Chapter 11

Sustainable Transport and Quality of Life

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11.1. Introduction

Automobile use has greatly increased during the last few decades. The number of passenger kilometers by private car per capita increased by 90 percent in Western Europe and 13 percent in the US between 1970 and 1990. In 1990, the average number of passenger kilometers travelled by private car in the US (18,650 km) was more than double the Western European figure (8710 km; OECD, 1996). The number of motorised vehicles in the world grew by about 600 million between 1950 and 1990. Of the 675 million motorised vehicles in 1990, approximately 80 percent were for passenger transport. However, the number of people in the world who do *not* own a car increased even more in this period, by over 2 billion (Adams, 1999; OECD, 1996). On a typical day in 1998, 75 percent of the adult population of Canada went somewhere in a car, up from 70 percent in 1986 (Clark, 2000). In the Netherlands, the number of car trips per person per day increased by 16 percent, while the number of kilometers driven by car per day increased by 31 percent between 1985 and 1998 (Steg & Kalfs, 2000). Of further concern, drivers seem to expect they will take far fewer trips than they actually do. When asked to prospectively estimate how many trips they would take during the next week, Swedish drivers took 80 percent more trips than they expected to (Jakobsson, 2004).

The increasing number of cars and their daily use causes various problems (e.g., OECD, 1996; see also http://home.connection.com/~regan/carcosts.htm for Canadian data and http://www.rivm.nl/milieu/ for Dutch data). Many have stressed that the current transportation system is not sustainable (e.g., OECD, 1996). Various strategies have been proposed to achieve a more sustainable transport system, ranging from behavioural to technological changes. Behavioural strategies are aimed at reducing the level of car use, for example by shifting to less-polluting modes of transport, changing destination choices, combining trips, encouraging car sharing

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(e.g., Katzev, 2003), or travelling less. These strategies may improve environmental quality, urban quality of life (QoL), destination accessibility, and even health, because, according to one study, each added daily hour spent in a car adds 6 percent to one's chances of being obese (Frank, Andresen, & Schmidt, 2004).

Technological strategies attempt to reduce the negative impact per car and per kilometer. Examples include increasing the energy efficiency of cars and developing new forms of road pavement to reduce the level of traffic noise. Such solutions do not appear to sufficiently reduce the problems of car use, so as to make it compatible with sustainability (e.g., OECD, 1996). The mitigating effects of new technologies tend to be overshadowed by the continuing growth of car use. Whereas new technologies are capable of substantially reducing various emissions, other sustainability problems such as urban sprawl and accessibility are rooted in a wider complex of causes for which new technology *per se* is not a solution. For example, energy-efficient cars may reduce environmental problems, but will not reduce problems caused by accessibility to cars. Drivers might even be tempted to use their energy-efficient cars more often because they are cheaper on fuel and more environmentally friendly, a phenomenon known as the rebound effect (Berkhout, Muskens, & Velthuijsen, 2000) or the Jevons principle (OECD, 1996).

Behavioural and technological strategies not only differ in the extent to which they may improve different sustainability aspects, but probably also in the extent to which they affect individual QoL. In general, individuals prefer technological solutions to behaviour change, because the latter are perceived as reducing one's freedom to move (e.g., Poortinga, Steg, Vlek, & Wiersma, 2003). This may be explained by the different psychological properties of the two strategies (Gardner & Stern, 1996). Behavioural changes generally are associated with additional effort or decreased comfort. For example, reducing car use implies a need to adjust one's lifestyle, which may evoke resistance because it requires effort and reduces freedom, comfort, and convenience. Many believe that technological measures require few behavioural changes. For example, an energy-efficient car allows individuals to drive as much as they always did, thereby significantly reducing adverse environmental impacts. However, technological strategies generally require initial investments, and are therefore often rather expensive in the short term, especially for low-income groups. In the long term, technological improvements may be beneficial because of energy (and consequently cost) savings. Although technological measures usually are preferred to behavioural changes, many also believe that reductions in the volume of car use are needed to manage the problems caused by traffic and transport, and that technological solutions will not be sufficient to solve these problems (e.g., Steg & Sievers, 1996). Thus, many drivers agree that car use should be reduced in order to manage transport problems, but they are not in favour of measures that restrict their own car use.

The current transport system is not sustainable. However, little is known about which kind of transport system would be sustainable, or even which criteria for sustainability should be used. In this chapter, we describe possible ways to examine whether transportation systems are sustainable, taking into account individual as well as collective interests. This chapter focuses on private transport, especially car

use. The following section reviews methods for assessing sustainable transport. Next, we introduce a method for assessing the QoL effects of transport plans. This method enables the examination of the degree to which sustainable transport is acceptable to the public. Psychological factors that affect individual QoL judgments and the acceptability of transport plans are then briefly reviewed. Finally, some conclusions and the practical value of instruments for assessing sustainable transport are offered.

11.2. Sustainable Transport

Although no common accepted definition of sustainability exists, definitions of sustainable development or sustainable transport are available (Beatley, 1995). Sustainable development, and more specifically, sustainable transport, implies finding a proper balance between current and future environmental, social, and economic qualities (e.g., OECD, 1996; Ruckelhaus, 1989; Litman, 2003; WCED, 1987). Which environmental, social, and economic qualities should be guaranteed and balanced is less clear. Although various attempts have been made to define sustainable transport indicators (see below), a set of indicators that adequately reflects environmental, social, and economic qualities has not yet been identified. Ideally, theory-based conceptions and operationalisations of sustainable transport indicators should be developed, first by defining sustainable transport, and then by deriving significant performance indicators that enable us to measure sustainable transport. At present, many performance indicators have been derived from current practices (e.g., in transport plans and policies) and stakeholder perceptions of sustainable transport. Indicator development often has not been based on an explicit definition or vision of sustainable transport (Gilbert & Tanguay, 2000).

Sustainable transportation might be considered by examining the sustainability of the transport system itself, focusing on the positive and negative values and externalities of traffic and transport as they are apparent now or in the near future. These kinds of indicators have been used by governments (e.g., Department for Transport, 2004; V&W, 1991; see also Gilbert & Tanguay, 2000; Gudmundsson, 2001) to set sustainable transport goals and to monitor whether the current transport system is moving towards sustainability. In some cases, future projections are also made, to forecast developments in transport and relevant sustainability indicators (e.g., RIVM, 2000). Various attempts have been made to list such indicators (e.g., Gilbert & Tanguay, 2000; Gudmundsson, 2001; Litman, 2003). Some examples are energy use, CO_2 emissions, emissions of toxic and harmful substances, land use, disruption and fragmentation of natural areas, waste, traffic safety, noise pollution, health consequences of transport, crash costs, the contribution of the transport sector to economic welfare, and accessibility. Also, indicators have been defined that are based on the quality of the current transport system, including commuting speed, congestion delay, variety and quality of transport options available in a community, accessibility of activities (for drivers and non-drivers), and the proportion of household expenditures devoted to transport (e.g., Litman, 2003).

One may also assess the effects of possible future transport systems on sustainable development in general. In this case, a broader range of sustainability indicators may be considered. Changes in the transport sector may induce changes in various other sectors, which in turn may affect sustainable development. For example, they may induce macroeconomic changes (e.g., lower production values in transport, and higher production values in trade and industry), resulting in changes in GDP and employment levels (Geurs & Van Wee, 2000). Thus, valid sustainability indicators are needed to examine the extent to which possible future transport systems affect sustainable development. Various methods and models have been developed to assess environmental, social, and economic effects of transport plans (see Geurs & Van Wee, 2003, for an overview). These models need improvement. In particular, social indicators are rarely included, because of a lack of knowledge and rigorous methods, tools, and techniques for assessing the social impact of transport changes.

Sustainability indicators are needed to examine possibilities and conditions for sustainable transportation. The extent to which various sustainable policies would affect important sustainable transport indicators should be assessed by systematically examining the economic, social, and environmental effects of these transport systems. Economic indicators should measure possible effects on economic welfare, such as macroeconomic changes, GDP, economic efficiency, income distribution, and unemployment rates. Social indicators should reflect effects on societal and individual QoL, such as health and safety (e.g., OECD, 1976, 1982). Environmental indicators should measure effects on environmental qualities, such as resource use, emissions and waste, and the quality of soil, water, and air that may affect human (and non-human) life (e.g., OECD, 2002; Steg et al., 2003).

Geurs and Van Wee (2000) examined whether various future transport scenarios would be sustainable. First, they defined environmentally sustainable transport criteria, such as emissions of CO_2, NO_x, VOS, particles, noise, and land use. Second, they defined three environmentally sustainable transport scenarios that would meet these criteria, following a backcasting method: a high-technology scenario (only technological changes), a mobility-change scenario (only behaviour changes aimed to reduce car dependency), and a combination scenario (technological and behavioural changes). Next, they examined which policy measures would have been needed to reach these environmentally sustainable transport systems. Moreover, they explored possible economic and social consequences of the combination scenario, which they compared to the economic and social consequences of a business-as-usual scenario. The social impacts were qualitatively assessed by experts. Their study revealed that environmentally sustainable transport goals can be met only if a large increase in technological development is assumed, and/or very stringent behavioural adaptations and changes in spatial and economic structures are assumed. Moreover, Geurs and Van Wee concluded that the current policy life cycle should change radically to bring about the timely implementation of relevant policy measures. The economic and social consequences of environmentally sustainable transport scenarios appeared to be less drastic than is often assumed. However, they focused on social indicators that are threatened by motorised transport, such as safety, health, perceived environmental qualities, and community relationships. Other probably important

social indicators, such as equity, freedom, convenience and comfort, may be threatened if sustainable transport were in place, especially for groups that are forced to reduce their car travel.

Prescriptive studies like these are important for examining whether and how sustainable transportation systems are feasible. They clarify what a sustainable future might look like. Of course, the next important questions are: How does the public evaluate such sustainable futures? Is a sustainable transport system widely acceptable? The answers will depend, among other things, on the extent to which members of the public believe that these futures result in an increase or decrease of their QoL.

Improvements in collective qualities of life, as attempted through sustainable transport, may conflict with individual short-term interests, especially when individuals must adapt their lifestyles in order to reach the sustainability goals. Thus, collective and individual interests may be at odds. In fact, this is often the case with sustainable transport issues. For that reason, problems caused by traffic and transport may be defined as a typical example of a social dilemma. To achieve a sustainable transport system, drivers may have to drive less. However, from an individual point of view, continuing to drive may be more attractive because of the many advantages of individual car use. For many, driving a car is much more attractive than are other modes of transport. The car is especially attractive because of its convenience, independence, flexibility, comfort, speed, perceived safety, and privacy. The car also provides more status and pleasure than other modes of transport; it is a means of self-expression, and enables one to control a powerful machine (e.g., Reser, 1980; Steg, 2003a, 2003b). Thus, improved QoL for most citizens may imply that drivers forfeit some of the individual advantages of car use, which may (at least initially) be perceived as a threat to their individual QoL. This may be especially difficult when most citizens are, in fact, also drivers. In such situations, many are tempted to act in their own interest, especially because this results in immediate gratification, whereas the collective problems will be visible only in the long term. Moreover, individuals themselves cannot control the problems caused by car use; the problems will be solved only if many individuals cooperate. For many, it does not seem sensible to forego the individual advantages of car use because of the uncertainty about whether others also will do so. However, various factors may encourage people to act in the common interest, even though doing so may not have immediate positive consequences for themselves. Some of these factors include problem awareness (e.g., Nordlund & Garvill, 2003; Steg & Vlek, 1997), perceived responsibility for the problems, trust in others' contributions, consideration of future consequences (Joireman, Van Lange, & Van Vugt, 2004) and personal norms (see Gifford, 2001, and Steg, 2003c, for extensive overviews).

From these considerations, one may conclude that the sustainability of different transport scenarios for society at large should be examined (e.g., by investigating the effects of possible future transport systems on sustainable development in general). One also may conclude that whether such scenarios are acceptable to the public should be examined, and why, especially when significant changes in travel behaviour are needed to achieve transportation sustainability. More specifically, knowing which

factors cause which scenarios to have low public acceptance would be important. This will depend on, among other things, the extent to which members of the public expect that the scenarios would affect their QoL. Obviously, one can hardly expect sustainable transport to work if most citizens believe it will significantly reduce their QoL. The Brundtland Commission Report also implies the importance of QoL in its definition of sustainable development: ''meeting the needs of the present without compromising the ability of future generations to meet their own needs'' (WCED, 1987, p. 43). This definition emphasises that ''quality of life'' depends on the extent to which current and future generations are able to fulfil their needs. Thus, sustainable transport must also be concerned with human needs and values. Needs refer to internal forces that drive individual actions (e.g., Maslow, 1954), whereas values refer to desirable transsituational goals that vary in importance, which serve as guiding principles in the life of a person or other social entity (Schwartz, 1992). In contrast to needs, values are tied to a normative base involving evaluations of goodness and badness (e.g., Feather, 1995). The satisfaction of needs and the fulfillment of values both are important to QoL, and so the effects of strategies aimed at creating sustainable transport should be assessed in terms of both needs and values. The next section describes a measurement instrument for assessing quality-of-life effects of more sustainable transport scenarios of the future.

11.3. Sustainable Transport and Quality of Life

QoL is a multidimensional construct, and may be defined as the extent to which important values and needs of people are fulfilled (e.g., Diener, 1995; Diener, Suh, Lucas, & Smith, 1999). QoL refers to well-being, conceptualized either as the objective conditions of living of an individual, as the person's experience of life, or both. This chapter focuses on subjective well-being, that is, individuals' cognitive and affective evaluations of their lives (Diener, 2000).

Based on an extensive literature review of needs, values, and human well-being, a list of QoL indicators has been developed and used in various research projects on sustainable household consumption at the University of Groningen. These indicators are believed to represent a wide range of non-overlapping dimensions that are important to consumers and, by extension, travellers (see De Groot & Steg, 2005; Gatersleben, 2000; Poortinga et al., 2001; Poortinga, Steg, & Vlek, 2004; Skolnik, 1997; Slotegraaf & Vlek, 1996; Steg et al., 2002; Vlek, Skolnik, & Gatersleben, 1998; Vlek, Rooijers, & Steg, 1999). Table 11.1 presents the most recent version of these QoL indicators. Although the list of QoL indicators in Table 11.1 is believed complete, or nearly so, additions and changes may be needed. Note that when these constructs are assessed by consumers in terms of their importance, as in Table 11.1, they reflect their origins in terms of constructs as needs or values. However, when respondents are asked how well each construct is satisfied or fulfilled in their lives, they may be viewed as QoL measures.

Table 11.1: Description and importance ratings of 22 quality-of-life indicators.

QoL-Indicator	Description	M
Health	Being in good health. Having access to adequate health care	4.9
Partner and family	Having an intimate relationship. Having a stable family life and good family relationships	4.7
Social justice	Having equal opportunities and the same possibilities and rights as others. Being treated in a just manner	4.7
Freedom	Freedom and control over the course of one's life, to be able to decide for yourself, what you will do, when and how.	4.5
Safety	Being safe at home and in the streets. Being able to avoid accidents and protected against criminality	4.5
Education	Having the opportunity to get a good education and to develop one's general knowledge.	4.3
Identity/self-respect	Having sufficient self-respect and being able to develop one's own identity.	4.2
Privacy	Having the opportunity to be yourself, to do your own things and to have a place of your own	4.2
Environmental quality	Having access to clean air, water and soil. Having and maintaining good environmental quality	4.2
Social relations	Having good relationships with friends, colleagues and neighbours. Being able to maintain contacts and to make new ones	4.2
Work	Having or being able to find a job and being able to fulfil it as pleasantly as possible	4.2
Security	Feeling attended to and cared for by others	4.1
Nature/ biodiversity	Being able to enjoy natural landscapes, parks and forests. Assurance of the continued existence of plants and animals and maintaining biodiversity	4.1
Leisure time	Having enough time after work and household work and being able to spend this time satisfactorily	4.0
Money/income	Having enough money to buy and to do the things that are necessary and pleasing	3.6
Comfort	Having a comfortable and easy daily life	3.5
Aesthetic beauty	Being able to enjoy the beauty of nature and culture	3.5
Change/ variation	Having a varied life. Experiencing as many things as possible	3.3
Challenge/ excitement	Having challenges and experiencing pleasant and exciting things	3.2
Status/ recognition	Being appreciated and respected by others	3.0
Spirituality/ religion	Being able to live a life with the emphasis on spirituality and/ or with your own religious persuasion	2.9
Material beauty	Having nice possessions in and around the house	2.6

Source: Adapted from Poortinga et al. (2004).

The data in Table 11.1 are from a questionnaire study of 455 Dutch respondents in 1999; scores could range from 1 "not important" to 5 "very important" (see Poortinga et al., 2001, 2004, for more details).

Table 11.1 reveals that most QoL indicators are considered to be very important to people's lives. This is not surprising, because these QoL indicators are based on important needs and values. However, Table 11.1 shows that some QoL indicators are valued more than others. Health, partner and family, social justice, freedom, and safety are valued more highly (at least were by Dutch people in 1999) than material beauty, spirituality and religion, status and recognition, and challenge and excitement. Policy-makers should give more attention to possible impacts on the most important QoL indicators when they design and implement sustainable transport policies, because the public can be expected to more strongly oppose measures that negatively affect these QoL indicators. Policy-makers may need to search for ways to achieve sustainable transport that would affect these QoL indicators in less negative ways, or even in positive ways. They might also consider possible ways to compensate any expected negative effects.

11.3.1. Assessing Quality of Life Effects

QoL effects of transportation scenarios or plans may be assessed by asking respondents to indicate the extent to which varying sustainable transportation scenarios would affect relevant QoL indicators in positive or negative ways. To obtain a more precise view of these effects, these expected changes may be weighted, based on importance judgments of the relevant QoL indicators, because changes in more-important QoL indicators presumably will be more significant for individuals than will changes in less-important QoL indicators. Subsequently, the overall expected changes in QoL may be calculated. A multi-attribute QoL scale may then be created by summing the expected changes on the QoL indicators, each multiplied by the importance judgment assigned to it.

The QoL instrument has been successfully used in several studies of sustainable household consumption. For example, Vlek et al. (1998) examined which QoL changes respondents would expect from future economic and environmental improvements or deteriorations. Dutch respondents evaluated three different scenarios. Various negative QoL changes were expected when environmental conditions deteriorated under either an improved or deteriorated economy. In particular, environmental quality, nature, health, aesthetic beauty, and safety were expected to be threatened when environmental conditions deteriorated. In contrast, the respondents expected mixed positive and negative changes in QoL when economic conditions deteriorated under improved environmental quality. More specifically, positive changes were expected in environmental quality, nature, safety, and health, whereas negative changes were expected in comfort, money, material beauty, and work.

In a second study, Gatersleben (2000) examined how the QoL of Dutch households would be affected if residents were required to reduce their energy use to a sustainable

level. Study participants first indicated which energy savings they would choose to reach a sustainable consumption level. Next, they indicated to what extent this would result in changes in 16 QoL indicators. Reductions in freedom, comfort, pleasure, social relations, work, and leisure time were expected, as were minor reductions in privacy and social justice. Improvements in environmental resources, quality of nature, income, safety, and recognition were expected. Few changes were expected in material beauty, education, and health. The more respondents expected energy savings to have negative effects for health, social justice, leisure time, and freedom, and the less they expected negative effects for privacy, the more they believed that the quality of their life in general would be reduced.

In a third study, Poortinga et al. (2001) examined the extent to which sustainable household energy consumption scenarios would affect judged QoL. Scenarios were presented that systematically varied on three dimensions: the focus of energy saving (home versus transport), the means of energy saving (technical innovations, behaviour changes, or a combination of both), and the amount of energy saved (20 percent versus 30 percent). Dutch respondents reported which QoL changes would be expected from the scenarios. For present purposes, the expected QoL changes from the transport scenarios are most relevant. In general, the transport scenarios were expected to result in a reduction in comfort, work, money, privacy, and freedom, whereas improvements were expected in nature/biodiversity and environmental qualities. Overall QoL was not much affected, which implies that the expected improvements nearly compensated for the expected reductions in QoL. The respondents expected most negative consequences from the transport scenario that involved technological as well as behavioural changes that would result in small energy savings. The multi-attribute QoL measure appeared to be significantly correlated with an intuitive measure of expected QoL changes (i.e., respondents indicated to what extent their QoL would change if the scenario were implemented).

Fourth, Steg et al. (2002) asked respondents to indicate how and to what extent their QoL was affected by reducing their household energy use. In this study, Dutch households were asked to (voluntarily) reduce their household energy use by at least 5 percent. Each household received tailored information about possible ways to reduce their household energy use. They also received feedback about the amount of energy saved. Before the experiment, respondents expected improvements in environmental qualities and in nature and biodiversity when they reduced their energy use by about 5 percent, whereas few changes were expected on the other 20 QoL indicators listed in Table 11.1. One month after the experiment started, households indicated to what extent their QoL had actually changed because of their attempts to reduce energy use. They reported improvements in environmental quality and in nature and biodiversity. No changes in the other QoL indicators were reported.

Finally, in a study by De Groot and Steg (2005), study participants in five European countries (i.e., Austria, the Czech Republic, Italy, Sweden, and the Netherlands) evaluated the extent to which a doubling of the costs of car use would affect their QoL. Respondents indicated to what extent their overall QoL would be affected, as well as to what extent the policy would affect 22 QoL indicators. In general, respondents anticipated negative effects for the QoL indicators comfort,

money and income, leisure time, change and variation, freedom and work, but they thought the QoL indicators environmental quality, nature and biodiversity, and safety would improve. Some interesting differences between the five countries were found. In general, respondents from the Czech Republic and Italy expected the negative QoL effects to be weaker than did the Dutch, Swedes, and Austrians. Also, respondents from the Czech Republic, Italy, and Austria expected the positive QoL effects to be more significant than the Dutch and Swedes. Again, the total expected change in QoL (i.e., the sum of expected positive and negative changes) was correlated with the expected changes in overall QoL (i.e., an intuitive measure of QoL).

11.3.2. Factors Influencing Judgments of QoL Effects

Based on these studies, we believe that the QoL concept is useful for assessing expected effects of future scenarios. They not only reveal whether people believe that QoL would be affected by various transport plans, but also how it would be affected, i.e., which QoL indicators would improve and which would deteriorate. The studies reveal that deteriorations in specific QoL indicators may be compensated for by improvements in other dimensions. Clearly, sustainable scenarios typically threaten personal QoL indicators such as comfort, freedom, and privacy, while QoL indicators that refer to societal indicators such as environmental quality and nature and biodiversity would improve. This once again illustrates the conflict between individual and collective interests, and demonstrates that individual and collective interests must be balanced.

Most of the five studies reported above (except Steg et al., 2002) examined only anticipated changes in QoL, i.e., respondents indicated to what extent they expected their QoL to be affected in such cases. These may differ from actual QoL changes that would occur when the proposed changes would be implemented. For example, studies of the acceptability of transport policies have shown that public support may be higher after transport policies have been implemented (Tretvik, 2003; see also Steg, 2003b). This may occur when respondents' opinions are better informed after policy implementation, because they have more experience with the pros and cons of the measures. For example, a study by Heath and Gifford (2002) revealed that attitudes toward bus-riding improved and bus-riding increased after the implementation of a U-Pass that allowed free bus transport for students after a mandatory addition to their University tuition fees. Individuals may also become more convinced of the advantages of the new policies because they perceive that collective problems are being solved.

Changes typically are resisted at first, because they *may* have negative consequences. As long as individuals are unsure of the consequences, they prefer the status quo (Kahneman & Tversky, 1984). Similar processes may play a role when people are asked to assess which changes in QoL they would expect from future transport scenarios. Therefore, the QoL concept should also be used to monitor QoL over time, to examine the extent to which changes in society or in transport affect

judged QoL. This highlights the importance of the way in which future scenarios are presented. To ensure that respondents provide well-considered judgments of expected QoL effects of transport plans, the plans should be described in plausible and imaginable ways. Clear description of proposed changes in the transport system is important for helping respondents to think through the possible consequences of the plans for themselves. The public should also be involved in the development of sustainable transport plans. This should result in better and more acceptable sustainable transport plans.

The research methods described above are based on a *compensatory* decision-making model. Individuals may use other decision rules when they evaluate future scenarios. Whether drivers or other concerned individuals are "involved" in (that is, actively considering) the issue of sustainable transport may invoke different models of how proposed alternatives are evaluated (e.g., Greenwald & Leavitt, 1984). When individuals *are* involved, compensatory models like the multi-attribute model described above may best describe their evaluations of transport alternatives presented to them. Involved persons are able and willing to consider trade-offs between less-desirable and more-desirable consequences of scenarios presented to them.

However, many persons have little cognitive or emotional involvement in transport issues. For them, a variety of *non-compensatory* models may better describe their evaluation of alternatives, because they have limited beliefs and limited knowledge, and care little for the issues. For example, their evaluations may be better predicted by conjunctive or disjunctive rules. When a conjunctive rule is used, the person rejects any alternative that does not meet all his or her minimum criteria for acceptability. When a disjunctive rule is used, the person accepts any alternative that meets or surpasses any of his or her criteria. Individuals may also use "fast and frugal" criteria when they are less involved (Gigerenzer & Todd, 1999); transport users have many things on their minds in their daily lives besides sustainability, and typically must be "cognitive misers" (Fiske & Neuberg, 1990) to survive and prosper. Future research should examine whether level of involvement indeed affects the evaluation of transport scenarios. The results of the studies discussed above suggest that a compensatory model may be appropriate to describe evaluations of QoL effects of policies, at least when a study or everyday circumstances bring the issues into the consumer's active consideration, because overall scores on expected changes in QoL (i.e., the weighted sum of expected positive and negative changes) appeared to be correlated with an intuitive measure of expected QoL changes (i.e., an overall judgement of expected QoL effects). This implies that expected negative changes in QoL indicators may indeed be compensated by expected positive changes in other QoL indicators.

A few other factors should be considered when examining QoL effects of sustainable transport scenarios. General subjective well-being has not changed much over the last several decades, even though incomes and consumption levels have increased significantly (Diener et al., 1999; Veenhoven, 2004). Individuals seem to adapt to positive as well as to negative changes in their lives; they change their expectations and goals (e.g., Diener, 2000; Meyers, 1992; Suh, Diener, & Fujita, 1996). QoL is judged in comparison to some social or personal standard (Diener, 2000; Ormel, Lindenberg, Steverink, & Vonkorff, 1997). People seem to feel more

satisfied with their lives when they believe they are better off than others are, when they are better off than yesterday, or when they are closer to their aspirations. These standards, which are used to judge QoL, do change over time, i.e., individuals appear to adapt their comparative standards to changes in their circumstances (which might improve or deteriorate). This implies that further increases in consumption levels, including transport, will not necessarily enhance QoL, and reductions in consumption and transport levels may not necessarily reduce QoL. Although individuals may initially experience a reduction in QoL, they may well adapt soon after the changes (Diener, 2000). Thus, the conviction of many politicians that a truly sustainable transportation system is not feasible because environmentally sound transportation systems will seriously threaten QoL may not be correct, and should at least be tested. AU :2

Theories of QoL and human well-being typically assume that a general set of indicators for QoL can be defined that does not differ over time or between cultures (e.g., Maslow, 1954; Max-Neef, 1992; Rokeach, 1973; Schwartz, 1992; Schwartz & Bilsky, 1987, 1990; see Vlek et al., 1999, for a review). However, the way individuals prefer to fulfil their needs and values does change over time and differs between cultures. Moreover, the relative importance of various QoL indicators (or needs and values) differs between groups (see Gatersleben, 2000; Gatersleben & Vlek, 1998; Inglehart, 1990; Poortinga et al., 2001). For example, Dutch respondents with greater environmental concern evaluate environmental quality and personal freedom as more important, and material wealth as less important than do respondents with less environmental concern. Dutch women value personal freedom and maturity more than do men, and unmarried persons evaluate family, health, and safety as less important than do couples and families (Poortinga et al., 2001). The relative importance of environmental values also depends on the resource context (Heath & Gifford, 2005). Obviously, current and future sustainable forms of transport may affect various groups in society differently, and group differences may exist in what is considered to be sustainable (or livable) transport (see also Adams, 1999, and Button, 1982). Consequently, the interests of various groups should be balanced, and it may be necessary to compensate groups that are disproportionately affected by current and future transport systems. Also, the relative importance of QoL indicators may vary over time (see Gatersleben, 2000; Inglehart, 1990). This implies that the multi-attributive evaluation of QoL effects of sustainable transport scenarios may be time-dependent. Which QoL aspects should be considered is known, but the relative importance of various QoL aspects, and consequently, overall (multi-attributive) QoL effects should be monitored regularly. This will also reveal to what extent actual QoL effects differ from anticipated effects. Based on these considerations, policies for developing sustainability may need to be adapted.

11.3.3. Significance for Policy Making

Policy-makers should take into account the extent to which their policies may affect judged QoL. Transport policies will be less acceptable, and consequently, less feasible

and less effective, if they have significant negative impacts on QoL. For example, restrictions on freedom of choice may evoke serious resistance, psychological reactance (Brehm, 1966). As a consequence, restrictive policy plans may have no effect, or even opposite effects from what was intended (Tertoolen, Van Kreveld, & Verstraten, 1998). If specific transport policies aimed at reducing car use are believed to threaten freedom of choice, drivers might be motivated to continue driving, regardless of the possible negative consequences.

Sustainable transport may imply different things in different regions and cultures, and consequently, specific sustainable transport plans may be evaluated differently in these regions and cultures. For example, North American society is more strongly tuned towards the regular use of cars than many European societies, such as Dutch society. Of course, inter-city distances in Canada and parts of the US are much greater than those in the Netherlands. Also, the public transport system in the Netherlands is sophisticated compared to that in many parts of North America. Thus, car dependency (i.e., the level of car use, car-oriented land use, and quality of travel alternatives; Newman & Kenworthy, 1999) is much higher in North America compared to the Netherlands. This implies that reductions in car use may have more significant consequences for the QoL of North Americans than for the Dutch. Similar differences may emerge when comparing regions within a country. For example, reductions in traffic volume may significantly enhance the QoL of people in densely populated areas (e.g., fewer traffic jams, less noise, better urban QoL), but may reduce the QoL of rural dwellers (e.g., some key locations and activities may be much more difficult to access).

11.4. Conclusions

Although no common definition of sustainable transport exists, most observers would agree that sustainable transport implies balancing current and future economic, social, and environmental qualities. A valid set of sustainable transport indicators has not yet been identified. However, current traffic and transport trends are not sustainable in the long term. The negative environmental, social, and economic externalities outweigh the social and economic values of transport. Sustainable transport is mainly investigated by examining the sustainability of current transport systems. In this case, the positive and negative values and externalities of current transport systems are examined, such as energy and land use, waste, traffic safety, traffic noise, health consequences, accident costs, accessibility, and economic wealth. Governments and international bodies such as the OECD often apply this approach. Sustainability indicators are defined and operationalised as sustainable transport policy goals, and whether the transport system is moving towards sustainability is monitored. In some cases future projections are also made.

In addition, the effects of various transport plans on sustainability are being assessed. This implies a need to consider a broader range of sustainability indicators, because changes in current transport systems may affect other sectors that also

contribute to unsustainable development (such as employment levels). Various methods and models have been developed to assess economic, social, and environmental consequences of transport plans. However, at present, only a few social indicators are being considered, because of the lack of knowledge and valid methods, tools, and techniques for assessing relevant social impacts.

Obviously, an important question concerns how the public evaluates such sustainable futures, and whether transitions to sustainable transport systems are acceptable to the public. These transitions may not be acceptable to everyone, because sustainable transport may conflict with individual short-term interests, especially if individual car users are asked to significantly adapt their lifestyles and transport behaviour. We should therefore also examine to what extent transitions to sustainable transport would affect individual QoL, and to what extent such transitions are acceptable to the public.

This chapter proposes a compensatory methodology for assessing the QoL effects of transitions to transportation systems that systematically differ in the extent to which they are sustainable. QoL is a multidimensional construct and is defined as the extent to which important values and needs are fulfilled. Subjective evaluations of QoL, i.e., cognitive evaluations of citizens' lives as a whole, are considered. A list of 22 QoL indicators was introduced for assessing QoL effects of transport policy plans; the list is believed to represent a wide range of dimensions that are important to consumers (and thus travellers). The QoL effects of possible transportation scenarios are assessed by asking respondents to indicate to what extent various transportation scenarios would affect relevant QoL indicators, and how important each indicator is to their lives. The overall expected changes in QoL may be calculated by summing the expected changes on the QoL indicators, possibly after multiplying the importance assigned to it. Several empirical studies revealed that the QoL concept is useful for assessing actual as well as expected QoL effects of various sustainable transport scenarios. They reveal not only whether overall QoL is or would be affected by transport plans, but also how QoL would be affected, i.e., which QoL indicators are expected to improve or deteriorate under different sustainable transport scenarios. Moreover, the method enables examination of which groups' QoL would be affected most strongly. Based on this, politicians and policy-makers should be able to decide whether and how specific groups should be compensated, and to better inform the public about expected positive and negative effects of the proposed sustainable policies. This would greatly improve the current situation, in which decisions often are based on the preferences of special-interest groups. At present, significant minorities that wield sufficient political power can obstruct particular solutions or compromises, which leaves governments with options that are unacceptable for others and/or watered down so much that their effectiveness becomes questionable.

The objective and subjective approaches described above are not contradictory; they complement each other. Assessments of sustainable transport typically are based on objective measures, whereas QoL assessments typically are based on subjective evaluations. QoL effects must be considered when designing and implementing sustainable transport plans, because they are crucial for the public

acceptability, and consequently the feasibility and effectiveness, of such plans. Sustainable transport plans will be strongly opposed when citizens believe the plans will significantly reduce their QoL. Sustainable development is unlikely to develop when sustainable transport is believed to be associated with significant reductions in individual QoL. To improve the chances for sustainable development, the basis of the expectations that sustainable transport will reduce QoL must be investigated. If the expectations are realistic, policy-makers should consider other ways to achieve sustainable transport that would affect QoL less negatively, or even positively. The extent to which possible negative effects could be compensated, e.g., by implementing additional policies, should be examined. However, it may also be that such expectations are based on lack of knowledge (e.g., people are not aware of environmental problems caused by car traffic) or misperceptions. In this case, the public should be informed and educated to the need for, and possible consequences of, sustainable transport.

The methodology described in this chapter may be used to collect lay judgments about which QoL changes would be anticipated if possible future scenarios were to be enacted. Many psychological processes will influence these judgments. For example, well-considered judgments about the expected QoL effects of transport plans may not be obtained if respondents do not think enough about the advantages and disadvantages of sustainable transport compared to a business-as-usual scenario. This may be facilitated by providing citizens or study respondents with clear descriptions or visualisations of plausible changes in transport, and by describing what each one implies for them personally. Members of the public must be involved in the development of sustainable transport scenarios. Changes understandably are met with initial resistance, as long as individuals are unconvinced of the positive consequences. Individuals generally judge their expected QoL in comparison to some standard, e.g., the QoL of others, their current QoL, or their aspirations. These standards are adapted in response to changes in their circumstances. This implies that changes in transport may initially negatively influence QoL, but because individuals usually adapt fairly quickly, no significant reductions in QoL may occur in the long term. Thus, support for sustainable transport plans may be stronger after they have been implemented. Finally, because the relative importance of QoL indicators may vary over time, the expected and actual changes in QoL of sustainable transport scenarios should be monitored continuously, and policies should be adapted when necessary.

Although much important work has been done to understand sustainable transport, many questions remain. The methods used for assessing sustainable transport and for assessing QoL effects of sustainable transport scenarios need to be further developed. For example, methods must be developed to examine how valid judgments can best be collected, and how psychological processes that may affect QoL evaluations can best be understood. Further, whether the results of studies like the ones reported here may be generalised to transport behaviour in everyday life need to be examined. As noted earlier, a multi-attribute model may be especially appropriate when citizen involvement is high, but other models are necessary when involvement is low, as it often is. The everyday preferences of many citizens might be

better predicted by fast-and-frugal or non-compensatory models. Finally, whether the present list of QoL indicators is comprehensive should be investigated. Relations between or among QoL indicators should be examined more thoroughly. For example, some QoL indicators refer to goals (e.g., comfort, status, or affection), but others refer to resources (e.g., money, time, or health) that may be used to fulfil these goals (see Ormel et al., 1997). This distinction perhaps should be made more clearly, to better understand how transport plans affect QoL.

The development of sustainable transport scenarios with QoL should be combined with assessments of those scenarios. Individuals may assess the QoL effects of transport plans that fulfil general sustainability criteria, but one may also assess the sustainability of transport plans that optimise the QoL of current as well as future generations.

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