The RAND Corporation is a nonprofit institution that helps improve policy and decisionmaking through research and analysis.

This electronic document was made available from www.rand.org as a public service of the RAND Corporation.

Skip all front matter: Jump to Page 1

Support RAND
- Purchase this document
- Browse Reports & Bookstore
- Make a charitable contribution

For More Information
- Visit RAND at www.rand.org
- Explore the RAND Corporation
- View document details

Limited Electronic Distribution Rights
This document and trademark(s) contained herein are protected by law as indicated in a notice appearing later in this work. This electronic representation of RAND intellectual property is provided for non-commercial use only. Unauthorized posting of RAND electronic documents to a non-RAND website is prohibited. RAND electronic documents are protected under copyright law. Permission is required from RAND to reproduce, or reuse in another form, any of our research documents for commercial use. For information on reprint and linking permissions, please see RAND Permissions.
This report is part of the RAND Corporation research report series. RAND reports present research findings and objective analysis that address the challenges facing the public and private sectors. All RAND reports undergo rigorous peer review to ensure high standards for research quality and objectivity.
Summary

Research Question

What might we expect for the future of mobility in the United States in 2030? Responses to this question will help transportation agencies at federal, state, and local levels to better prepare for the future. Although there is a legacy planning process to guide transportation decisions, long-range transportation planning involves many difficult choices, especially in an era of constrained resources. Which modes of transportation should be prioritized? Which investments should be funded? Which are the most-important trends to monitor over time? How are demographics, economics, and travel behavior likely to interact over time? These questions are hard to answer, particularly because transportation planners and policymakers must make decisions within a time horizon that extends 30 to 50 years into the future.

Although we know that the nation’s mobility (how people are capable of traveling from point to point) will be considerably different in 2030, figuring out how it will be different is a significant challenge. Substantial change tends to happen relatively slowly, but a long-term future can look very different from the situation today. For example, the U.S. Census Bureau projects that the U.S. population will grow from 308 million in 2010 to about 360 million in 2030. This is a big change from today’s number. Total miles traveled will also increase substantially as the population increases. However, the projected population growth will happen more slowly than the growth recorded in the past 50 years. How slowly the population grows will depend on the interactions of three underlying determinants: fertility, mortality, and net immigration. So what is important for long-term future policy- and decisionmaking regarding mobility is not how much the population will grow but where it will grow and who makes up that growth, as well as what will be the summation of the billions of their individual decisions about their mobility needs and wants. Demographic changes are only one of many different areas influencing future mobility.

Answers to our research question cannot be reliably addressed through straight-line trend analysis or improved travel demand forecast models. These approaches are lacking because the data and information to support long-term thinking about the future of mobility are uncertain, incomplete, evolving, or conflicting. Instead, we have applied scenario techniques, which are increasingly being used to deal with opportunities and risks of complex long-term issues. As we look ahead to 2030, multiple mobility futures are possible. Policy leaders face a big challenge in keeping people and goods moving today while reducing or avoiding negative consequences for the future. The relationship between today’s situation and a long-term future outcome is not linear. It is not even relevant to study the two points in time—now and then. It takes a systematic process of identifying possible, plausible futures and then of understanding the paths leading to those alternative futures.

Our study, which was a collaboration of RAND and the Institute for Mobility Research (ifmo), focused on long-term scenarios for passenger travel, which includes travel by car, transit, domestic air, and intercity rail. Long-term scenarios in this area are multilayered and complex, being influenced by demographics, economics, energy, transportation funding and supply, and technology. How these forces play out over the next 20 years will depend on whether and how policymakers and other decisionmakers sort out and address current and upcoming challenges. Although we cannot know these outcomes in advance, we can apply scenario planning to develop plausible mobility futures that can be used to anticipate and prepare for change.
Methodology

To develop alternative scenarios of the future of mobility, we applied a process that combined expert opinion gathered in workshops, impact analysis, consistency analysis, and cluster analysis. The study began with identifying five influencing areas and descriptors (variables of interest) within each area. Then RAND and ifmo convened five workshops, one for each influencing area: demographics, economics, energy, transportation funding and supply, and technology.

Six to eight subject-matter experts from government, academia, nonprofit organizations, and consulting firms were involved in each workshop, for a total of 37 individuals who brought considerable substantive experience in a variety of fields and disciplines. At each workshop, experts were asked for projections for each descriptor for 2030, along with their assumptions regarding the projection and their qualitative estimate of its impact on mobility. Where there was little uncertainty and high consensus, only one projection per descriptor was identified. Otherwise, two or three alternative projections surfaced.

The descriptors and projections were subjected to a cross-impact analysis and consistency analysis to identify relationships between the descriptors; these were then input into a computer support system. Cluster analysis was then used to group them into distinct scenario frameworks. Two scenarios were produced, No Free Lunch and Fueled and Freewheeling. A panel of 27 outside experts validated the scenarios through an online Delphi system, ExpertLens. The resulting scenario narratives were developed based on the assumptions and projections that surfaced during the expert workshops.
The Scenarios

The scenarios provide two distinct perspectives on the future of mobility in the United States in 2030. Each future represents a particular trajectory to arrive at the outcome. One path recognizes that climate-change effects, if severe and observable by enough Americans, will shift public sentiment to heavily favor regulation to mitigate greenhouse-gas (GHG) emissions. This policy direction, in addition to other global influences, causes a very high price of oil. Americans are driving less and using alternatives to conventional vehicles. On a rather different trajectory, abundant energy and cheap oil because of new supplies, technology, and global demand drive down the price of oil. The economy is booming, and Americans are driving more.

In this section, we briefly explore the United States in 2030 based on the two scenarios. Each provides a different future driven by a particular series of developments over the next two decades. Figures S.1 and S.2 provide a visual snapshot of these two scenarios.

Scenario 1: No Free Lunch

In 2030, several factors will have combined to bring about strengthened regulations to reduce dependency on oil and GHG emissions. Oil prices, rising for years, will have hit an all-time high. Two decades of undeniable evidence of climate change will have sparked changing attitudes among the public and business community to effect legislative change. National GHG-reduction policies will have been implemented. This legislation will have spurred innovation in the energy domain and the uptake of renewable and alternative fuels. Gross domestic product (GDP) and oil consumption will no longer be coupled; oil consumption will be down, and the supply will be constrained. New zoning restrictions will have created greater densities in urban and suburban areas, which, in turn, will have increased public transit use. The “young elderly” will continue to drive but favor alternatively fueled vehicles (AFVs) for cost savings and vehicles equipped with advanced driver-assistance systems for safety. Road pricing will be prevalent as a source of needed revenues to maintain and expand the surface transportation system and as a disincentive to use the system, which will have caused tangible reductions in congestion. The United States will address the effects of climate change with regulation, having reached a national consensus on its causes and effects, and this will have had a positive rather than a negative effect on the economy.
The price of oil is a major driver in both scenarios, along with the level of environmental regulation and the amount of highway revenues and expenditures.

Acknowledging that scenarios can be constrained by what is plausible, believable, or imaginable today, we crafted two wild-card scenarios to provoke “thinking about the unthinkable.” These assume that certain events have broken with otherwise-foreseeable trends.

One wild card is based on the possibility that China experiences a major debt crisis and ensuing economic stagnation, with economic and demographic impacts that profoundly affect the United States. The other assumes that autonomous vehicles, currently unavailable commercially and thought by our experts to be several decades away, experience cost reductions that make them marketable much sooner than expected, with attendant effects on transportation.
No Free Lunch

When evidence of climate change and very high oil prices combine to create changing attitudes about regulating GHG emission reduction

High CAFE standards • More innovation • Renewable energy • Electric vehicles • More telework • Shorter trips • Carbon tax • Better infrastructure • Greater car sharing • Densification • AFVs • Higher transit use • Rail freight transport

NOTE: CAFE = Corporate Average Fuel Economy.
Fueled and Freewheeling

When cheap and abundant energy, relatively low oil prices, and a lack of regulation combine to create high transport demand

- High per capita VMT
- Significant congestion
- High immigration
- Low unemployment
- Cheap to drive
- More cars
- Crumbling infrastructure
- Demand for air travel
- New home sales
- Fuel-efficient cars
- Suburbanization
- Geographic winners and losers

NOTE: VMT = vehicle-mile traveled.
Implications

For Future Mobility

For each scenario, we developed estimates of passenger-miles traveled (PMT) in 2030 for four transportation modes: vehicle, transit, domestic air, and intercity rail. Our analysis takes into account the descriptors’ influence on travel demand and the strength of that influence. Under both scenarios, the number of PMT in the United States has grown by 2030. Much of the increase is due to population growth. However, the increase is greater in Fueled and Freewheeling than in No Free Lunch by almost a factor of four, indicating the influence of factors other than demographics. PMT increased by 22 percent between 2010 and 2030 in Fueled and Freewheeling and by 6 percent in No Free Lunch (while population increased by 17.3 percent). On a per capita basis, though, PMT actually declined in the latter scenario by 9.5 percent even as total PMT increased. This is due to decreases in daily travel among certain population groups, such as young adults, older persons, and the technology-connected.

In both scenarios, growth in travel by air (68-percent increase in Fueled and Freewheeling, 37 percent in No Free Lunch) dwarfs the growth for highway miles of travel (16 percent and 2 percent, respectively). In the No Free Lunch scenario, economic growth has pushed air transport up, but high oil prices, in combination with additional carbon dioxide (CO2) emission trading costs, have increased ticket prices. So air travel demand is diminished from what it would be in the Fueled and Freewheeling scenario. In the Fueled and Freewheeling scenario, the significant growth is due to stronger economic growth and low oil prices. These two influencing areas, along with operational efficiencies, have caused airfares to grow more slowly than inflation, which drives substantial demand. As might be expected, growth rates for transit are robust under No Free Lunch (30 percent total and 11 percent per capita) and modest under Fueled and Freewheeling (17 percent total and -1 percent per capita). In 2030, in both scenarios, intercity rail remains a negligible contributor to total PMT.

For Transportation Agencies

Our two scenarios describe different mobility futures. The scenarios are descriptive, not normative—neither is put forward as the ideal path for the future of mobility in the United States. In addition, our study did not address the likelihood of one particular outcome versus another. The scenarios are instead indicative of a range of “plausibilities.” By making potential long-term consequences more vivid, scenarios can support public policy by helping planners and policymakers at different levels of government envision what the future might bring.

---

1 Emission trading costs are costs associated with actions and strategies used to reduce emissions in order to stay below a government-set limit (the cap) under a cap-and-trade policy scheme.
Our analysis revealed three driving forces as being significant in this regard: (1) the price of oil, (2) the development of environmental regulation, and (3) the amount of highway revenues and expenditures. The price of oil is exogenous; transportation policymakers have virtually no leverage over it. The other two drivers are well within the purview of transportation policy at all levels of government. In applying the scenarios in agencies’ planning activities, we identified three possible approaches: (1) identifying early warning signs; (2) determining opportunities, risks, and contingencies; and (3) reviewing strategic options against the scenarios.

Conclusions

From our research, we find the following:

The future of mobility in the United States in 2030 is uncertain. This project created two scenarios, No Free Lunch and Fueled and Freewheeling, to illustrate the paths that may result from interconnected effects of market, policy, and consumer forces.

No Free Lunch describes a future in which the United States has strengthened regulations to reduce dependency on oil and GHG emissions, which results in greater investment in research and development (R&D) on AFVs, increased public transit ridership, greater reliance on road pricing, and lower levels of car ownership.

Fueled and Freewheeling describes a future in which the economy is booming and a reluctance to raise taxes is prevalent, which results in high car ownership and steadily increasing congestion.

The study identified three critical uncertainties, or driving forces, that cause one path to emerge over another: the price of oil, the development of environmental regulation, and the amount of highway revenues and expenditures. Of these, the most critical is oil price.

The potential for transportation policymakers and other decisionmakers to influence the price of oil is limited. However, they will have greater opportunity to leverage the other key drivers.