising one for another. Canada's goals are safety, efficiency, and environmental responsibility, including affordability, accessibility, and responsiveness to communities. In contrast, noticeably absent from the 2006 national transport goals in the US were equity, social development, regions, communities, and liveability.

Below we summarize how each country is attempting to implement its vision for sustainable development. The countries' strategies are similar to one another and reflect the Principles of Urban Sustainability from the European Sustainable Cities report in 1996; urban management, policy integration, ecosystems thinking, and cooperation and partnership. In particular, these principles are reflected in the vertical and horizontal cooperation in planning for housing, transport, and other infrastructure within each country; changes to the structure of departments for transportation; the prominence of regions; and their work with non-profits and other partners on climate change, sustainability education, and other programs.

Canada's Policies and Practices for Sustainable Development

The national role in Canadian transportation formerly was limited to regulation, safety, and investment in nationally significant infrastructure, such as certain ports and federal bridges. The central government devolved its operations and maintenance roles in 1994. The provinces are responsible for building and funding nearly all local and regional transport through provincial gas taxes and other local taxes, and until 2001, municipalities in most provinces were responsible for nearly all public transit with the exceptions in the provinces of Manitoba, Quebec, and British Columbia (Bradford, 2005).

A stronger central government role resulted from recent government reviews including the 2001 Prime Minister's Task Force on Urban Issues, which indicated the need for much greater investment in affordable housing, regional transport and transit, and sustainable infrastructure (Wolfe, 2003). The second and third rounds of Sustainable Development Strategies under the Office of the Commissioner of Environment and Sustainable Development required Sustainable Transport plans in 2001 and 2003. In 2006, the national strategic plan, *Advantage Canada,* with its corresponding sub-plan within the Ministry of Transport, Infrastructure, and Communities, *Building Canada,* updated urban development and transport investment policies. Since 2001, the central government has gone from no funding of public transport, to annual and increasing expenditures on transit. In the 2007/2008 budget year, transit expenditures were nine times greater than national expenditures on roads.

In 2008, the Ministry signed separate framework agreements with each province to confirm the two levels of government will take a collaborative long term approach to planning infrastructure. The agreements commit the governments to a joint spending plan, accountability procedures, a stable and predictable source of funding, and collaborative management. Provinces will each receive a base funding amount for municipal infrastructure, and additional program funds will be allocated to the provinces depending on project need based on applications by the provinces to the national department, Infrastructure Canada. Canada's hands-off approach with provinces did not result in consistent outcomes across provinces (Evans, 2007; Webb, 2008). Sustainable development requires investments that some provinces and municipalities are unable to fund. The different resources and locational advantages of each of the provinces collectively contribute to the national economy and therefore need to be coordinated nationally; Edmonton's oil, Vancouver's and Quebec's ports, Ontario's manufacturing, etc.

The new Canadian Ministry of Transport, Infrastructure and Communities combines the previously separate ministries into a single portfolio, both to reduce costs of administration but more importantly, to coordinate economic development with transport and infrastructure investments, to work with communities to find ways to reduce pollution from goods and people movement through communities, and to improve the quality of life by helping to build and maintain shared projects such as community centers, water treatment, roads, and bridges (Department of Finance Canada, 2006).

Finally, the federal government has directed Transport Canada to review the economic and financial performance of the entire transport system, by mode, every five years. To realize performance improvements, the central government assumes it will need to work more closely with the provinces and regions.

Canada's Carbon Policies

In Canada, the national government and Transport Canada have set targets, established tracking and performance monitoring programs, and created new programs aimed at reducing carbon emissions. The ecoACTION program is the national comprehensive program to improve the environment and it contains programs for agriculture, energy, and transport, plus a dedicated trust fund to support projects that "have measurable, positive impacts on the environment". The program has funded hundreds of community projects (Environment Canada, 2009). The Moving on Sustainable Transport program (MOST) provides grants to non-governmental groups and programs in cities and regions that provide a variety of programs to help individuals and businesses reduce carbon, including marketing campaigns, bicycling programs, travel planning, etc. However, through 2005, the most important restraint on CO2 emissions from transport in Canada has been its fuel economy standards.

With an MoU between government and the auto industry, Canada adopted fuel economy standards tied to the US CAFÉ standards in 1982. Their new cars went from approximately 22.5 mpg in 1981 to 27.8 MPG in 1982, where it has remained (with fluctuations). New cars in Canada sold in 2005 achieved 27.5 MPG, the equivalent of 202 gm/km, about 5% less than those in the U.S. But a key change in Canada was large increase in fuel taxes in 1981, which sent Canadian fuel prices from well below those of the US to well above. US new cars did not achieve 27.5 MPG until five years after those in Canada, suggesting that the large fuel tax increase in 1981 had an important impact on cars Canadians bought the very next year.

Sweden's Policies and Practices for Sustainable Development

In Sweden, the national government funds the national rail network and main highway network, usually under a 10 year package. It promulgates the basic land use and housing law requiring every municipality to have a land use plan. It sets safety and air pollution/fuel quality standards and fuel taxation. Counties are required to appoint a transport chief to oversee local rail and transit and insure that schedules are coordinated that also fit with national rail and even local airports. Private operators may bid for this service or the local authority may provide the service. At certain times the national government has funded local procurement of rolling stock, but in general counties or municipalities are in charge of funding and administering local transport. A key exception is where a local or regional route would be very unprofitable for a concession and expensive for a county to maintain, yet vital for national security, regional competitiveness, or equity. In such cases, the national traffic chief assures bus or rail services. Municipalities ("kommuner") are in charge of local road

investment and maintenance. Fuel taxation is solely the authority of the national government, but municipalities are funded by a large share of personal income taxes and property taxes.

Driven by concerns over congestion, transport-related pollution, and isolation of rural areas, Sweden began a series of institutional reforms in the 1970s. The goals were to strengthen local transport and insure that transfers from long-distance rail or air to local public transport was smooth, and to use both land-use regulation and encouragement of local authorities to implement other measures (such as traffic calming) to help reduce or smooth traffic and thus improve air quality, safety, and noise levels in neighborhoods. This ongoing effort recognized how connected modes of transport were not only to each other but to housing, employment, outdoor space and free time, and economic development.

Sweden was reluctant to join the European Union and was among the last set of Western European countries to join before the large number of New Member States from Eastern Europe. Some argue that Sweden's strong social and environmental policies have had an influence on EU policy, both before and since it joined the Union (Kronsell, 2002).

Sweden's Carbon Policies

Because Sweden took the international lead in pricing environmental externalities into fuels and vehicles in the early 1990s, it was relatively easy to add a carbon tax to road fuel that has increased regularly and is now approximately $1.40 US/gallon of gasoline. Per capita growth in auto vehicle kilometres travelled (vkt) has slowed under the weight of these and other fuel taxes. Tax breaks for acquiring flex fuel vehicles (using Brazilian ethanol or locally produced biogas), moves by major cities towards more renewable fuels for buses, and freight projects that transfer some road freight to rail, all have helped steer Sweden's transport system towards fewer CO2 emissions/km and fewer kilometers travelled in the most carbon intensive modes. CO2 reduction has been noted in official documents as an important co-benefit enhancing the value of the Stockholm congestion pricing scheme and other large projects. This shows how Swedish authorities integrate CO2 mitigation in these transport projects, basing their calculations on the carbon tax applied to transport fuels.

In Sweden and the UK, fuel prices have traditionally been much higher than in other western developed countries, including Canada and the US, and cars have been smaller and less powerful. However, no fuel economy standards were applied until the EU voluntary agreement with manufacturers on CO2 tailpipe emissions came into force in 1998. This aimed at an EU-wide sales weighted average CO2 emissions of 140 gm/km by 2008 (approx. 42.3 MPG for gasoline) compared with the 1995 base year value of 185 gm/km. For EU as a whole, 160 gm/km was achieved by 2006, an improvement of 14%. New cars in Sweden only achieved 189 gm/km in 2006, but this was still 16% below 1995 levels. Sweden pushed for flex fuel and biogas cars which helped provoke a 6% decline in 2007 over 2006. New cars in the UK have shown a 12% improvement 1995-2006, to 165 gm/km. Hopes that increased shares of diesel cars would lead to significant CO2 savings have not been met in either Sweden or the UK, both because new diesel cars only emit slightly less

CO2/km than gasoline and because diesel cars are driven so many more km/year than gasoline cars. The UK is now advocating a new car emission target of 100 gm/km (approximately 55 MPG test value for gasoline), well below the missed EU voluntary target of 140 gm/km or the new mandatory level of 120 gm/km. Both Sweden and the UK are investigating measures to reduce the influence of company-car tax privileges on raising both new car size/weight and driving distance.

United Kingdom's Polices and Practices for Sustainable Development

The UK has been developing its sustainable development policies since the early 1990s, along side the European Union's adoption of the principles following the 1987 Brundtland Commission. While it has been one of the lead countries in making changes through its Departments of Environment and Transport, its progress has been slow at times, and until recently, vague and non-committal (Glaister, 2002; O'Riordan & Voisey, 1997). However, recognizing the need to improve its transport system and to improve its policies for sustainable development, the UK launched several studies in 2005 and 2006: the Eddington Study on Transport, the Barker report on Planning, and the Stern report on Climate. Based on the reports, the Department for Transport (DfT) and Department of Communities and Local Government have made administrative changes to improve the sustainability and efficiency of major infrastructure planning. They are also working together on several projects, including locating and serving the new housing units in the government's plan for 3 million new units by 2020. The housing will be targeted to identify Growth Points and Eco-towns and accompanied by sustainable transport systems that emphasize public transport, walking, and biking infrastructure.

In 2007, DfT restructured its portfolios from modal divisions to objectives and places in order to improve both vertical integration and cross-modal integration (United Kingdom Department for Transport, 2007). The new divisions are: Cross Network (national policy), National Networks, City and Regional Networks, International Networks, and Delivery. This new format makes travel within the network the organizing principle for the division while maintaining modal expertise in financing, planning, and delivery (United Kingdom Department for Transport, 2008). Because of the UK's highly centralized planning system for land use and transport, the City and Regional Networks division supports project planning and delivery in cities and regions and it approves local and regional transport plans. However, the central government has been granting more planning authority to local governments, beginning with London, Scotland, and Wales, under the premise that local and regional authorities are most familiar with their travel needs and are better suited to integrate transport spending with other decisions on sustainable economic development. Further devolution is planned for all regions (the UK was divided into 9 regions plus London in 1994) and municipalities through the revised Spatial Planning and Transport Planning processes.

Even with devolution, the national government will continue to require that regional transport plans are coordinated with national economic development and housing plans and these separate plans may eventually be combined into Single Regional Strategies. The national

authority will also maintain responsibility for motorways, national railways, international gateways (ports and airports), and National Strategic Corridors the connections between the 14 national routes and the 10 largest metropolitan areas.

In 2008, the DfT updated its project selection process, the 1998 version of the New Approach to Transport Appraisal (NATA), to reflect growing concerns about climate, congestion, auto use, and budget deficits. The update also coincided with the UK's 2008 Climate Change Act, which gives each department a carbon budget and makes DfT responsible for the transport sector's carbon emissions. In their review of the 2008 version of the NATA, "Third Sector" partners, Green Alliance and Campaign for Better Transport, recognized the government for integrating some of the third sector's suggestions, but strongly criticized DfT for continuing to place too much weight on the benefit cost ratio (BCR) when prioritizing funding for transport schemes. In particular, the BCR gives too much credit to small differences in time savings and not enough to carbon reduction, equity and access, and transport choice. Through project selection case studies, these partners showed that the new NATA continues to preference road widening projects over multi-modal and transit projects (Cary, Phillips, & Harwood, 2009).

United Kingdom's Carbon Policies

DfT has a multi-pronged approach to reduce carbon emissions: pricing carbon, developing low-carbon technologies and transport options, reducing the need to travel through planning, and providing information to the consumer. On pricing carbon, the UK is working with the EU Commission to analyze the costs and benefits of including road transport emissions in the EU emissions trading scheme. Fuel duties are set high to reflect the costs of pollution and typically rise with inflation. DfT is also working with the Department of Environment, Food and Rural Affairs on the environmental impact and performance of cars and the Department of Business, Enterprise and Regulatory Reform on the impact of electric and plug-in hybrid vehicles, bio-fuels, and low carbon business opportunities, among other initiatives to support sustainable development and to meet their targeted carbon budgets. (See also the discussion above in Sweden's Carbon Policies, for the joint influence of the UK and Sweden on the EU's fuel efficiency and emissions standards.)

DfT supports research on attitudes and behavior regarding carbon reduction and lifestyle changes which is then used in marketing campaigns and programs to reduce carbon use, such as "Act on CO_2" and the Smarter Choices campaign, which encourages travel planning for schools, workplaces, and individuals. School children aged 5-16 are taught about sustainable development and the relation between individual travel behavior and climate change through the National Curriculum. The Vehicle Excise Duty and the Fuel Economy vehicle labels were both reformed to provide consumers with more information and financial incentives to purchase the most efficient vehicle in their preferred car class. National transport carbon reduction programs will be disseminated to cities and regions through a forthcoming revised Guidance on Local Transport Plans as well as funding and planning packages that help to implement demand management, public transport, cycling, smart travel

choices, and land use planning designed to reduce the need to travel. The plan is for DfT to incorporate the expected impact of these carbon reduction measures in their transport forecasting models which will then determine infrastructure expenditures and projects in the cities, regions, and national networks.

Policy Influence? Travel Trends 2000-2006

In their study of transport trends from the 1970s to 2005 in six industrialized western nations, including the four studied here, Millard-Ball and Schipper (2010) identified a plateau of VKT/person after decades of increase, lowered CO2 emissions per vehicle kilometer of car travel, and modest mode shifts beginning in 2000. They assert these trends are driven both by continued higher fuel prices, and for EU countries: the voluntary agreement on autos. Table 4 shows that the transport trends from 2000 to 2006 are more favorable in Canada and the UK, in terms of sustainable development, than in the US. For Canada, though vehicle ownership grew, per capita car use (passenger kilometers) declined, per capita car travel (vehicle-kilometers) had only a modest increase and was much less than the US. Their vehicle efficiency also increased, as did per capita bus travel, though not as much as it did in the UK or US. In the UK, despite a large increase in per capita GDP and vehicle ownership, per capita car use and car travel increased less than the US; and bus and rail mode share, and per capita bus travel, increased the most among the four countries. Sweden is the exception in these trends; it had relatively high growth in vehicle-kilometers of car use, though not car travel in passenger kilometers, and saw a relatively large decline in per capita bus travel. In essence, vehicles were driven more, but so did travel activity, and not all passengers switched to vehicles. One factor in these comparisons is the measure; as a percentage change, the base matters and in each case the base begins at a more sustainable level for the comparison countries than it does for the US.

Table 4. Transport Trends: Change from 2000 to 2006

	Canada	Sweden	UK	US
Per capita GDP US$2000 PPP	9%	14%	11%	9%
Vehicle ownership (cars/1000 people)	5%	2%	8%	3%
Per capita car use (vehicle km travel/capita)	-2%	10%	3%	4%
Per capita car travel (passenger km traveled/capita)	0.3%	2%	2%	4%
Bus and rail mode share	-1%	0%	5%	-4%
Vehicle efficiency (MJ per car km)	1%	3%	-9%	-1%
Per capita bus travel pkm/yr	1%	-5%	4%	2%

CONCLUSION: LESSONS FOR THE US?

We conclude that despite differences in context, the experiences of Canada, Sweden and the UK offer lessons on how the United States might close its own transport funding gap, improve the quality of surface transport, reduce CO2 emissions, and make transport more sustainable. In particular, we find that other affluent countries with high auto ownership and

use have delivered better transport performance, especially from a CO2 emissions perspective, than the US.

Analyzing national transport policy for effectiveness is indeed risky. As transport and land use planners have recounted in countless studies, numerous factors affect travel behavior; urban form, pricing, individual circumstances, weather, and quality of the transport system-including the transit reliability and speed, and level of road congestion. However, we found that a host of policies and tools targeted at the goals of sustainable development have resulted in positive benefits.

While the US government is spending more on transport per capita, its transport system does not show an adequate return for this huge investment. As a result, US residents spend a large share of their income on transport, they pollute more in less efficient cars, and they have fewer options for travel. In contrast, the comparison countries have lower transportation costs per capita for government, more revenues to invest in transit and rail, lower emissions per mile travelled, greater and increasing use of alternative modes, and fewer vehicle miles per capita.

The three comparison countries were invoking the four principles outlined for urban sustainability: urban management (changing governance to address the three issues of sustainability; economy, environment, and equity); policy integration (working vertically and horizontally across agencies and levels of government on housing, infrastructure and urban development); ecosystems thinking (looking at transport regionally and in networks); and cooperation and partnerships with the private and non-profit sectors (working with nonprofit and private sector partners to evaluate programs, promote sustainability, and provide local transit services). While the US has had comparable policies promoting environmental protection, social equity, public private partnerships, and economic development, a major missing link is that the US has not carried through on connecting these policies to transport taxation and finance, or messages about sustainable transport and development. As a result, its taxation and finance policies undermine its other goals.

Changes in US policy may be on the way. Throughout 2009, the new US administration began implementing new policies aligned with principles of sustainable development. The Departments of Transportation and Housing and Urban Development, and the Environmental Protection Agency have signed an interagency agreement to promote sustainable communities through the coordination of housing and transport spending and planning at the federal, regional, and local levels. The White House has mandated new auto fuel standards. There has been a modest push for travel behavior changes by providing incentives for more fuel efficient cars, the Cash for Clunkers program, and rebates for hybrid vehicles, but there is little discussion at the federal level about reducing ones carbon footprint by taking transit, walking, and biking. Incentives for buying more fuel efficient cars are an expensive way to reduce CO2. Meanwhile, several large cities throughout the US are cutting back on transit services, operations, and maintenance.

However, the taxation and finance piece remains missing. These new ad-hoc administration policies are largely separate from one another and lack an overarching vision with performance goals. Without the political will and commitment to meeting clear targets, as the comparison countries each made with their commitment to the Kyoto Protocol, the US transport programs will be watered down to the lowest denominator among the states, rather than to necessary targets. In terms of setting transportation strategy and vision, US transport policy needs to expand from a list of separate goals for safety, economic growth, efficiency, and the environment, to include equity, social development, and the importance of regions and communities, that are then tied together through a larger framework of sustainable development. In this framework, the goals reinforce one another and can be achieved simultaneously through programs for housing, transport, and other infrastructure that address all the goals.

Concluding Comments: Lessons from the Cases

Set sustainable development as the goal: The US should adopt policies that require transportation programs and projects to be sustainable economically, socially, and environmentally in both the short and the long term. Projects that receive national funding in Canada, the UK, and Sweden are expected to improve transportation sustainability. Policies and programs emphasize transit and non-motorized modes and, in Sweden and the UK, encourage pricing that reflects social, economic and environmental costs. The US should evaluate its projects on sustainability grounds and should move expeditiously toward more sustainable pricing strategies. Sweden, the UK and Canada are all ahead of the US in responding to the threat of global warming, even though US CO2 emissions per capita are much higher. To address this problem the US should adopt lifecycle cost-effective fuel, vehicle, travel demand and urban development policies immediately and reorganize institutions to effectively deliver programs and projects supporting a sustainable high quality of life. The US should also examine how all three countries are working to relieve crowded roads of some freight by shifting to rail, which yields an important co-benefit of reducing CO2 emissions.

Use pricing and information to influence behavior to meet intended outcomes: The US has substantially lower fuel taxes and fewer policies that connect transportation prices to transportation's full social, environmental, and fiscal costs. While an increase in the US gas tax would be justified immediately, the changes in transport fuels and vehicle technologies that are occurring point to the need for a transition to other types of pricing, including vmt fees, carbon fees, and congestion fees. American technologies can help to speed these transitions, and provide needed jobs. These behavior changes are worth pursuing. Other countries are effectively using similar pricing, incentives, and information campaigns to encourage their citizens to buy more efficient cars, drive fewer miles, to use transit, and to adopt other more sustainable travel patterns.

Coordination: While the national role and its share of the total transport budget varies across nations, the US stands out in having far weaker policy coordination among levels of

government, particularly in land use and transportation planning, as well as fewer incentives for harmonizing state and local policies with national ones. The US should adopt policies that explicitly incentivize greater policy harmonization and greater intergovernmental collaboration and cooperation to achieve sustainable transport. The US also stands out in having weak coordination of transport investments with public and private investments in other sectors; in coordinating urban and regional transportation infrastructure with intercity transport; in coordinating transport investments to investments in other infrastructure; and in integrating transport investments with those in housing, urban development and redevelopment.

REFERENCES

Beatley, T. (2000). *Green urbanism: learning from European cities*. Washington, DC: Island Press.

Bradford, N. (2005). Place-based Public Policy: Towards a New Urban and Community Agenda for Canada. Ottawa: Canadian Policy Research Networks, Inc.

Button, K. (2007). Transport Policy. In A. M. El-Agraa (Ed.), *The European Union: Economics and Policies* (8th ed., pp. 298-313). Cambridge; New York: Cambridge University Press.

Cary, R., Phillips, R., & Harwood, J. (2009). The right route: Improving transport decision-making (pp. 15). London: Green Alliance.

Cervero, R. (1988). *The Transit Metropolis: A Global Inquiry*. Washington, D.C.: Island Press.

Committee for an International Comparison of National Policies and Expectations Affecting Public Transit, N. R. C. (2001). Making Transit Work: Insight from Western Europe, Canada, and the United States -- Special Report 257. Washington, D.C.

Deakin. (2006). Transportation, Urban Form and Economic Growth: Environmental Issues: Background Paper for Transport, Urban Form and Economic Growth, OECD Roundtable 137, Winter 2006.

Deakin, E., Ferrell, C., Mason, J., & Thomas, J. (2002). Policies and Practices For Cost-Effective Transit Investments: Recent Experiences in the United States. *Transportation Research Record of the Transportation Research Board, 1799*, 1-9.

Department of Finance Canada. (2006). *Advantage Canada Summary Report 2006*. Retrieved from http://www.fin.gc.ca/ec2006/plan/ecpame.html.

Environment Canada. (2009, May 22, 2010). Environment Canada's EcoAction Community Funding Program Retrieved June, 2009, from http://www.ec.gc.ca/default.asp?lang=En&xml=C8FBA5FA-486D-4D82-86CD-B19C6B52B434

Evans, L. (2007). Moving towards Sustainability: City-Regions and their Infrastructure *Family Network Project* (Vol. F-137). Ottawa: Canadian Policy Research Networks.

Glaister, S. (2002). UK Transport Policy 1997-2001. *Oxf Rev Econ Policy, 18*(2), 154-186. doi: 10.1093/oxrep/18.2.154

Haas, P., Carrie Makarewicz, Albert Benedict, and Scott Bernstein. (2008). Estimating Transportation Costs for Households by the Characteristics of the Neighborhood and Household. *Transportation Research Record of the Transportation Research Board*.

Harrison, K. (2007). The Road not Taken: Climate Change Policy in Canada and the United States. *Global Environmental Politics, 7*(4), 92-117.

Heston, A., Robert Summers, and Bettina Aten. (2006). Penn World Table Version 6.2. Retrieved Accessed June 2007, from University of Pennsylvania, Center for International Comparisons of Production, Income and Prices http://pwt.econ.upenn.edu/

Hill, S. (2010). *Europe's Promise : Why the European Way Is the Best Hope in an Insecure Age*. Berkeley: University of California Press.

Kronsell, A. (2002). Can small states influence EU norms? Insighs from Sweden's participation in the field of environmental politics. *Scandinavian Studies, 74*(3), 287.

Lucas, K. (2004). *Running on empty : transport, social exclusion and environmental justice*. Bristol: Policy Press, University of Bristol.

Millard-Ball, A., & Schipper, L. (2010). *Are we reaching 'peak travel"? Trends in passenger transport in industrialized countries*. Paper presented at the 12th WCTR, Lisbon, Portugal.

Nakagawa, D., & Matsunaka, R. (1997). *Funding transport systems : a comparison among developed countries*. Amsterdam; New York: Pergamon.

National Surface Transportation Infrastructure Financing Commission. (February 2009). *Paying Our Way- A New Framework for Transportation Finance*. Retrieved from http://financecommission.dot.gov/Documents/NSTIF_Commission_Final_Report_Mar09FNL.pdf.

National Surface Transportation Policy and Revenue Study Commission. (2008). *Transportation for Tomorrow: Report of the National Surface Transportation Policy and Revenue Study Commission*. Washington, D.C.: Retrieved from http://transportationfortomorrow.org/final_report/.

National Transportation Policy Project. (2009). Performance Driven: A New Vision for U.S. Transportation Policy (pp. 136). Washington, D.C.: Bipartisan Policy Center.

O'Riordan, T., & Voisey, H. (1997). *Sustainable development in Western Europe : coming to terms with Agenda 21*. London; Portland, Ore.: Frank Cass.

Panagopoulos, C., & Schank, J. (2007). *All Roads Lead to Congress: The $300 Billion Fight Over Highway Funding*. Washington, DC: CQ Press.

Pucher, J. (1988). Urban Travel Behavior as the Outcome of Public Policy: The Example of Modal-Split in Western Europe and North America. *Journal of the American Planning Association, 54*(4), 509-520. doi: 10.1080/01944368808976677

Pucher, J. (1995). Urban Passenger Transport in the United States and Europe: A Comparative Analysis of Public Policies: Part I: Travel Behaviour, Urban Development and Automobile Use. *Transport Reviews, 15*(2), 99-117.

Schiller, P. L., Bruun, E. C., & Kenworthy, J. R. (2010). *An Introduction to Sustainable Transport: Policy, Planning, and Implementation*. Washington, DC: Earthscan.

Schipper, L., Makarewicz, C., & Deakin, E. (January 2009). National transport funding, policies, and carbon reduction strategies in Canada, United Kingdom, and Sweden. *Working Papers*: UC Berkeley, Global Metropolitan Studies. Available from http://metrostudies.berkeley.edu/wp.html.

United Kingdom Department for Transport. (2007). *Toward a Sustainable Transport System*. United Kingdom.

United Kingdom Department for Transport. (2008). National Networks Retrieved October, 2008, from http://www.dft.gov.uk/press/speechesstatements/statements/wmsnationalnetworks.

US Department of Transportation. (2008). *Refocus. Reform. Renew. A New Transportation Approach for America*. Washington, D.C.

Webb, B. N. (2008). *The Articulation and Coordination of National level Planning Policy in Western Europe: Lessons for Canada*. Paper presented at the ACSP-AESOP Fourth Joint Congress, Chicago, Illinois, U.S.A.

Wolfe, J. M. (2003). A National Urban Policy for Canada? Prospects and Challenges. *Canadian Journal of Urban Research, 12*(1), 1-21.