Environmental Science & Policy 2000, 3:11-13

Editorial

Urban Transportation in the 21st Century

Mark Diesendorf
email: mark@sustainabilitycentre.com.au

The seeds of future, more sustainable, urban passenger transportation systems have germinated in the 1980s and 1990s and already formed vigorous saplings before year 2000. They can be seen in a number of cities scattered around the world, including Copenhagen, Curitiba, Freiburg, Hong Kong, Stockholm, Singapore, Tokyo, Toronto, Vancouver and Zürich (Newman & Kenworthy, 1999). These cities have developed, or are developing, excellent transit (public transport) systems. Most are integrating urban development with transit and some are implementing traffic calming extensively. Some have integrated cycling and pedestrian areas with transit, while others have just begun to recognise the importance of these modes for a large proportion of urban trips.

Characteristics of more sustainable cities of the 21st century are becoming clear. If they are large cities, there are likely to have several, high-density subcenters as well as the historical center. The center and subcenters have concentrations of high-rise housing, shops, offices, educational institutes, and social/entertainment facilities. Between the high-rise buildings are people-friendly open spaces that include large car-free pedestrian zones, bicycle ways and bicycle parking areas. However, car parking areas are severely limited in space and time, and are expensive for all except less abled drivers. On roads that are still accessible to cars, there is substantial traffic calming, carried out by reshaping the roads and installing traffic lights and 'smart' bollards that favour pedestrians and transit. The center and subcenters will be linked together by fast, electric, heavy rail. In relation to the center, there will be both radial and circumferential railway lines.

Feeding into the center and subcentres will be light rail (trams), buses and cycleways. Medium distance trips, in medium- and high-density corridors of population, will be provided mainly by light rail running on existing roads. Buses and minibuses, which require more land area per passenger, will tend to be used in lower density suburbs and in hilly regions of medium density. There will still be an important role for automobiles in low-density suburbs that are poorly served by transit. However, these cars will be required to have much lower local and global emissions than the existing fleet.

The intersections of transit lines that are not at urban subcenters will have smaller-scale concentrations of housing and commercial activity, known as 'Urban Villages'. Their main characteristics are:

- mixed land uses;
- close access to community facilities such as schools, libraries and centers for child care and senior citizens;
- compactness, so that everything is within walking or cycling distances;
- restricted access for automobiles;
- a heavy or light rail station near its core;
- public spaces.

Modern examples of Urban Villages are Arabella Park in Munich (Germany), New Westminster and False Creek in Vancouver (Canada), River Place in Portland (Oregon,

USA), several satellite subcenters of Stockholm (Sweden) and, to some extent, Ultimo in Sydney (Australia). These are described by Newman & Kenworthy (1999).

The hierarchy of center, subcenters and Urban Villages also provides a hierarchy of employment and activity centers and so potentially reduces the average trip distance in a city. Indeed, the ground-breaking 'Seeds for Change' study of the 1970s also envisaged the introduction of neighborhood centers within a suburb (White et al., 1978). Thus a more localised, convenient and less alienating city can be created. The alternative, a homogeneous low-density city, in which most trips span large distances in a wide range of directions, is hostile to transit, walking and cycling. Los Angeles is generally quoted as the most obvious example.

In trying to plan more sustainable cities, freight transportation has received much less attention than passenger transportation. However, the existing system, based on trucks and vans, is polluting and dangerous. With small improvements to existing technologies, feasible alternatives are possible. For instance, freight could be transported by several modes, depending upon size of object to be carried. Once again, there could be a kind of subcenter system within a city, but the freight subcenters would not coincide completely with the subcenters of population. During off-peak periods and especially between midnight and dawn, heavy rail vehicles running mainly on passenger railway lines would carry large containerised loads between transfer stations. The large containers carried by trains would contain smaller containers and so on, all electronically tagged. At the transfer stations the larger containers will be packed and unpacked, and the smaller containers will be sorted and loaded into, or unloaded from, vans and pneumatic tubes. All these packings and transfers would be carried out automatically. Vans (with drivers) and pneumatic tubes would take the smaller containers to their final destinations.

Incidentally, it is envisaged that the vans would be electric and charged from the electricity grid. The grid would be increasingly powered by renewable sources of energy: wind, biomass, geothermal, and solar.

This transformation of cities will be motivated by environmental, economic and social considerations. Environmental concerns were already well recognised in the 1990s. The enormous growth in air pollution and noise, associated with the growth in motor vehicle trips, was obvious to many people. Even the invisible greenhouse gas emissions are widely recognised as leading to global climate change and associated environmental and health impacts. The way in which roads divide communities and create dangerous open spaces is a subject for vigorous public protest in a number of countries. However, until recently, most people assumed that these concerns had to be traded off against the alleged enormous economic benefits of motor vehicles, and that the only economic disadvantage of motor vehicles resulted from congestion. Furthermore, they assumed that building more and more roads would relieve congestion. Both these beliefs are being increasingly questioned by environmental scientists and ecological economists.

First came the recognition that traffic congestion is not eased by building new roads. To the contrary, in the short term new roads simply move traffic congestion to their entrances, exits and surrounding regions. In the long term they encourage more people to use their cars more often. They don't just shift motorists from old roads to new roads. The same effect is produced by building more parking spaces in centers and subcenters. This phenomenon is known as 'induced traffic growth'. Although it has been understood for decades by the

governments of many European countries and cities, it was only acknowledged officially quite recently in Britain, where it led to dramatic changes in government policy. A watershed was the report of the British Royal Commission on Environmental Pollution (1994). A more recent review of induced traffic growth has been given by Litman (1999a).

The second notion, that cars are the cheapest form of urban transportation, has been criticised widely for some time on the basis on environmental and health costs. However, even on the basis of a limited range of economic costs alone, it has been shown that current vehicle user charges (fuel taxes and registration fees) only cover a fraction of total roadway costs: e.g. 70% in USA, without including the cost of land (US Department of Transportation, 1997). Recently the Institute for Sustainable Futures considered the costs of land, as well as infrastructure, rolling stock, operation & maintenance, and showed that all three of the principal modes of passenger transportation in Sydney, Australia – car, train and bus -- are heavily subsidised. It found that the cost of cars, measured in cents per passenger per km travelled, is highest, followed by heavy rail and then buses (Banfield, Hutabarat & Diesendorf, 1999). The inclusion of other costs that are readily quantified -- e.g. the uncompensated cost of crashes and the cost of traffic policing -- will of course increase the cost gap between cars and transit even further (see review by Litman, 1999b).

This approach, of developing policies and plans based on optimising the full social costs, is known as 'least cost planning' or 'integrated resource planning'. Although this approach is well-documented in the simpler case of energy services, it has rarely been applied to transportation/communication services. Least cost planning leads to solutions that can simultaneously protect the environment, improve urban 'livability' and reduce costs.

At the level of the macro-economy of the city, there is clear evidence that cities which are highly dependent upon cars do not necessarily perform better than cities which have very good public transportation (Newman & Kenworthy, 1999). This can be explained on the basis that:

i) cars are actually more expensive to society as a whole than public transportation, walking and cycling (as discussed above); and
ii) car-dependent cities tend to sprawl much more than transit-dependent cities, and the cost of providing infrastructure on the fringe of a sprawling city is greater than on the fringe of a more compact city (Burchell, 1998; Guhathakurta, 1998).

Clearly there are environmental, social and economic reasons why cities should attempt to reduce dependence upon cars and large trucks. The remaining question is, given this motivation, how can the transition be made to a more sustainable city? This writer's suggested answer is that, in circumstances where the whole system has become biased towards motor vehicles, education and information are necessary but not sufficient. In addition, we need a mixture of appropriate pricing, regulations and standards, and institutional change.

In an efficient economic system, pricing of fuel should reflect much more closely the environmental and health costs of burning it. Soerensen (1997) estimates that a fair tax level on gasoline, reflecting external costs which include some quantifiable greenhouse gas impacts, would be about US$5 per litre. In order to protect communities from motor vehicles, pricing is necessary but not sufficient. Regulations are required to promote traffic calming, implement parking restrictions, and place limits on exhaust emissions. Institutional change is required to create fair mechanisms for funding various transportation modes equitably.

Currently, many countries have large, powerful, well-funded organisations to carry out road building and small, weak, poorly funded organisations responsible for transit, cycling and pedestrian areas. Another vital institutional change is to create organisations responsible for an integrated approach to urban planning and transportation planning, which are responsive to community views.

The barriers to the sustainable development of cities are vested interests and a peculiar economic ideology that argues that the current, highly distorted market can and should be allowed to 'plan' a city. These barriers can be challenged intellectually by environmental science and ecological economics in order to implement more appropriate pricing, regulations, institutions, education and information. With these instruments in place, we can move more quickly and efficiently to develop better cities.

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Mark Diesendorf is Professor of Environmental Science and Director of the Institute for Sustainable Futures at University of Technology, Sydney.
[Current address; Sustainability Centre Pty Ltd, PO Box 221, Epping NSW 1710, Australia.]