

# EVOLVING CONCEPTS OF TRANSPORT SUSTAINABILITY: U.S. EXPERIENCE

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## ABSTRACT

Over the past 20 years, U.S. transportation professionals have embraced sustainability, recognizing that transportation is central to any concepts of development that span multiple generations and seek to balance economic, environmental, and social needs. But definitions vary about what is meant by sustainability in a transportation context.

At the state and local planning levels, terms such as “sustainable transport” and “sustainable mobility” generally refer to actions that promote modal diversity, reduced emissions and energy consumption, compact development, and greater social awareness. Trends to introduce more environmentally and socially sensitive planning methods, however, were well under way when these terms appeared, and although sustainability terminology was helpful, it was not essential for reform of transportation planning methods and policy.

The Brundtland Commission concept of sustainability focuses on planet-wide problems, such as climate change, that require difficult actions by all nations for the sake of future generations. With respect to greenhouse gas (GHG) emissions, the United States has made modest improvements to motor vehicle fuel economy but has not committed itself to measures such as broad-based carbon pricing or more aggressive fuel economy standards that would put it on a pathway to achieving the significant GHG reductions needed to affect climate change trends.

## 1. INTRODUCTION

In the United States “sustainability” has become a staple of the everyday vocabulary over the past 20 years. In the process, the term has taken on a variety of meanings, some of which may have obscured the underlying sustainability concept that first attracted worldwide attention.

For the most part, U.S. transportation professionals have embraced sustainability, recognizing that transportation is central to any concepts and strategies that span multiple generations and seek to balance economic needs, resources, and environmental quality. But transportation professionals, like professionals in other fields and the public at-large, are not of one mind about what sustainability means; how it should affect transportation policy, planning, design, and operations; and how it should be applied at different geographic scales.

This paper offers some observations about how sustainability concepts have influenced transportation in the United States, and how the use of the term and its meaning have evolved.

## **2. SUSTAINABILITY CONCEPTS AND DEFINITIONS**

The best-known definition of “sustainable development” is the one put forth by the Brundtland Commission [1]: “A sustainable condition for this planet is one in which there is stability for both social and physical systems, achieved through meeting the needs of the present without compromising the ability of future generations to meet their own needs.” This definition is broad in scope: it embraces both social and physical systems and covers the entire planet. It takes a long-term view: it calls for intergenerational equity. It is concerned with big, planet-wide problems that typically involve a “tragedy of the commons” on a massive scale: as we individually behave rationally and pursue our own needs, we deplete resources, change the climate, or do other things that are not in the interest of the planet or of future generations.

Transportation clearly had a role in the large-scale environmental, economic, and social concerns to which the sustainability concept was first directed, and by the early 1990s, U.S. transportation researchers and practitioners began to make references to “sustainable transport,” “sustainable transportation,” and “sustainable mobility” in the published literature. Definitions varied of course, and some simply tried to restate, more or less, the Brundtland Commission definition in transportation terms. For example, in a paper co-authored with Thomas Deen [2], the author offered this version in 1994: “...sustainable transportation means a transportation system and process for modifying or adapting the system that can accommodate expected population changes, growth in economic activity, and changes in resource availability and meet environmental standards indefinitely.”

Although the topic was beginning to appear in the mainstream literature, it was not part of mainstream transportation practice. Indeed, for a time there was some risk that the sustainability perspective might be misunderstood as just another piece of “anti-highway” rhetoric rather than a more holistic way of thinking about development, environment, and resources issues that include transportation generally and roads in particular.

Today, sustainability is not viewed as anti-highway rhetoric. The term is commonly used by the mainstream transportation community throughout the United States. Conferences are organized around transport sustainability, academic research centers include sustainability in their name, and even some state and local government offices do so as well. But this does not mean that there is a commonly accepted, well understood definition of sustainable transportation or that it is used in ways that hark back to the Brundtland Commission’s concerns about planet-wide environmental conditions and intergenerational equity. The real issue is not definitional but rather the extent to which sustainability concepts in their various forms have influenced, and are reflected in, transportation policy and practices in the United States.

## **3. OPERATIONALIZING SUSTAINABILITY CONCEPTS**

Moving from sustainability concepts to changes in policy and practice has not been straightforward. There were questions about which issues to tackle, at what scale, and how the concepts related to transportation.

The United States probably lagged other parts of the developed world in incorporating sustainability into national policy debates about resources and the environment. For instance, the National Research Council (NRC), the operating arm of the National

Academies of Sciences and Engineering, did not issue its first major report [3] on sustainability, *Our Common Journey: A Transition Toward Sustainability*, until 1999. The Transportation Research Board (TRB), which is part of the NRC, completed its first major sustainability-related study two years earlier, *Toward a Sustainable Future: Addressing the Long-Term Effects of Motor Vehicle Transportation on Climate and Ecology* [4]. This report explicitly avoided defining sustainable transportation and instead addressed what the authoring committee considered to be the main sustainability challenges posed by highway transportation—greenhouse gas (GHG) emissions that contribute to global warming and disruptions to natural habitats that threaten biodiversity.

The narrow, very focused use of sustainability concepts in the 1997 TRB report has been more the exception than the rule in the United States and elsewhere. The World Bank's 1996 report [5] on sustainable transport argued that transportation investments regardless of scale should be not be evaluated strictly based on economic returns but rather with respect to three sustainability criteria: economic and financial sustainability, environmental sustainability, and social stability. Today, hardly anyone would dispute the value of evaluating major transportation investments according to these dimensions, but taking into account local environmental and social impacts was hardly revolutionary in 1996 and not something first stimulated by notions of sustainability.

The World Bank report is a prime example of the evolution of the term sustainability as it applies to transportation. By 2000, the term was widely used in the United States in a broad context to refer to transportation systems that incorporate many or most of the following characteristics: increased pedestrian and bicycle transportation; more, and more varied, public transportation options; pricing of highway transportation to include external costs; the use of hybrid, electric, or alternative-fueled vehicles; coordinated land use and transportation investments; context-sensitive design; and greater attention to environmental and community impacts.

Today, “sustainability” is one of several, almost interchangeable, descriptors of new ways to manage the U.S. road system usually in the context of more compact, energy-efficient urban forms: smart transportation, smart growth, livable communities, and context-sensitive design.

## **4. THE RESULTS: WHAT HAS THE IMPACT BEEN?**

### **4.1. Impacts at the State and Local Levels**

It has now been roughly 20 years since the transportation community in the United States first began discussing sustainability and considering the role of transportation. Unquestionably, transportation practice in the United States has changed during this period in ways that are both profound and generally consistent with sustainability concepts as they are commonly understood. The changes are most evident at state and local levels where examples of the characteristics of sustainable transportation cited in the above section are frequently evident. Of course America could not be remade in this 20-year period, and it would take decades for the transport system itself to reflect fully these changes in planning and policy. For these and other reasons, the evolution of transport planning and its energy and GHG consequences varies widely across the United States, and thus the character of the transport system will continue to vary as well.

The heightened emphasis on community and environmental concerns is evident in a new set of highway planning and preliminary design tools developed by the Strategic Highway Research Program 2 (SHRP 2), which TRB manages on behalf of the Federal Highway Administration and state departments of transportation [6]. SHRP 2 is now refining and pilot-testing comprehensive models and a variety of planning aids that will enable planners and designers to consider environmental and community impacts in very sophisticated ways much earlier in the planning process and to conduct the entire process in a more holistic manner [7]. The evolution in this direction of “sustainability” is not complete and may never be complete as new environmental, social, and economic concerns arise.

It is worth emphasizing that at this point the challenge of changing planning practices and investment decisions at the state and local level is not related to a lack of concepts and theory. And, hopefully, it will not be related to the lack of suitable analytical tools for very much longer. Rather, the principal challenges of operationalizing new concepts in planning within the United States consist of such things as a confusing array of U.S. institutions and regulatory responsibilities. For the continued evolution in transportation planning and practice to result in even modest changes in the energy efficiency of urban transport, for example, they would have to be much better integrated with land use planning and regulation. With limited exceptions, governance of land use in the United States is carried out at the county, city, or town level. (In general, U.S. law and policy tend to place few constraints on the use of private property.) In contrast, decisions about major transportation infrastructure investments are made at the metropolitan or state level. Close coordination of transportation and land use planning in the United States is the exception rather than the rule. Indeed, even when local governments such as Portland, Oregon, have succeeded in linking transport and land use decision making at the metropolitan scale, the energy efficiency benefits are limited because policies affecting vehicle fuel economy and energy consumption are made at the national level. A recent TRB study [9] illustrates that the energy and emission benefits of more compact development alone are quite modest. To be effective, more compact development must be tied to other measures such as more aggressive fuel economy standards, which until recently had been unchanged for 20 years in the United States.

Integrating transportation investments with controls on development practices also faces the inherent difficulty of trading off more costly design and operational features against user and community benefits that cannot be easily translated into project funding. Such investments can be socially beneficial, but they require budgeting for, or internalizing, external costs passed along to future generations that are not generally recognized in U.S. public policies.

A final point concerning changes in state and local planning practices: they were already under way in the United States before many people heard the term “transportation sustainability.” They respond to important environmental (e.g., local air quality), economic, and social values that were changing the planning process, albeit not necessarily smoothly or consistently, as early as the 1970s. (There is a considerable literature in this area that could demonstrate this point, but the author will only cite one article by Marvin Manheim [8], a leader in conceiving how the planning process for transportation projects should be redesigned.) As a result, one can debate the extent to which sustainability concepts and worldwide attraction to these concepts played a role in the evolution of state and local planning and decision making. Without a doubt, the concept was generally consistent with these trends, and the author’s view is that the sustainability terminology played a helpful, if not essential, role.

## 4.2. Impacts on National Transportation Policy and Transportation System Performance

From the perspective of the TRB committee that first looked at transportation and sustainability in 1997 and focused on climate change and to a lesser extent biodiversity, the results are not so positive. Transportation in the United States still accounts for about 5 percent of the world's carbon dioxide emissions, and the United States contributes about 20 percent overall. While the United States is making progress toward introducing more fuel-efficient vehicles, and it has experienced recent moderation in growth of total motor vehicle travel, the United States has not introduced, nor are there any imminent plans to introduce, broad-based carbon pricing schemes, much higher fuel taxes, area-wide tolling, or other aggressive measures that would be necessary to promote significant changes in the use of fossil fuels.

A recent National Research Council study [10] noted that merely slowing the use of fossil fuels will not be enough to address climate change. The study concluded that to make a serious commitment to addressing climate change, the United States would have to cut GHG emissions over the 2010-2050 period to a level on average that is about one-third less than the 2010 emissions. One can argue about the share that the United States and U.S. transport should contribute to this sustainability target, but regardless, there is no indication that U.S. transport—or the United States more generally—is on a path that would meet even a proportional share.

TRB's 1997 report concluded that to get on that path with regard to transportation, the United States would need to impose additional constraints on transportation through more aggressive taxes, pricing of transportation consumption, or fuel economy standards. This conclusion is reinforced by a forthcoming TRB study [11] examining options to reduce transportation energy consumption and GHG emissions. Introducing such policy shifts, however, would require strong public support, which in turn requires that the public embrace sustainability in the full spirit of the Brundtland Commission. So far, that level of public acceptance does not exist.

## 5. CONCLUSION

Sustainability concepts have been applied to transportation in the United States at different geographic scales and often with somewhat different meanings. At the state and local level, the use of terms such as "sustainable transportation" was consistent with changes in transportation planning methods and practices already under way. Sustainable transportation and similar terms have been generally associated with actions that promote more energy-efficient transportation, transportation with fewer GHG emissions, greater modal diversity, and more compact urban development. At this point, the major impediments to development with these characteristics are institutional and regulatory.

At a national level, debate continues within the United States about the appropriate response to planet-wide environmental problems that drew the attention of the Brundtland Commission, especially climate change and the reduction of GHG emissions. With regard to GHG emission reductions, aggressive national policies that increase the cost of motor vehicle travel using petroleum-based fuels and promote more fuel-efficient technologies would be required for the transport sector to make significant contributions. So far, broad public support for such policies has not developed.

## REFERENCES

1. World Commission on Environment and Development (1987), *Our Common Future*, Cambridge University Press.
2. Deen, T. B. and Skinner, R. E. (1994), A Paradigm for Addressing Change in the Transportation Environment, *TR News*, No. 174, September-October, pp 11-13.
3. National Research Council (1999), *Our Common Journey: A Transition Toward Sustainability*, National Academy Press.
4. Transportation Research Board (1997), *Toward a Sustainable Future: Addressing the Long-Term Effects of Motor Vehicle Transportation on Climate and Ecology*, Special Report 251, Washington, D. C.
5. World Bank (1996), *Sustainable Transport, Priorities for Policy Reform*, Washington, D.C.
6. Transportation Research Board (2011), [www.trb.org/shrp2](http://www.trb.org/shrp2)
7. Transportation Research Board (2011), [www.transportationforcommunities.com](http://www.transportationforcommunities.com),
8. Manheim, M. L. (1973), Reaching Decisions About Technological Projects with Social Consequences: A Normative Model, *Transportation*, Vol. 2, No. 1, pp 1-24.
9. Transportation Research Board (2009), *Driving and the Built Environment—The Effects of Compact Development on Motorized Travel, Energy Use, and CO2 Emissions*, Special Report 298, Washington, D.C.
10. National Research Council (2010), *Limiting the Magnitude of Future Climate Change*, The National Academies Press, pp 36-40.
11. Transportation Research Board (2011), *Policy Options for Reducing Energy Use and Greenhouse Gas Emissions from U.S. Transportation*, Special Report 307, Washington, D.C.