Accessibility

Defining *accessibility* requires the introduction of three assumptions, which are well cited in research on human behaviour (see in particular Hägestrand, 1970; Zahavi, 1974; Hupkes, 1982; Downes and Emmerson, 1985; Schafer and Victor, 1997; WBCSD, 2001). These are as follows:

1. **People for the large part travel in order to participate in activities**
2. **They strive to be able to choose between participation in as many and varied a range of activities as possible**
3. **Possible travel options are restricted not so much by distance but rather by their cost and, in particular, in terms of their duration which can be expressed in the form of fixed daily time budget; for example, acceptable travelling time as a proportion of the total time spent on an activity, or acceptable commuting time**

Based upon these assumptions, accessibility can be defined as the number and range of activity locations which can be reached within an acceptable time, particularly from the home and the workplace. This is the same type of definition that Prud'homme and Lee's adopted in their operationalization of the concept of the effective-urban market as number of jobs or workers within a given travel time. The most important determinants of accessibility thus defined are the quality of the urban transport system (relating to the distance covered in a given time period) and the quality of the urban land use system (e.g. the extent to which one can reach employment or services).

Environmental sustainability

Sustainability, in the context of this chapter, is discussed in relation to accessibility and transport. Urban transport, while providing accessibility and other benefits, can produce a number of environmental costs. Direct measures such as energy use, CO_2 emissions, air pollution, traffic noise would be the best indicators of the environmental impact of urban transport. However, these measures are often unavailable, making the *per capita distance travelled by car* the most widely accepted (un)sustainability indicator (Wegener and Fürst, 1999). This indicator, at least in the present technological context, is highly correlated with most of the negative environmental impacts of urban transport (see *inter alia* Wegener and Fürst, 1999; Hall and Pfeiffer, 2000; WBCSD, 2001; Van Wee and Annema, 2002). Whether, and to what extent this will also be

true in the future is still a matter for discussion. Some contend that technological progress will continue to put into perspective the present environmental impacts of the private automobile. Cases in point include innovations in engine and fuel technology radically reducing emissions and energy use per kilometre travelled, or advanced travel-demand management systems and intelligent transportation systems which dramatically curb congestion and make more efficient use of infrastructure possible (WBCSD, 2001; Van den Brink, 2002). However, others argue that limiting mobility by car would have to remain part of the solution (Van Wee and Annema, 2002). This is because of the still unresolved technical uncertainties, political controversies and the long-term nature of most technological solutions.

If this latter view is adopted, environmental sustainability in urban transport can be improved primarily by reducing private-car miles as much as possible, and making those driven as 'clean' as possible; in more general terms, by reducing all motorized transport, including public transport, as much as possible and making what remains as 'clean' as possible.

In practice, this comes down to, in order of priority:

1. **increasing opportunities to walk or cycle, or even to participate in activities without moving at all as much as possible**
2. **if walking and cycling, or not moving, are not realistic or desirable options, increasing opportunities to use public transport as much as possible whilst at the same time improving the intrinsic environmental performance and efficiency of public transport**
3. **if the use of public transport is also not an option, improving the intrinsic environmental performance and efficiency of the car, including a limitation of the average distances travelled**

The multi-modal urban region: enhancing both accessibility and sustainability

Based upon the above objectives of accessibility and sustainability, the operational assignment of VPR is worded as follows:

> **Create conditions under which as much of the transport used for urban-regional movements as possible is environmentally friendly, whilst maintaining and if possible increasing the number and variety of activity places which are reachable within an acceptable time from homes and workplaces.**
>
> **Bertolini *et al*. 2002**