

Achieving environmental sustainability beyond technological improvements: Potential role of high-speed rail in the United States of America



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ABSTRACT

In order to reduce energy use and cut emissions that contribute to climate change, countries need to radically reinvent their fossil-fuel intensive transportation systems. As a major consumer of energy and contributor to greenhouse gas (GHG) emissions, the U.S. transportation sector faces extraordinary challenges in the twenty-first century. Transportation in the U.S. depends heavily on fossil-fuel dependent cars and planes to the near exclusion of more energy-efficient electric trains. In order to address this concern, some policy makers refer to “technological optimism” which seeks no systemic change but instead focuses on employing technology to reduce the energy demand and environmental impact of the status quo. On the other hand, some researchers suggest a systematic paradigm shift away from cars and planes to intermodal systems that improve the sustainability of the system as a whole. High-speed rail (HSR) is arguably such an investment that can further this shift and help to achieve a more diversified and balanced transportation system. In this respect, by largely examining the role of the U.S. cars and planes “culture” in the economy, this paper elaborates on how building a HSR system may help U.S. advance towards environmental sustainability in transportation, make a break from the status quo, and create a more balanced, multimodal transportation system that will improve the quality and efficiency of travel.

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Introduction

Currently, most efforts to resolve the problems of energy, emissions, and the negative health effects of transportation are being addressed not by rethinking the system and developing a more balanced, intermodal system, but by improving the efficiency of plane and car design and operation. These efforts include developing more sustainable vehicles, increasing fuel efficiency, exploring alternative fuels, promoting more efficient flying and driving techniques, and developing safer vehicles, including driverless cars. Given the very high oil dependency of transportation, achieving sustainability—ensuring “that we have, and will continue to have, the water, materials, and resources to protect human health and our environment” (Environmental Protection Agency, 2013c) requires a systematic paradigm shift away from cars and planes to intermodal

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systems that allow travelers to make a shift to less carbon-intensive modes that improve the sustainability of the system as a whole. For decades, Japan, France, and other countries have benefited from building efficient, electric high-speed rail (HSR) for intercity travel. HSR runs on electricity that can be generated from renewable sources and has been shown to attract ridership away from air travel on busy medium-distance intercity routes. Meanwhile, the U.S. abandoned much of its once-extensive passenger rail service and re-directed investment to the road and air travel infrastructure that now predominates its transportation system. In an important shift spurred by today's concerns about congestion, energy, and the environment, the federal government and several states are reviving rail and working to reduce the nation's dependence on fossil-fuel intensive modes. Along with private investors and industry advocates, HSR projects are initiated along strategic corridors.

By largely considering the unsustainable environmental costs of the current transportation system, this paper suggests that building a HSR system can be one of the crucial investments in the U.S. in order to make a break from the status quo, improve environmental sustainability in transportation, and create a more balanced, multimodal transportation system. The paper first considers the U.S. transportation dependency on oil and its emissions related to greenhouse gases. Second, the importance of the car in the U.S. economy and culture is presented and the environmental and social costs of both automobiles and aviation are discussed. Accordingly, the unsustainable nature of the current system is emphasized and HSR's potential role in fostering a more sustainable transportation system in the U.S. is elaborated.

Transportation's oil dependence and greenhouse gas emissions

In 2011, Americans used some 19 million barrels of oil a day, making the U.S. the biggest consumer in the world (U.S. Energy Information Administration, 2011). The transportation sector consumes an estimated 72% of this total (U.S. Executive Office of the President, 2011), largely due to its dependence on the use of road vehicles. While other energy-consuming sectors have had some success with alternative fuels [Fig. 1], transportation has made little progress in cutting its oil use. Transportation modes that burn fossil fuels emit carbon that interacts with atmospheric oxygen to form carbon dioxide (CO₂), a greenhouse gas. Greenhouse gases are those that insulate the planet and upset the balance of heat exchange between the earth and the atmosphere.

Despite efforts to reduce fossil fuel consumption and expand access to electric and hybrid vehicles, transportation's reliance on oil shows very limited signs of abating. As a result, even as China has become the biggest overall emitter of CO₂, the

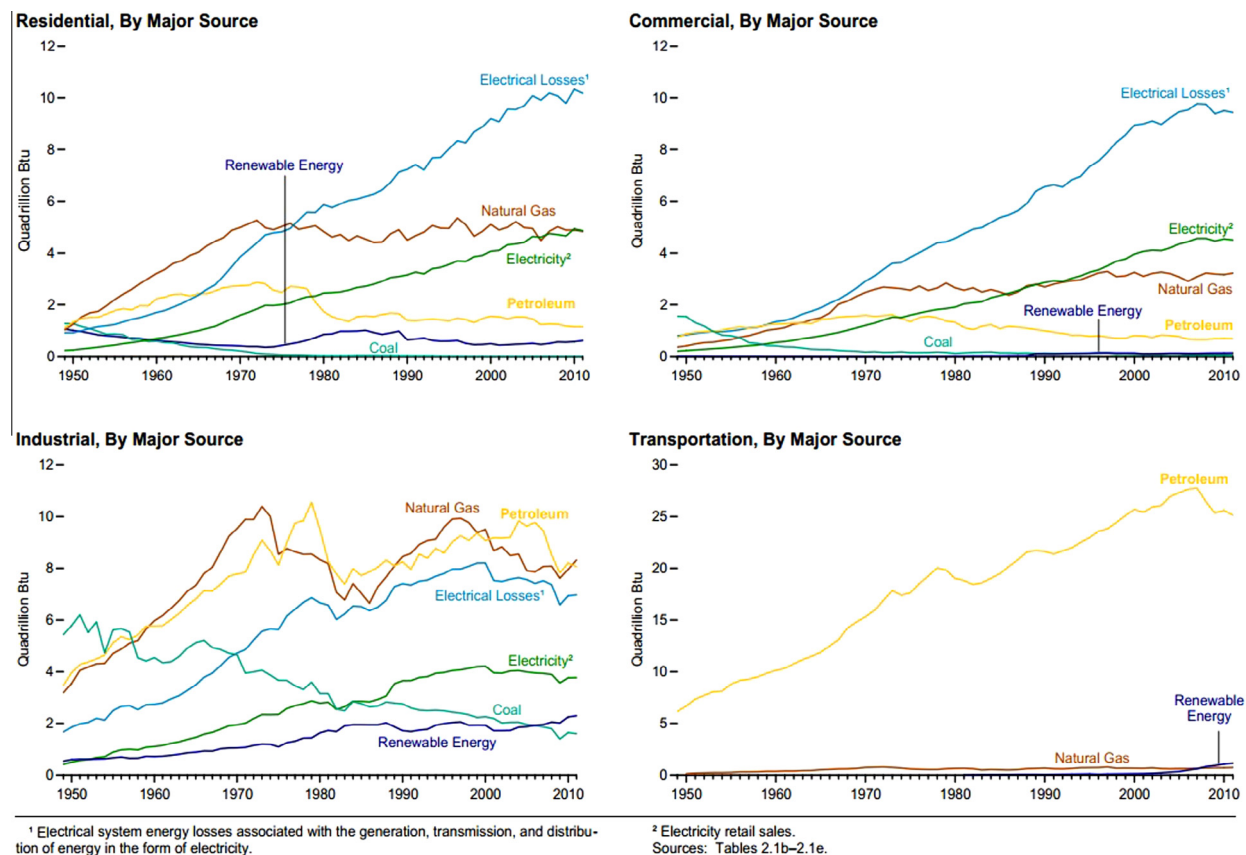


Fig. 1. Energy consumption estimates by end user sector measured in BTUs. Source: U.S. Energy Information Administration (2012).

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