13
Transport policy

Jan Anne Annema

13.1 INTRODUCTION

In Chapters 3 to 6 the different factors are discussed which explain mobility. Broadly speaking, people and companies base the decision to travel or to transport freight by weighing the private benefits and costs of the trip. A trip to a certain location is beneficial to them if it fulfils their needs. The private costs of a trip consist of monetary costs, travel time, and effort. This chapter shifts the range of view from the private to the government perspective. Governments also weigh the costs and benefits of mobility, but they also take a societal perspective. If a government concludes that the transport market from a societal perspective results in undesired outcomes (e.g., congestion, air pollution, traffic casualties) they often intervene with transport policy.

The aim of this chapter is twofold. The first aim is to explain the main reasons why governments intervene in the transport market. Secondly, a concise overview is given of the dominant transport policies. Transport policy covers many topics, much more than can be discussed in this chapter. For more detail and a far more in-depth analysis of transport planning issues, we refer the reader to Banister (2002). Guy Peters (2018) discusses in his book policy problems and policy design issues which we will only touch upon in this chapter. Although Guy Peters' book is not specifically aimed at transport policies, valuable lessons can be learned from his book for transport policy-making.

Transport is still one of the most regulated sectors in any economy as already noted by Button and Gillingwater (1986). Governments provide and own transport infrastructure, tax car owners, subsidize public transport, decide by implementing traffic rules who has right of way, implement emission standards to make vehicles cleaner and safer, and so forth. There are many reasons why governments intervene with these policies in the transport market. Different political parties and different political systems all over the world will have different considerations. However, generally speaking, all over the world three main reasons can be found for government interference in the transport market:

1. Market failure;
2. Equity reasons;
3. To generate revenues.

Market failure is an economic concept meaning that the market itself will not result in optimal outcomes from a societal perspective. In economic jargon: the market does not result in efficient allocation of resources. The 'transport market' stands for the interaction between, on the one hand, suppliers of transport services such as the infrastructure providers (in most cases governments), public transport companies, and vehicle manufacturers, and, on the other hand, people and shippers who demand transport services. Resources are any scarce goods that are needed to satisfy people's needs or wants. Transport-related examples of scarce goods are road capacity, cars, aircraft seating capacity, clean air, quiet living areas, land for transport facilities, and so forth. If a market does not result in an efficient allocation of resources, economists mean that the market cannot sustain 'desirable' outcomes or stop 'undesirable' outcomes. In Section 13.3 we will discuss efficient allocation of resources (or Pareto optimal) more in detail. For now, it is important to realize that when people decide to make a car trip (desirable outcome for them) they do not take into account, for example, the fact that they pollute the air (a scarce good) for people living close to the road when driving, so the result of their choice is poorer air quality for others (an undesirable result). This is a classic example of a transport market failure related to the existence of so-called transport external effects. In Section 13.2 we will explain the concept of external effects more in detail. An important policy aim for many governments is to maximize efficiency in the transport market (Section 13.3).

Equity reasons also explain why governments intervene in the transport market. The equity policy objectives can vary but are related to the distribution of the costs and benefits of transport in a fair way, or to give all people at least a sufficient ('fair') amount of mobility and accessibility. For example, many governments subsidize public transport because they think it is desirable that all people in a country have nearby public transport at their disposal; even in very low population density areas where running a profitable public transport service is impossible. Section 13.4 focuses on 'equity issues' related to transport policy-making.

Finally, governments may tax the transport market as a source of general *revenue*. For example, the total car tax revenue in the Netherlands was around 17 billion euros in 2018 consisting of vehicle purchase tax, fixed annual car tax, fuel levies, and the addition of the private use of company cars in the payroll and income tax (Algemene Rekenkamer, 2019). In the Dutch tax law it is motivated that these car taxes are partly meant to be supportive to improve the transport system but it is specifically mentioned in the law that this money is also meant to be an important and stable revenue stream for the government which can be spent for any purpose politicians choose to.

Section 13.5 explains that next to improving efficiency and equity also politicians' self-interest is a reason for implementing transport policies. Section 13.6 discusses criteria that can be used to define healthy transport policies. Section 13.7 gives some examples of transport policy-making. Conclusions can be found in Section 13.8.

13.2 EXTERNAL EFFECTS OF TRANSPORT

An important reason for government intervention is transport market failure in the form of external effects. External effects of transport are mostly costs (rarely benefits, see below) which

people and shippers do not take into account when deciding to make a trip or to transport freight. What they do take into account are the costs (the resistance factors, Chapter 6) for themselves (internal costs) such as their travel time, fuel costs, and effort. However, when deciding to make a trip they also produce costs – unintentionally – to third parties which are outside the decision of the trip makers because the trip makers do not have to compensate for those costs. External effects can be both negative (costs) as well as positive (benefits) but almost all debates and research in transport is on negative external costs and how to decrease these. External costs (or external benefits) accrue per definition to a third party. A third party can be a non-traffic participant such as people living close to a road who are exposed to poor air quality (see example above). Also, other traffic participants can be a third party such as cyclists who may be at risk of an accident because a car driver has decided to drive on the same road. Most external costs are related to the environment, safety, and accessibility. Chapters 9–12 have introduced the reader to these areas and Chapter 8 has discussed the importance of technologies for these areas. This chapter introduces the reader to the area of external costs from a policy perspective.

13.2.1 External Costs

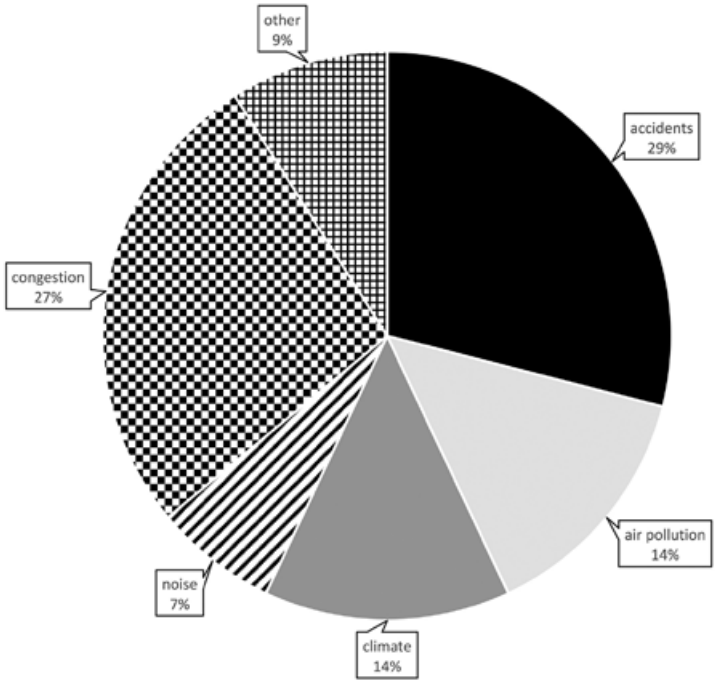
Negative external effects are called external costs. Verhoef (1996) distinguishes three kinds of external transport costs:

1. costs due to the use of transport means such as road vehicles, ships, or aeroplanes;
2. costs due to vehicle ownership and availability;
3. costs due to infrastructure.

We will now discuss these three kinds of external costs more in detail.

Costs due to the use of transport means such as road vehicles, ships, or aeroplanes

The use of cars, lorries, trains, aeroplanes, and ships result in external costs. Figure 13.1 shows the share of external cost categories for transportation within the EU28 for 2016 (the UK was part of the EU at that time) (Van Essen et al., 2019). The figure also shows the share of the different transport modes. In order to estimate these shares, all the different cost categories are expressed in money units so that they have the same unit. As external costs are per definition not included in market transactions, it may be a surprise that the external costs can be expressed in money units at all. However, there are different methods developed to estimate people's willingness to pay (WTP) to avoid external costs (or people's willingness to accept (WTA) a monetary reward to compensate for external costs). For more details on this issue, see Chapter 14. These WTPs and WTAs are used in Figure 13.1 to estimate the external costs per category and mode. Delucchi and McCubbin (2010) give an overview of external costs for transport in the US; Van Essen et al., (2019) provide an extensive 'Handbook on the external costs of transport' for the EU with, amongst others, all kinds of detailed information on WTPs and WTAs. Below we will briefly explain that estimating these WTPs and WTAs is difficult and sometimes severely criticized.



Source: Van Essen et al. (2019).

Figure 13.1 Share of the different cost categories on total external costs within the EU28 for 2016

Accidents are shown to be an important external cost category (Figure 13.1). For example, cars in Europe had an external accident cost of more than 200 billion euros in 2016 according to Van Essen et al. (2019). Cars pose a relatively large risk for other road users to be involved in an accident with sometimes huge implications ('costs') such as deaths and severe injuries (see Chapter 11 on safety). The WTP to avoid these risks is high. Also, congestion is an important external cost category according to the data presented. When a car driver decides to use the road during peak hours s/he causes unintendedly time delays for other road users which s/he does not have to compensate. The valuation of congestion costs are depicted in Figure 13.1 using 'Value of Travel Times' (see Chapter 6).

Figure 13.1 includes for accidents and congestion the direct external costs. However, as also explained in Chapter 6, the risks of having an accident or losing time in a traffic jam can motivate people not to travel. These travelling avoidance costs are also part of external costs. Not including these avoidance costs could be an important omission. For example, Adams (1999) showed that in 1971 around 80% of British children went to school by themselves. In 2014 this share has decreased to 12% for seven to ten year-olds and 69% for 11 to 13 years-old (UK National Travel Survey, 2014). The most important reason for the seven to ten year-olds is that parents are afraid of their children being involved in traffic accidents. The external costs of preventing children from cycling or walking to school relate to freedom loss for children to

partially develop themselves in a space without parental supervision and, probably, to children losing the opportunity to have some 'easy' daily physical exercise.

Costs due to vehicle ownership and availability

The second external costs category distinguished by Verhoef is related to the non-use phase of vehicles. For example, vehicles sometimes use space for parking in the public domain for which the vehicle owner does not have to pay or the payment is not sufficient to cover all costs. Also, environmental effects related to producing and scrapping vehicles, aircraft, or ships are part of this external cost category. Here, a relation can be made with the concept of Life Cycle Analysis (LCA; see Chapters 8 and 9). LCA takes the environmental impacts into account over the whole life cycle of a product such as a car. So, in those kinds of analyses, the external costs can be found related to the non-use phase of products.

Costs due to infrastructure

Finally, external costs arise according to Verhoef because of the construction and existence of transport infrastructure. In a review, Geurs et al. (2009) point out that the mere presence of transport infrastructures (roads, railway lines, waterways, etc.) may affect the quality of the physical environment. This applies to, for example, noise, visual quality, light pollution and people's perception of the environment or neighbourhood, aesthetics, and quality of life. Furthermore, Geurs et al. (2009) cite research that showed that new or existing transport schemes, such as roads or railways, can have detrimental social impacts on communities (severance). Transport infrastructure can also act as both physical and biological barriers to many wildlife species, as Kreling et al. (2019) show related to Interstate-280 in California, USA. Roads can affect the quality and quantity of available wildlife habitat, most notably through fragmentation. Furthermore, producing asphalt, making or scrapping roads and/or road maintenance can result in environmental impacts or direct negative health impacts to the construction workers which are not sufficiently reflected in their wages. These environmental and health-related impacts are also negative external costs of infrastructure; see LCA in the previous paragraph.

13.2.2 External Benefits

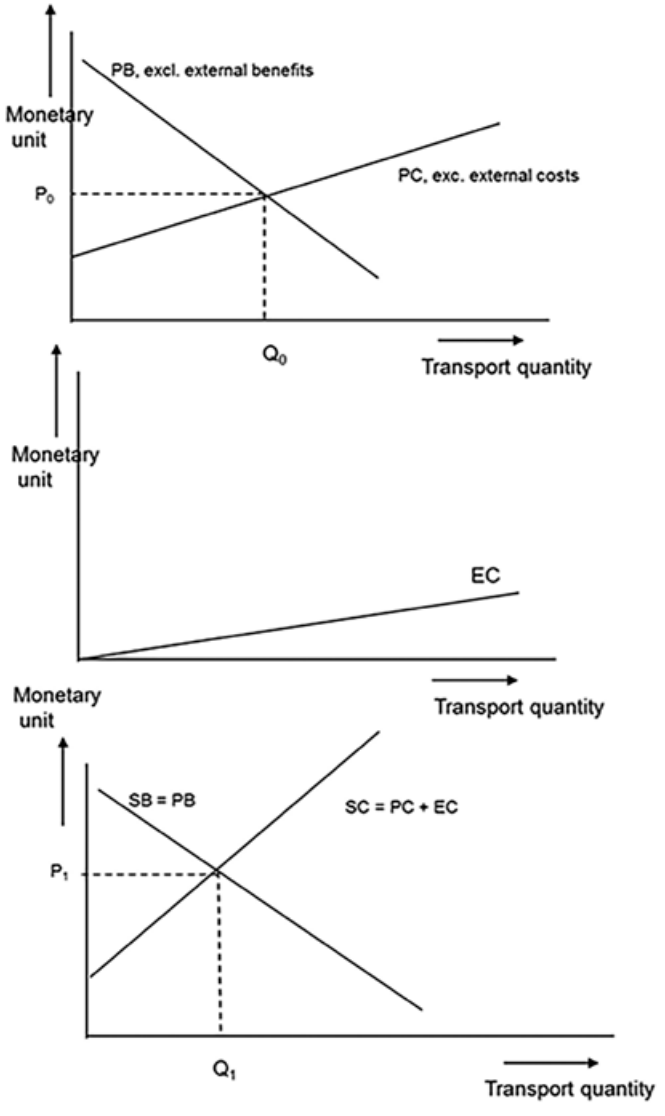
External benefits are the positive external effects of mobility. The existence of external benefits can be a reason for governments to intervene as in the case of external costs. These benefits work per definition outside the 'normal' market: people or shippers who participate in a transport activity do not take these positive impacts into account when they decide to make a trip. This could, as opposed to negative external effects, result in an amount of transport which is too low from a societal perspective. External benefits have been discussed for a long time. In most cases, there was confusion in these discussions about the concept. For example, some people claim that freight transport results in 'external' impacts such as lower production costs, low consumer prices, and a broad product variety. However, these benefits are all monetized impacts in the freight transport market. Producers and shippers take all of these impacts into account when deciding to transport freight. Others sometimes claim that mobility leads to

external benefits such as enhanced family relations or to a smaller world as thanks to cheap aviation people can get acquainted in a relatively easy way with far-away cultures. However, these benefits are not external because they are intended. Thus, external benefits of transport are limited to the well-known classic examples such as aeroplane or train spotting. In the remainder of this chapter external transport benefits are not discussed.

13.3 MAXIMIZING WELFARE

As stated in Section 13.1 maximizing welfare (improving efficiency) is an important transport policy aim. The aim is based on the so-called economic welfare theory (a relatively easy introduction to welfare economics can be found in Johansson, 1991). The economic welfare theory states that we should strive in policy-making for Pareto optimal welfare, or Pareto efficiency. The Italian economist Vilfredo Pareto is one of the founders of the welfare theory. According to many standard economic textbooks Pareto efficiency is said to exist when no other improvements can be made in the allocation of resources to one individual without it causing a loss to others. It is important to realize that Pareto efficiency does not mean that resources are distributed fairly (see Section 13.4). A way of explaining Pareto efficiency in the transport market is to think of a policy (e.g., lowering existing fuel levies) that would result in more transport. Assume that noise nuisance is the only transport externality. The people who can make more car kilometres due to this policy are better off. However, the extra car kilometres will result in an increase in the road noise load. Perhaps lowering the fuel levy to a small extent would only result in some small traffic increase and, thus, only some small amount of extra noise load very close to the road where nobody is affected by it. By increasingly lowering the fuel levy more traffic arises and at a certain point, the first persons living close to the road will hear the increased noise load and will be perhaps bothered by it. If this is the case, these people are worse off at that point. Thus, lowering fuel levies is a Pareto efficient policy just before the point that the first people are worse off due to this policy.

The Pareto optimum is a strict criterion. Later in history, a more applicable criterion was formulated by Nicholas Kaldor and John Hicks (Hicks, 1939; Kaldor, 1993). They have stated the now so-called Kaldor-Hicks efficiency criterion (also called compensation criterion), which means that an outcome of a policy is efficient if those that are made better off could in theory compensate those that are made worse off. The compensation criterion is the most used criterion in cost–benefit analysis (CBA) (Chapter 15 and below). Related to the previous example, the Kaldor-Hicks optimum of the fuel levy decrease policy is not reached as long as the benefits to the people who can drive more than outweigh the costs of the people who suffer from the extra noise load. It is important to note that in Kaldor–Hicks it is not required that the compensation is actually being paid, merely that the possibility for compensation exists. Thus, using the Kaldor–Hicks criterion in practice, a more efficient outcome in case of the fuel levy decrease policy can in fact leave some people worse off, namely, the people who will suffer from the increased noise load and who are only in theory compensated. In contrast, using Pareto efficiency in practice nobody can become worse off.



Note: The middle picture shows the marginal external costs.

Figure 13.2 Transport prices and quantities in two equilibrium situations: without external benefits and costs (top) and with external benefits and costs

Welfare theory can also be explained using Figure 13.2 (based on Schmidtchen et al., 2009 but in economic textbooks many more examples can be found). The figure shows so-called marginal costs and benefits. 'Marginal' means per extra unit of transport such as one extra passenger kilometre or one extra ton freight kilometre. The top figure (13.2a) reflects the situation on the transport market where external costs (EC, see middle picture) are not taken into

account. In the top figure marginal private benefits (PB) of transport are sorted in such a way that they decrease according to the amount of transport. The explanation is that people value the kilometres they travel differently. There are highly beneficial trips for them, for example, the trips to their work where they can earn money. For these trips, they are willing to pay relatively much money, travel time, and/or effort. They make also less important trips for which they are not willing to pay much money, travel time, and/or effort. It seems obvious that people prioritize their kilometres from the most beneficial ones to the lesser beneficial ones. In Figure 13.2a the trips are sorted from higher to lower beneficial ones. For the marginal private costs (PC) it is the other way around (Figure 13.2a): it is assumed in the figure that the marginal private costs increase according to transport quantity. To be clear, the figure is schematic. In reality, it is highly probable that the private cost line will stay constant for a long while: the marginal private costs for the first kilometres are more or less the same as for the 20,000th kilometre travelled. However, for sake of clarity, an increasing marginal private cost line is assumed, because now it can be shown more clearly to the reader that there is an equilibrium at quantity Q0 with price P0. Of course, there would also be an equilibrium at the intersection assuming a constant private marginal cost line but the picture would be messier. No matter how, at Q0 with price P0 the private optimum is reached. At the equilibrium, the marginal private cost (PC) of the last kilometre travelled equals exactly the marginal private benefit (PB) of that kilometre. Adding one more kilometre would still result in marginal private benefits but, at the same time, the marginal private costs of that one more kilometre is higher. Thus, it is from a private perspective not rational to drive that extra kilometre.

As follows from the definition, private parties do not take external costs into account when deciding to make a trip. In the Figure 13.2c bottom it is depicted what would happen if marginal external costs are taken into account in the transport price. This 'taking into account' is also called internalization of external costs. The marginal social cost line will become steeper when external costs are internalized compared to the marginal private cost line (SC = PC + EC). The reason is that increasing quantities of transport often result in higher marginal external costs (see middle picture). For example, the first car or lorry kilometres hardly result in traffic jams. However, above a certain point traffic jams grow more or less exponentially in proportion as traffic quantities increase without adding new road capacity. Thus, as a result of the steeper SC line, a new equilibrium arises at price P1 and transport quantity Q1 (Figure 13.2c bottom): the so-called social optimum. Figure 13.2 shows how to internalize from a theoretical point of view: governments should increase the private transport price (P0) with a charge equal to P1 minus P0. By doing so, the social optimum in the transport market will arise resulting in less transport (Q1) compared to the situation where external costs are not internalized (Q0). In other words, in a world without internalizing external costs, there is too much traffic (Q0) from a societal point of view.

On the basis of the welfare theory governments carry out transport pricing policies. For example, one of the focus points in the 'European Strategy for Low-Emission Mobility' is a fair and efficient pricing in transport which should better reflect negative externalities of transport (DG MOVE, 2019, p. 3). Another global example, based on the notion of external costs, is urban charging schemes that are implemented or studied. Congestion charging schemes have different motivations but one of them is to internalize the external costs of road traffic. Cities

such as Singapore in 1975, Oslo in 1990, Trondheim in 1991, Durham in 2002, London in 2003, Valletta and Stockholm in 2007, Milan in 2012, and Gothenburg in 2013 have implemented a kind of road or area pricing system (Ortúzar et al., 2021).

As already mentioned, societal CBA is based on the welfare theory. CBA is applied to evaluate many transport policies. For example, Bouscasse et al. (2022) applied CBA for policies aiming at decreasing transport air pollutants (fine particulate matter, $PM_{2.5}$, see Chapter10). CBA is, however, mostly used as an appraisal tool for new transport infrastructure in Western countries (Koopmans and Mouter, 2020). A CBA aims to quantify all marginal impacts of new infrastructure as much as possible and puts a monetary value to these impacts. Impacts are, for example, construction costs, decreased travel times, lower air quality, and so forth. In most cases, travel time gains are the most important marginal benefit and construction costs the most important marginal costs. The idea is that if the marginal benefits of new infrastructure outweigh the marginal costs, politicians could decide to build the new infrastructure as, by doing so, they increase total welfare in a country or region. For more details on CBA, see Chapter 15.

13.3.1 The Practice

The welfare theory may seem elegant and rather straightforward. However, implementing the theory in practice is not particularly easy. One important reason is that it is complicated to monetize external costs. To determine the charge level (P1 minus P0) or to carry out a proper CBA researchers need to know the price people or shippers are willing to pay to avoid one unit of traffic jam, noise nuisance, traffic accident, air pollution, and so forth. The problem here is that these impacts are external, thus, per definition, outside a market of supply and demand where prices are determined. Still, based on different kinds of valuation techniques scientists are capable to monetize external effects (see before). Contingent valuation methods (CVM) are prominent in trying to find people's WTPs or WTAs for goods that are not traded at markets, which external effects per definition are not. CVM are survey-based methods where people can state their preferences or where via choice experiments people's valuations for non-tradable goods can be estimated. The valuation results are uncertain and sometimes highly debated (see, for example, Aldred, 2002 and 2006). Especially, the valuation of one tonne extra or less carbon dioxide (CO_2) emissions or the valuation of damage to nature or landscapes due to new infrastructure is often highly controversial (see Niemeyer and Spash, 2001, for a critique on nature valuation). Koopmans and Mouter (2020) give in their chapter on CBA an overview of the pros and cons of CVM to find people's valuations for travel time savings and all kinds of external effects.

13.4 EQUITY

Next to policies aimed at improving efficiency, governments all over the world implement or may implement transport policies because they consider them as being fair. Equity has received growing attention in the scientific literature. In this section, only some main lines will

be sketched. Banister (2018), Martens (2017), and van Wee (2011) are some examples of books by scholars that address in far more detail issues and solutions related to fair transport policies.

Equity in transport literature is often referred to as a 'fair' or 'just' distribution of transport benefits and costs (Camporeale et al., 2019). The difficulty lies in the words 'fair' and 'just'. Within a country, the better-off can travel faster and further, leaving the poor in the slow lane closer to home, as Banister (2018) notes. To judge if this is unfair or unjust and to decide if policies are required to make the distribution of faster transport more equal among income groups depends on a moral judgement. Pereira et al. (2017) point out that philosophers who think about morality have no single overarching definition of justice. In their paper, they give an overview of ethical theories of justice in political philosophy.

Relatively often mentioned ethical theories in the transport literature are utilitarianism, egalitarianism, and sufficientarianism. Utilitarianism is strongly related to CBA and holds that if the consequences of a policy imply a net welfare gain for the greater number of people, this policy is just. Egalitarianism is concerned with inequalities in society. The theory is more complicated than described here but broadly speaking an egalitarian finds a transport policy just if it maximizes the minimum level of primary goods (such as accessibility to primary schools) of the people in the worst-off position (taken from Pereira et al., 2017). People in the worst-off position could be people with low incomes in suburbs relatively far away from areas where there are many primary schools to choose from. A just egalitarian policy would, especially for these 'worst-off' people, improve school accessibility in terms of lowering travel time or 'out-of-pocket' costs to this school area for them. Sufficientarianism argues that policies are just if they result in an improvement so that everybody is sufficiently well-off ('has an adequate amount of that good'). Egalitarianian policies strive to decrease the differences between worst-off and better-off groups or areas, whilst under sufficientarianistic policies there is a threshold expressing what is 'sufficient' for all (van Wee and Geurs, 2011). This threshold should be aimed for by politicians according to sufficientarianism and could be something such as every household should at least have access to destinations with many primary schools within y minutes travelling or z euros "out-of-pocket" costs.

Transport-related social exclusion is a notion that is often mentioned in the transport equity literature (Lucas, 2018). Transport-related social exclusion means that if people lack mobility options (e.g., no car availability, not enough money to pay regularly for public transport), their level of access to jobs, goods, medical services, education, and so forth can be low, which can contribute significantly to social exclusion for these people and to feelings of social isolation for them. Lucas (2018) cites an older study which also found that these transport inequalities are highly correlated with social disadvantage which means that some parts of the population are more at risk than others for transport-related social exclusion.

In the practice of transport policy, ethical theories of egalitarianism and sufficientarianism are applied to some extent to government provided public transport and public transport subsidies. There are various motivations for such a policy (Button, 1993; van Goeverden et al., 2006) but one of them is the so-called 'social function' of public transport, meaning that vulnerable groups such as low-income households, persons without a driver licence, elderly, and persons with a disability, need public transport to avoid problems of social exclusion (e.g., Lucas, 2018). However, despite good intentions a redistribution is not always actually reached

with public investments in rail and transport fare reduction subsidies. Banister (2018) found, for example, that in the UK each household on average receives a transport subsidy of £151, but that the richest 10% receive more than twice as much as the poorest 10%. Börjesson et al. (2020) analysed that the average transit subsidy rate in Stockholm, Sweden, is 44%. They indeed found that these subsidies are mildly progressive because of discounts for students and retired and because top-income citizens make fewer transit trips per person. However, they also conclude that the progressivity of the subsidy scheme is weak and that the current way of subsidizing Stockholm transit is not an effective policy from an equity point of view.

Governments can find it fair that certain transport mode users (e.g., all car users) pay for their total social costs even if this means that in this way of pricing, the marginal social costs outweigh the marginal social benefits. To explain the notion of total social costs we have made a balance of total costs and benefits of a transport mode (see Table 13.1 with car driving as an example). We can assume in this balance that total internal benefits are equal to total internal costs. Thus, the total social balance is reached when on the one hand the external costs caused by car driving and government expenditures for roads and policies are equal to the tax revenues paid by the car drivers. So, car drivers pay for their total costs when the government revenue from fixed and variable car taxes equals the external car costs and government expenditures on car driving.

Table 13.1 Balance of costs and benefits of car driving – an example

Car driving benefits	Car driving costs
Internal benefits: the car driver has benefits because he or she can reach the desired destination; some car drivers will have benefits because he or she can satisfy certain social-psychological needs (e.g., car driving results in pure joy or status enhancement)	Internal costs: travel time, effort, money costs related to fuel, car purchase, taxes (see Chapter 6)
External benefits: negligible[a]	External costs: accident risks, environmental damage, traffic jams, and so forth
Benefits for the government: fixed and variable tax revenues	Costs for the government: road construction and maintenance, traffic police, and so forth

Note: [a] With the exception that people may enjoy watching ships, trains, aircraft, or a beautiful modern or historic car that is owned by another person (see external benefits before).

Governments have the choice to charge transport modes their marginal or total social costs dependent on their policy goal. They can aim for an efficient or fair transportation system. In scientific literature, the tension in this policy choice is sometimes denoted as efficiency versus equity (see, for example, Verhoef, 1994). To explain this tension a bit more we give an example of rail infrastructure construction. The social costs in this example are construction costs and external costs such as damage to landscapes and nature. The construction and damage costs to landscapes and nature are not directly related to use. If it be 25,000 or 50,000 train movements per year between locations 'A' or 'B', the whole track between 'A' and 'B' has to be built because it makes no sense to only build half of the track. When governments aim at equity they will charge the rail track users with a price based on covering total social costs. Thus, a price per kilometre has to be paid that includes the construction and landscape/nature costs which are

not directly related to the amount of use. However, with this charge a price level per kilometre travelled may arise which is higher compared to the price where marginal social costs equal marginal social benefits: point P1 in Figure 13.2c. Consequently, too few rail kilometres will be travelled from a social optimum point of view. In conclusion, the tension is that it may seem fair to confront road or rail users with their total social costs, but this may result in an inefficient transport system. On the contrary, if these users are only charged according to their marginal social costs, governments cannot cover all their social costs.

As mentioned above, CBA is a much-used appraisal method for transport policies. However, the CBA is often criticized for ignoring equity issues such as distribution effects (see also Chapter 15). Other equity-related criticisms are, first, that rich people matter more than poor people in CBA because, for example, rich people are – *ceteris paribus* – willing to pay more for travel time gains and environmental benefits compared to poor people. Second, when using discounting, current generations matter more than future generations. It is important to realize that CBA does not exclude reporting distribution effects, e.g., over income classes or regions, or the use of a discount rate of zero or even a negative discount rate. So, these critics mainly relate to the use of CBA in practice. However, there is also more fundamental criticism on CBA (perhaps on the broader idea of utilitarianism) related to justice. Some point out that it would not be sensible to use highest total utility as the only yardstick in decision-making. In their view it is not wise to disregard the presence of tragic choices in politics (Nussbaum, 2000), as when CBA leads to a choice of course A (many winners) over course B (hardly any winner), but course A leads to uncompensated losers (a potentially small group whose members may suffer from, for example, losing their homes, serious illnesses, and even death which are, of course, tragic impacts of course A). For more discussion on the limitations of CBA from an ethical perspective see van Wee (2011). To overcome problems of tragic choices in CBA, appraisal methods such as multi criteria analysis (MCA), environmental impact assessment and social impact assessment are used. Sometimes these evaluation studies are additional to CBA outcomes, sometimes only these appraisal methods are applied *see* Chapter 15 for more information on MCA.

13.5 PUBLIC CHOICE THEORY

Sections 13.3 and 13.4 describe rational considerations or aims which politicians can apply when deciding to implement a new transport policy or not. But there are other reasons – perhaps more irrational – which explain the actual behaviour of politicians and bureaucrats in the practice of transport policy-making. Here, the core idea is that psychological reasons and politicians' self-interest explain the choice of transport policies. The idea of self-interest is rooted in 'public choice theory' (Buchanan and Tullock, 1962). In this economic theory it is assumed that people acting in the political marketplace act in the same way as in other markets: they are mainly concerned for themselves (and their nearest relatives).

When building new transport infrastructure there is a substantial body of scientific literature that points at psychology and 'self-interest' as explanations for the question of why new infrastructure is sometimes built that does not meet the expected efficiency and/or equity

considerations. Also for the worldwide CBA practice, Flyvbjerg and Bester (2021) found based on a large dataset that cost and benefit estimates of public investments are often inaccurate and biased. Flyvbjerg et al. (2003a) have built a database of 258 transport infrastructure projects all over the world. Of these projects 86% showed cost overruns, with an average overrun of 28% of the estimated costs. 'Cost overruns' means that the costs of building the new infrastructure is higher compared to the cost estimation used for making the political decision. Later in time, Cantarelli et al. (2012) found for the Netherlands average cost overrun of 10.6% for rail, 18.6% for roads, and 21.7% for fixed links. Flyvbjerg et al. (2003b, 2006, Flyvbjerg 2007) also investigated 210 projects on demand shortfalls, comparing transport demand the first year after introduction of the new infrastructure with the *ex ante* estimate. Mainly for rail projects, they found large inaccuracies. For the occurrence of these problems, the literature distinguishes four different types of explanations: technical, psychological, economic, and political explanations (Flyvbjerg, 2005; Cantarelli et al., 2010). Technical explanations explain failure in terms of honest mistakes, related to difficulties in predicting the future (Flyvbjerg, 2005). Nevertheless, if only technical reasons explain the mistakes, it seems improbable that mainly cost underestimations and benefit overestimations (for rail) would occur. Therefore, two additional reasons are proposed. First, it seems probable that politicians and bureaucrats are unintentionally too optimistic about their projects. Psychological explanations state that humans tend to overemphasize their own abilities and to be overly optimistic about the future, rather than rationally weighing gains, losses, and probabilities (Lovallo and Kahneman, 2003). Second, and here self-interest comes into play, it is probable that decision-makers deliberately present wrong numbers (Flyvbjerg et al., 2003a; Flyvbjerg, 2005; Cantarelli et al., 2010). Project funds are scarce, and projects that look good on paper can more easily be financed than projects that do not. Politicians, planners, and forecasters are said to deliberately underestimate costs while overestimating benefits in order to gain approval and funding for their 'own' (sometimes much loved) project.

Flyvbjerg and Bester (2021) argue also for the worldwide CBA practice that the root causes of inaccuracies in CBA outcomes are not technical as often is mentioned by the planners of the projects. Flyvbjerg and Bester agree that scope changes, unexpected technical drawbacks, and changes in the economy are very difficult to predict and can explain the inaccuracy. Their point is, however, that again and again in CBAs for public projects these well-known phenomena are underestimated. Overwhelmingly the CBA analysts are far too optimistic in their assumptions due to aspects such as 'overconfidence bias, the planning fallacy, and strategic misrepresentation' (Flyvbjerg and Bester, 2021, p. 405). Here, the important point is that there does not seem to have been any improvement in estimation methods over time – there is no feedback loop and a learning process in place.

13.6 'HEALTHY' TRANSPORT POLICIES

An important question is: how to achieve a 'healthy' transport policy? (Van Wee, 2009). Much transport research and analysis is aimed at helping decision-makers to answer this question. Researchers and consultants help by developing and improving tools such as CBA and MCA

(Chapter 15) and by carrying out future studies (Chapter 14) and all kinds of effectiveness studies. Van Wee (2009) distinguishes six general criteria for policy interventions that should be taken into account in the decision-making process in order to achieve healthy policies: (1) effectiveness, (2) efficiency, (3) equity, (4) ease of implementation, (5) flexibility, and (6) long-term robustness:

1. Effectiveness relates to the question: does the policy do what it is supposed to do? For example, if free public transport is implemented because of environmental reasons, the question is: will it lead to less environmental pressure? Van Wee (2009) notes that it is not only the question of whether the policy is effective at all, but also the level of effects.
2. Efficiency can be expressed in terms of cost-effectiveness or cost-to-benefit ratio. Cost-effectiveness is generally a relatively easy indicator in the case of 'simple' policy options, having one dominant effect, and only monetary costs. It can, for example, be applied to helping the political choice between subsidizing technology A or B which only differ in technical costs and carbon dioxide (CO_2) emission reduction potential. Of course, it is 'healthy' to subsidize the technology which has the lowest costs in achieving one kg of emission reduction. It is less simple to use cost-effectiveness as an efficiency indicator if a policy option has (1) multiple effects, or (2) monetary as well as non-monetary costs. An example of multiple effects: improvements in public transport may contribute to accessibility, safety, and the environment. An example of non-monetary effects: reduction in speeds on motorways could result in lower emissions. In addition, they result in reduced fuel use and costs, which can be expressed in monetary terms, but they also increase travel times and might reduce the fun of driving for some, both being non-monetary costs. For such less simple policy options a (simple) CBA is to be preferred to estimate efficiency.
3. As explained earlier, equity relates to questions about the distribution of benefits and costs of the policy. Policies may be aimed to solve equity issues. In that case, it is important that the aim is formulated very clearly, for example, from a more egalitarian or sufficientarian principle. Which group is to be helped with improved accessibility precisely? And what is meant precisely with improved accessibility for that group? As shown in the previous example with the transit fare subsidies, with only good intentions equity aims do not have to be met. So, healthy equity policies must be defined very precisely so that effectiveness (see item 1) can be analysed. On the other hand, policies can have non-equity aims but can have equity implications. It seems obvious that policy instruments with hardly any equity issues are relatively much easier to implement compared to instruments with many equity issues.
4. It is an advantage if a policy option is easy to implement. But van Wee (2009) stresses that this criterion is not included to suggest that only easy-to-implement policy options are 'healthy'. A policy option should be considered as an important candidate option particularly if it could have major effects and is cost-effective. For example, some road pricing designs could belong to this category. However, it is worth trying to understand the major barriers for implementation and to learn from successful implementations elsewhere. For example, the equity barrier (see above) can be reduced or even solved by carefully selecting options for revenue use. It could be an option to reduce income tax for low-income people, or to reduce tax on fuel efficient cars which tend to be owned by low-income people.
5. Flexibility relates to the ease to adapt the policy, because of the ease or difficulty to foresee changes. For example, once introduced, levies on fuels and cars, and emissions regulations

can be changed relatively easy. The importance of the flexibility criterion will be discussed more in detail in Chapter 14 (exploring the future).

6. Long-term robustness, the final criterion, relates to the question of whether a policy is 'no regret' under uncertain long-term developments that could have a major impact on society. This criterion is strongly related to flexibility (see further Chapter 14). Here, the term 'flexibility' is used for any foreseen or unforeseen changes, also short-term changes and changes with relatively low impacts. Long-term robustness relates to major changes. A check on robustness is recommended by van Wee (2009) at least in cases of expensive land-use or transport infrastructure policies. Are these policies no-regret in case of major changes?

13.7 CURRENT TRANSPORT POLICY

The previous chapters contained many topics for which government policies are developed. Some transport policies aim at decreasing transport resistance factors, other policies try to influence the needs and location of activities or try to improve the environmental performance of vehicles and so forth. It is impossible to give a complete overview of all policies at all levels. Therefore, this section will only outline some main policies. When using keywords such as 'transportation policy' or 'transport policy' in a search engine such as 'Scopus' easily almost 40,000 documents pop up.

There are different ways to classify transport policies:

1. According to policy goal. For example, policies to improve accessibility or to improve transport safety.
2. According to kind of instrument. For example, pricing policies or policies providing new infrastructure.
3. According to the policy body responsible for implementing the policy. These bodies are: national governments, regional governments (federal states or provinces), city councils, supranational bodies (such as the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO) of the United Nations), and international economic and political blocks (e.g., the European Union, EU).

In Table 13.2 we have chosen to give a transport policy overview according to goal and dominant instruments. In the column remarks, we give some examples of bodies responsible for the policy. Note that this table is not complete.

Table 13.2 Much used transport policy instruments

Goal	Important instruments	Remarks
Improving accessibility	Providing and maintaining road, port, and rail infrastructure; Subsidizing public transport fares; Road pricing; Providing traffic management; Implementing land-use policies	These policies are mostly implemented by national governments. Road pricing is the exception as almost all current road pricing schemes are implemented in specific cities.
Improving the environment, liveability, and health	Setting vehicle emission and noise standards; Setting fuel standards; Providing noise barriers along (rail) roads, providing eco-tunnels and tunnels in urban areas; Promoting the use of active modes (e.g., improving the cycling and walking infrastructure, providing and maintaining public cycle parking facilities)	National governments implement standards in most cases. In Europe the EU sets standards which are transferred to national laws accordingly. For aviation and shipping the ICAO and IMO sign international agreements to make, amongst others, aircraft less noisy and aircraft and ships less polluting and more fuel-efficient. Adapting infrastructure is national and/or local/regional policy.
Improving transport safety	Setting safety standards for vehicles; Implementing rules such as making wearing seat belts and crash helmets mandatory; Adapting infrastructure to make traffic situations safer (e.g., constructing roundabouts in place of junctions)	National governments implement standards in most cases. Adapting infrastructure is national and/or regional local/policy.
Improving equity	Subsidizing public transport fares; Providing railroads, ports, and roads in poor and/or low densely populated areas	National, regional, and local governments subsidize public transport fares. National governments but also international economic blocks (such as the EU) sometimes decide to subsidize new infrastructure being built in poorer or slow developing regions or countries (the aim is often also improving accessibility next to social inclusion). Additionally, the World Bank[a)] offers low-interest loans to poorer countries, for example, in order to make it possible for them to build new transport infrastructure. One of the aims of the World Bank is to fight poverty.
Generate government revenues	Implementing taxes on vehicles and fuels	Mostly national and regional governments tax transport vehicles and fuels.

Note: [a]The World Bank is like a cooperative, where its 187 member countries are shareholders (for more information, see http://web.worldbank.org).

13.8 CONCLUSIONS

The main conclusions are:

1. Governments implement transport policies from a societal perspective. They weigh all social costs and benefits of transport, including so-called external effects.

2. External effects of transport are 'real' effects which people and shippers do not take into account when deciding to make a trip or to transport freight. External effects can be both negative (costs) as well as positive (benefits). Nearly all policies aimed at external effects relate to decreasing external costs such as congestion delays, air pollution, climate change, and accident risks.
3. Governments implement policies because they aim to improve efficiency: with this aim they want to increase total welfare. Another main reason for transport policies is because governments consider them as being fair: with this aim, they want to distribute welfare more fairly.
4. Also psychological reasons and politicians' self-interest can explain the implementation of policy.
5. The policy goal to improve accessibility is mainly reached by providing new infrastructure. The improvement of equity is mainly fulfilled by providing new infrastructure also and by subsidizing public transport fares. For policy goals such as improving environment and liveability and transport safety, dominant policy instruments are vehicle and fuel standards and regulations which try to improve the technical characteristics of vehicles and fuels.

REFERENCES

Adams, J. (1999), 'The social implications of hypermobility: speculations about the social consequences of the OECD scenarios for environmentally sustainable transport and business-as-usual trend projections', in Project on Environmentally Sustainable Transport (EST), *The Economic Implications of Sustainable Transportation*, Ottawa Workshop, 20–21 October 1998, Paris: OECD.

Aldred, J. (2002), 'Cost–benefit analysis, incommensurability and rough equality', *Environmental Values*, 11 (1), 27–47.

Aldred, J. (2006), 'Incommensurability and monetary valuation', *Land Economics*, 82 (2), 141–61.

Algemene Rekenkamer (2019), *Autobelastingen als beleidsinstrument* [*Car taxation as a policy instrument*], The Hague: Algemene Rekenkamer (www.rekenkamer.nl) (in Dutch).

Banister, D. (2002), *Transport Planning* (2nd edn), London and New York: Spon Press.

Banister, D. (2018), *Inequality in Transport*, Oxford: Alexandrine Press.

Börjesson, M., J. Eliasson and I. Rubensson (2020), 'Distributional effects of public transport subsidies', *Journal of Transport Geography*, 84, 102674.

Bouscasse, H., S. Gabet, G. Kerneis, A. Provent, C. Rieux, N. Ben Salem and R. Slama (2022), 'Designing local air pollution policies focusing on mobility and heating to avoid a targeted number of pollution-related deaths: Forward and backward approaches combining air pollution modeling, health impact assessment and cost-benefit analysis', *Environment International*, 159, 107030.

Buchanan, J. M. and G. Tullock (1962), *The Calculus of Consent*, Ann Arbor: University of Michigan Press.

Button, K.J. (1993), *Transport Economics* (2nd edn), Aldershot, UK and Brookfield, VT, USA: Edward Elgar.

Button, K.J. and D. Gillingwater (1986), *Future Transport Policy*, London: Routledge.

Camporeale, R., L. Caggiani, M. Ottomanelli (2019), 'Modeling horizontal and vertical equity in the public transport design problem: a case study', *Transportation Research Part A: Policy and Practice*, 125, p. 184-206.

Cantarelli, C.C., B. Flyvbjerg, E.J.E. Molin and B. van Wee (2010), 'Cost overruns in large-scale transportation infrastructure projects: explanations and their theoretical embeddedness', *European Journal of Transport Infrastructure Research*, 10 (1), 5–18.

Cantarelli, C.C., B. van Wee, E.J.E. Molin and B. Fluvbjerg (2012), 'Different cost performance: different determinants?: The case of cost overruns in Dutch transport infrastructure projects', *Transport Policy*, 22, 88–95.

Delucchi, M.A. and D.R. McCubbin (2010), *External Costs of Transport in the U.S.*, Davis, CA: Institute of Transportation Studies, UC Davis, at http://escholarship. org/uc/item/13n8v8gq.
DG MOVE (2019), *Transport in the European Union Current Trends and Issues*, Brussels, European Commission, Directorate-General Mobility and Transport.
Essen, H. L. van, Wijngaarden L. van, A. Schroten, D. Sutter, C. Bieler, M. Silvia Maffii, M. Brambilla, D. Fiorello, F. Fermi, R. Parolin and K. El Beyrouty (2019), *Handbook on the External Costs of Transport Version 2019* – 1.1, Luxembourg: Publications Office of the European Union, 2020.
Flyvbjerg, B. (2005), 'Policy and planning for large infrastructure projects: problems, causes, cures', Policy Research Working Paper, World Bank: Washington, DC.
Flyvbjerg, B. (2007), 'Megaproject policy and planning: problems, causes, cures', Ph.D. thesis, Aalborg University.
Flyvbjerg, B. and D.W. Bester (2021), 'The cost-benefit fallacy: Why cost-benefit analysis is broken and how to fix it', *Journal of Benefit-Cost Analysis*, 12 (3), 395–419.
Flyvbjerg, B., N. Bruzelius and W. Rothengatter (2003a), *Megaprojects and Risk: An Anatomy of Ambition*, Cambridge: Cambridge University Press.
Flyvbjerg, B., M.K. Skamris Holm and S.L. Buhl (2003b), 'How common and how large are cost overruns in transport infrastructure projects?' *Transport Reviews*, 23 (1), 71–88.
Flyvbjerg, B., M.K. Skamris Holm and S.L. Buhl (2006), 'Inaccuracy in traffic forecasts', *Transport Reviews*, 26 (1), 1–24.
Geurs, K.T., W. Boon and B. van Wee (2009), 'Social impacts of transport: literature review and the state of the practice of transport appraisal in the Netherlands and the United Kingdom', *Transport Reviews*, 29 (1), 69–90.
Goeverden, C. van, P. Rietveld, J. Koelemeijer and P. Peeters (2006), 'Subsidies in public transport', *European Transport [Trasporti Europei]*, 32, 5–25.
Guy Peters, B. (2018), *Policy Problems and Policy Design*, Cheltenham, UK and Northampton, MA, USA: Edward Elgar.
Hicks, J.R (1939), 'The foundations of welfare economics', *Economic Journal*, 49 (196), 696–712.
Johansson, P.-O. (1991), *An Introduction to Modern Welfare Economics*, Cambridge: Cambridge University Press.
Kaldor, N. (1993), 'Welfare propositions of economics and interpersonal comparisons of utility', *Economic Journal*, 49 (195), 549–52.
Koopmans, C. and N. Mouter (2020), 'Cost-benefit analysis', in N. Mouter (ed.), *Advances in Transport Policy and Planning. Standard Transport Appraisal Methods*, 225-254. London: Elsevier.
Kreling, S.E.S., K.M. Gaynor and C.A.C. Coon (2019), 'Roadkill distribution at the wildland-urban interface', *Journal of Wildlife Management*, 83 (6), 1427–36.
Lovallo, D. and D. Kahneman (2003), 'Delusions of success: how optimism undermines executives' decisions', *Harvard Business Review*, 81 (7), 56–63.
Lucas, K. (2018) 'A new evolution for transport-related social exclusion research?' *Journal of Transport Geography*, 81, 102529 https://doi.org/10.1016/j.jtrangeo.2019.102529.
Martens, K. (2017), *Transport Justice. Designing Fair Transportation Systems*, New York: Routledge.
Naess, P., (2020), 'Project appraisal methods: Tools for optimizing or for informed political debate?' in N. Mouter (ed.), *Advances in Transport Policy and Planning. Standard Transport Appraisal Methods*, 266-289. London: Elsevier.
Niemeyer, S. and C.L. Spash (2001), 'Environmental valuation analysis, public deliberation, and their pragmatic syntheses: a critical appraisal', *Environment and Planning C: Government and Policy*, 19, 567–85.
Nussbaum, M.C. (2000), 'The costs of tragedy: some moral limits of cost–benefit analysis', *Journal of Legal Studies*, XXIX (June), 1005–36.
Ortúzar, J.D., R. Bascuñán, L.I. Rizzi and A. Salata (2021), 'Assessing the potential acceptability of road pricing in Santiago', *Transportation Research Part A: Policy and Practice*, 144, 153–69.
Pereira, R.H., T. Schwanen and B. David Banister (2017), 'Distributive justice and equity in transportation', *Transport Reviews*, 37 (2), 170–91.
Rietveld, P., J. Rouwendal and A.J. van der Vlist (2007), 'Equity issues in the evaluation of transport policies and transport infrastructure projects', in M. van Geenhuizen, A. Reggiani and P. Rietveld (eds), *Policy Analysis of Transport Networks*, Aldershot: Ashgate, pp. 19–36.

Schmidtchen, D., C. Koboldt, J. Helstroffer, B. Will, G. Haas and S. Witte (2009), *Transport, Welfare and Externalities*, Cheltenham, UK and Northampton, MA, USA: Edward Elgar.
Thomopoulos, N., S. Grant-Muller and M.R. Tight (2009), 'Incorporating equity considerations in transport infrastructure evaluation: current practice and a proposed methodology', *Evaluation and Program Planning*, 32 (4), 351–59.
UK National Travel Survey (2014), accessed April 2022 at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/476635/travel-to-school.pdf.
van Wee, B. (2009), *Transport Policy: What Can It and What Can't It Do?* European Transport Conference 2009, http://etcproceedings.org/paper/ transport-policy-what-it-can-and-what-it-can-t-do.
van Wee, B. (2011), *Transport and Ethics. Ethics and the Evaluation of Transport Projects and Policies*, Cheltenham, UK and Northampton, MA, USA: Edgard Elgar.
van Wee, B. and K. Geurs (2011), 'Discussing Equity and Social Exclusion in Accessibility Evaluations', *European Journal of Transport and Infrastructure Research*, 11 (4), 350–67.
Verhoef, E.T. (1994), 'Efficiency and equity in externalities: a partial equilibrium analysis', *Environment and Planning*, 26A, 361–82.
Verhoef, E.T. (1996), *Economic Efficiency and Social Feasibility in the Regulation of Road Transport Externalities*, Tinbergen Research Series 108, Amsterdam: Thesis Publishers.