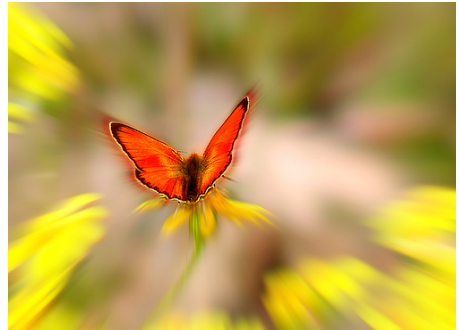


"The flapping of a single butterfly's wing today produces a tiny change in the state of the atmosphere. Over a period of time, what the atmosphere actually does diverges from what it would have done. So, in a month's time, a tornado that would have devastated the Indonesian coast doesn't happen. Or maybe one that wasn't going to happen, does."

About 50 years ago, Edward Lorenz theorized how tiny variations can affect giant systems, and complex systems, like weather patterns. The term "butterfly effect" was applied in Chaos Theory to suggest that the wing movements of a butterfly might have significant repercussions on wind strength and movements throughout the weather systems of the world, and theoretically, could cause tornadoes halfway around the world.



<http://farm2.static.flickr.com/1353/11871>

In a similar vein, what effect does the modernization and building boom of China have on your housing costs? What effect does the North American Free Trade Agreement have on your grocery bills? How do the political changes in the South America affect your energy bills?

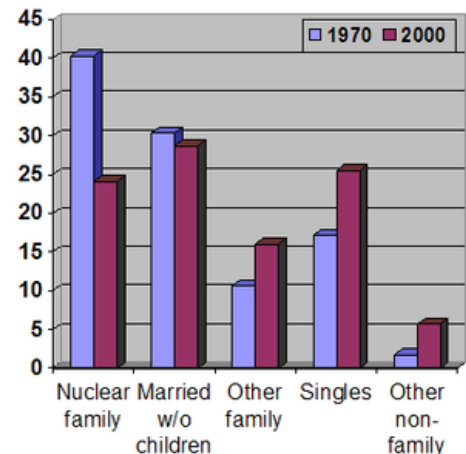
This document will highlight some of the global, national, and regional trends that affect our daily lives and will discuss some of the resulting transportation planning implications. Demographic, housing, economic, employment, energy, transportation, and political trends are difficult to predict because, much like the butterfly, small changes can have worldwide impacts. Even though planning agencies can neither control nor predict how and when most macro-level trends will impact the transportation system, it is important for them and the public they serve to understand the possible implications of such trends. It is imperative that trends are accounted for; otherwise, we may continue to build a costly infrastructure in a way that doesn't handle current and future conditions.

## Demographic Trends

Historically, the nuclear family has been the most common form of household in the United States. The Baby Boom generation is an example of how this family unit impacted today's conditions. The way we shop, work, live, and drive is largely the results of the way our households are established. In the last decades, a tremendous shift has occurred away from nuclear families toward more diverse household units.

Family arrangements such as blended families, binuclear families (separated spouses marrying new spouses with children), and single-parent families are typically referred to as *postmodern families*. Consider the following:

- Today, nuclear families with the original biological parents constitute roughly 24.1% of households, compared to 40.3% in 1970. Roughly 75% of all children in the United States will spend at least some time in a single-parent household.
- Average household size has decreased from 4.01 persons per household in 1930 to 2.59 persons per household in 2000.
- The percent of one-person households has increased from 9.5



[http://en.wikipedia.org/wiki/Nuclear\\_fam\\_1](http://en.wikipedia.org/wiki/Nuclear_fam_1)

percent in 1950 to 25.8 percent in 2000.

- In the U.S., the percentage of the population age 65 and over is projected to increase from 12.4% out of 282.1 million people in 2000 to 19.6% out of 389.5 million people by 2035.
- Between 2000 and 2008, 12 states experienced a positive domestic net migration every year, including Idaho. Conversely, 9 states experienced a negative net migration every year.

### Planning Implications

Changing demographics, such as household makeup and age, impact the demand for different types of housing and thus impact the accuracy in projecting the type, location, and rate at which housing will be built and the transportation networks that serve that housing. Migration patterns can also result in sudden spikes or declines in housing development that can impact the use rate of a transportation network. For example, based on projected future housing demand using historical growth rates, a planning agency may plan to build a road to accommodate future growth that may not materialize as quickly as expected due to changing migration patterns.

### **Housing Trends**

Shrinking household sizes, coupled with higher energy rates (discussed below) have generated a demand for smaller houses. Also, housing costs have been inconsistent the last few years. The subprime mortgage crisis is an ongoing financial issue triggered by a dramatic rise in mortgage delinquencies and foreclosures in the United States, with major adverse consequences for banks and financial markets around the globe. The crisis, which had its roots in the closing years of the 20th century, became apparent in 2007 and has exposed pervasive weaknesses in financial industry regulation and the global financial system.

“There is no longer a need for the neutron bomb. We already have something that destroys people and leaves buildings intact. It's called a mortgage.”

Author Unknown

Consider the following:

- In 2001, 85% of mortgage loan originations were prime mortgages (conventional conforming loans, FHA, and VA loans). However, by 2006 only 52% of loan originations were prime mortgages. The remaining originations comprised of subprime, Alt-A (near prime), and home equity loans.
- Various financial innovations, such as programs that enable loan originators to sell off loans to other investors, helped fuel the increase in subprime lending and the recent housing boom. A sharp increase in subprime mortgage delinquencies in 2006 (mostly those with adjustable rate mortgages) severely impacted the world financial system and may result in less subprime lending in the short-term.
- Multi-family and high-density housing often face opposition from communities (depending on the community). The reasons for the opposition are based on some of the perceptions that home values will decrease in the neighborhood, people who live in them are more likely to engage in anti-social behavior, and apartments will overburden schools and increase traffic problems<sup>7</sup>.

### Planning Implications

Declines, especially sharp declines, in housing affordability can impact transportation agencies' ability to cost-effectively build and maintain a transportation network. Declines in housing affordability can push moderate income households out to suburban fringes that create a new demand for road capacity expansion. Sharp increases in the number of people migrating to an area can exacerbate this problem by quickly driving up land prices. This boom will push people out further and increase travel demands on roads that are not prepared for the increased demands.

Well designed and located high-density developments can decrease the cost of housing and reduce the costs placed on the transportation network. However, opposition to developments can continue the trend of sprawling communities and associated transportation costs even though planning agencies allocate land for high-density and mixed-use developments.

### **Financial / Economic Trends**

The ability to construct a transportation system is largely dependent on securing the financial resources needed for roadway, bridges, and transit improvements. Unfortunately, national, state, and local governments' ability to acquire funds have diminished over the last few years. Some sobering facts:

- From 1987 to 2007, the national personal savings rate decreased from 6 percent to slightly less than 0.50%. Diminishing personal income makes taxation of transportation projects difficult.
- Foreign ownership of federal debt increased from 22% in June 1997 to 27% in June 2008, representing a dollar increase of \$1.7 trillion.

### **Planning Implications**

Both demand and supply factors of a transportation network are affected by global economic and financial systems. New residential, commercial, industrial, and other buildings are financed through capital markets. Investments in new transportation infrastructure and maintenance of the current system are based on tax revenues and sometimes financed through bond measures—both of which are reliant on a good economy and an increasingly global financial system. Therefore, planning agencies must continually adapt to changes in financial and economic conditions. During good economic times, construction of houses, office parks, and shopping centers can quickly strain transportation capacity. If good economic times are immediately followed by poor ones, such as is happening now, then the ability to respond to recent developments can become strained.

### Employment Trends

Eighty years ago Henry Ford revolutionized the American economy by creating the eight-hour-a-day, five-day work week. This became the standard for businesses, until today when changing demographics, economics, and transportation conditions have caused a variety of different working arrangements to become commonplace. Alternate types of work schedules are becoming popular, including part-time, flex-time, staggered hours, compressed work hours, job sharing, and telecommuting. In addition, part-time and job sharing could increase in the future with retirees wanting to stay in the workforce but on a part-time basis to help pay for retirement years or for other reasons. According to a recent Pew Research Center survey, 77% of currently employed (and not retired) workers expect to work after retirement. Since they are in their retirement years, they might want more flexibility in work schedules than other workers to enjoy this time of their life.



<http://www.baccinc.org/images/employment 1>

### Planning Implications

Changes in how, when, and where people will work in the future can change transportation patterns. For example, if more people work from home or work flexible schedules, then intra-day traffic patterns can change. It is possible rush-hour traffic can become less severe, not because of a reduction in employment or population, but because fewer workers will be working during similar hours of the day.

### Energy Trends

Someday we'll probably fly around in electric, saucer-like cars like George Jetson. However, right now petroleum-using cars are still the most common transportation choice. While hybrid and other electric cars are gaining popularity, there are still some short-term impediments to this becoming a common practice. In the future, houses may be built as "zero energy buildings," where zero net energy is consumed and zero carbon emissions are generated. However, in the meantime:

- Buildings use 40% of the total energy.
- Per capita consumption of petroleum in the United States has increased 2% per capita since 1996. Additionally, China's per capita consumption increased 186% over the last decade. As more countries become industrialized and petroleum use increases and production decreases global demand may push costs higher.

### Planning Implications

Energy trends could have a drastic impact on planning the future transportation network. The per-capita energy use in the U.S. is the largest in the world. The per-capita energy use of some countries is increasing rapidly, such as China. This increased demand with limited supplies can result in higher energy costs. Rising energy costs, both incremental and sudden, can result in macro-level changes in travel behavior and new technologies that planning agencies may not be able to accurately predict. This can result in reactive instead of proactive efforts to build and maintain an effective transportation network.

### **Transit and Transportation Trends**

- Between 1990 and 2007, only New York, Oregon, and Washington had a decrease in the percentage of commuters who drove to work alone.
- Nationally, in 2007, approximately nine people carpooled to work for every one individual who used public transportation. Even though the number of people who walked to work has been declining since 1990, for every person who rode their bike to work five people walked to work in 2007. In response to high gas prices, sales of scooters increased in 2008.

### Planning Implications

Understanding and predicting transportation mode choice is a vital element in planning because it impacts what, where, and when transportation facilities are built and how effectively they are used. Some states have seen decreases in the percentage of people using public transportation while others have seen increases. With public transportation costs increasing, investments in additional capacity might not always result in large increases in ridership to offset the increased costs. Also, increases in fuel costs can change behavior, and planning agencies must respond.

### **Political Trends**

- More and more planning agencies are integrating land use and transportation planning.
- Even though past attempts at global climate change legislation have failed (such as ratification of the Kyoto Protocol), the possibility of legislation is still present. Also, the possibility of regulation as opposed to legislation is possible through the U.S. Environmental Protection Agency under the Clean Air Act.
- Planning at the regional level is increasing for issues such as transportation and air quality based on federal, state, and local influences.

### Planning Implications

Transportation is inherently regional in nature since one road can pass through numerous communities and the land use patterns in each community can impact, for better or worse, the performance of a regional transportation system. How well land planning, transportation planning, and regional planning agencies work with each other can change over time and impacts the overall condition of the transportation network. Increased global climate change concerns can influence legislation and government regulations that, in turn, can change planning agency processes and priorities.