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## Travel by Mode

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The analysis of transport mode use is essential to understand and/or forecast travel behavior, and therefore to respond to planning needs. Given the strong economic, social, and environmental stakes related to transport mode use, especially car use, a considerable number of empirical or theoretical works can be found in the last decades.

Various transport mode segmentations are available that depend on several dimensions. Distance consideration impacts on the transport mode choice; for example, air transport is not relevant for urban areas, or the option of walking for longer distances, except as a feeder mode.

Distinction between motorized and non-motorized modes is significant when environment concern is important. Public versus private mode is also generally taken into account. But, available transport modes evolve, with new modes (e.g., rent services like self-service bicycle, car sharing, and motorbike-taxis) that contribute to reduce the frontier between private and public use.

Finally, more concern is being given to intermodality (i.e., combination of several transport modes within the same trip) and multimodality (i.e., use of different transport modes for travel over the course of the day or the week). This article first presents car use and the need to reduce its usage and then focuses on the main determinants of transport mode use.

## Can We Reduce Car Domination?

Throughout the 20th century, the car has expanded its share against all other modes in nearly all market segments in most Organisation for Economic Co-operation and Development (OECD) countries. In OECD countries, individuals without car access are a minority, although they represent an increasing concern because social inclusion and equity—which can be negatively impacted by limited mobility—are receiving more and more attention in transport planning.

However car domination is not universally true. In sub-Saharan African cities, only a minority of citizens (the richest 10%) regularly use a car for their daily mobility. In some developing countries, various forms of formal and informal public transport or individual modes (e.g., bicycles, motorized two wheelers, or walking) still have higher modal share than private cars. Nevertheless, in countries with high economic growth such as China, similar trends in car use growth as in OECD nations during the 20th century can be observed.

With varying degrees of intensity, all industrialized countries have put car use reduction on their political agenda. This evolution meets various objectives. First, environmental concerns

(greenhouse gas emissions and other pollution) demand restraint of the most polluting modes, use such as private car.

Traffic congestion also represents an important economic loss, and most experts agree that it can no longer be mitigated by infrastructure development. Equity and social inclusion require the development of alternatives for those who do not have access to car.

This has explained the development of public transport to some extent. Especially in European countries, development of public transport is favored not only for social equity, but also for economic and environmental reasons.

More recently, non-motorized transport modes have received more attention. Of course, they respond to environmental concerns and they also represent an economic solution both for individuals and for transport authorities. They also respond to the growing concern for transport solutions to health-related issues. Walking and cycling, used as a sole mode of transport on whole trips or to access public transport stations, are recommended as a way for city-dwellers to perform daily physical exercise in order to curb obesity and related health problems.

All these developments in transport are increasingly interacting with built-environment concerns, which are receiving growing interest from researchers and practitioners. Car reduction targets are most commonly defined in urban planning, but success in meeting these requirements requires understanding the reasons for car use and the mechanisms that might result in switching to other transport modes.

## Travel Mode Determinants

A considerable amount of work focuses on mode-choice understanding. Most determinants fall into four broad categories:

(1) *Trip characteristics* including purpose, origin/destination (OD), distance, and monetary cost impact mode use. In industrialized countries, modal share of walking is mainly restricted to trips of less than one mile. Cycling usage is strongly decreasing for distances of more than 3 miles, except in certain countries such as the Netherlands or Denmark.

Car monetary cost (gasoline, car parking, etc.) can strongly impact car use, especially in most central areas of European cities. The cost of public transport can hinder the mobility of low-income individuals of developing countries who have to “choose” between public transport and walking, as well as poorer people in developed countries, who are less likely to walk and have few public transport options. In early research, only the main transport mode was considered, but now, intermodal transfers are increasingly taken into account. Furthermore, trips have to be replaced within tour organization or within the whole travel/activity program of the day.

(2) *Transport supply* impacts also on modal choice. Public transport use is greater in large cities, especially in the most central area where public transport supply is the highest and car performance the lowest. Supply also has an influence on non-motorized mode use. Even if it is probably not the only reason, cycling is at the highest in Netherlands or in Denmark, where cycling lane supply is also the more developed. Supply level is important, but perceived quality of service also influences choice. Comfort, information, accessibility (especially for people with disabilities), and even image play important roles in travel mode choice.

(3) *The built environment* and urban form have also a direct impact on transport mode use. Low density generally favors car use whereas high density encourages public transport use.

The mix of urban land-use functions (e.g., housing, job, shopping, etc.) and high integration between transport and land use allow the greater development of cycling and walking, as is seen in Transit Oriented Development.

(4) *Individual and household characteristics* strongly impact mode usage. Gender, age, generation, activity status, and income are generally associated with differences in mode choice. Stage in life cycle appears also important; when individuals are moving from one stage to another appears to be the best period to encourage modal shift. These “objective” factors need to be combined with social perceptions and cultural and attitudinal factors associated with travel modes, because it appears that they could be strong forces to motivate behavioral change, as envisaged in travel demand management actions, for instance.

## Conclusion

Considerable knowledge has been accumulated on determinants of travel mode. This knowledge is more and more used in order to propose new transport policies emphasizing the need to increase the use of more sustainable, safer and more healthful transport modes.

More local measures are also developing, such as company mobility plans or travel demand management programs. The need remains, however, to develop research to better understand the way mode use can change through transport policy, land-use and built environment planning, or more personal changes. Also needed is longer-term planning, which implies continuing to develop models of interaction between transport and land use.

**See Also:** Travel Choice; Automobile Culture; Social Equity; Urban Sprawl vs. Compact Development.

## Further Readings

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