Summary

This publication presents the new social-economic values for changes in average travel times and in the reliability of travel times. These values can be applied to societal cost-benefit analyses of infrastructure projects. These are the first values of reliability which are based on empirical research. In addition, this is also the first time that the values for passenger air transport and recreational navigation were determined based on empirical research.

On behalf of the Directorate-General of the Ministry of Infrastructure and the Environment, KiM Netherlands Institute for Transport Policy Analysis has provided new social-economic values of travel times and the reliability of these travel times. These values are applied in the societal cost-benefit analyses conducted for infrastructure projects. KiM has determined values for the following transport modes:

- Passenger transport: car, bus, tram, metro, train, airplane, and recreational navigation;
- Freight transport: road, rail, inland waterways, sea, and air.

Relation to investment decisions

Societal cost-benefit analysis is an important instrument in investment decisions pertaining to transport infrastructure projects, such as railway line expansions, new highways, airport expansions or the widening of waterways. Important social benefits not only include shorter travel times for people and freight, but also a greater degree of reliability in these travel times. In order to use the social-economic value of these travel time savings and the increased reliability in a cost-benefit analysis, these values need to be expressed in monetary terms.

Reliability is defined as the extent to which travel times are certain, or as the variation around average travel times. For passenger transport, unexpected delays lead to costs resulting from the additional waiting times, stress levels among passengers, missed connections, missed appointments, and the negative impact on the efficiency of companies. For freight transport, the primary issue is the costs stemming from an inefficient use of transport personnel and materials, as well as missed opportunities pertaining to stock management, production and distribution systems. Predictable travel times are a vital prerequisite for organising logistical processes according to the *just-in-time* principle.

In addition to their application in cost-benefit analyses, values of travel time and reliability can also be used for calculating the costs of traffic jams, and for cost effectiveness analyses, which compare various policy measures and investments.

How are the values determined?

Stated-preference surveys are used, whereby the respondents are presented with situations in which the costs of a journey, the travel times and the travel time reliability vary. Based on the respondents' choices, it is possible to derive their trade-offs among travel times, travel time reliability and expenditures against one another.

Data collection for passenger travel and transport is conducted in two steps. In the first sample survey, the respondents were recruited from the largest online panel (PanelClix) in the Netherlands, which involves 240,000 participants and processing via an internet survey (number of respondents: 5,760). In the second sample survey, the respondents (1,430) were recruited in the same manner as for the previous research study; namely, at petrol stations along the motorways, parking garages, train stations, tram and bus stops, airports (Schiphol and Eindhoven), and marinas (recreational navigation). For freight transport, only *face-to-face* interviews were used, owing to the greater complexity of the survey questions (number of respondents: 812).

The latest relevant national and international scientific developments were processed in this research study. The *stated preference surveys* were compiled in collaboration with the Ministry and various sector organisations, including NS, ProRail, ANWB, EVO, Transport en Logistiek Nederland (Transport and Logistics Netherlands), *Centraal Bureau voor de Rijn- en Binnenvaart* (Central Bureau for Inland Shipping), Amsterdam Airport Schiphol and KLM airlines. In addition, a broad consultative group of international researchers routinely read and provided feedback on the draft texts and findings.

Why new values?

Values of travel time are periodically determined through the use of major empirical research studies conducted among passengers, carriers and shippers. In the time period between the two empirical research studies, the values were annually increased in line with inflation and wage developments. The most recent empirical research study for passenger transport was conducted in 1997. Today, more than 15 years later, the values of travel time for passenger transport were once again tested in practice and adjusted accordingly. An update was also performed for freight transport. The most recent empirical research study for freight transport was conducted in 2004.

In addition, for the first time, the values of travel time for aviation in this study were determined based on empirical research. Moreover, values of time for recreational navigation were also determined for the first time. The values for recreational navigation relate to waiting times at locks and bridges, which is not related to travel times. Travel time savings are irrelevant in this context, precisely because for recreational navigation the value is derived from the journey itself. Recreational navigation is an important user group of bridges and locks, and the benefits they derive from shorter waiting times can now be satisfactorily included in the cost-benefit analyses conducted for investments in these bridges and locks.

Finally, for the first time, the social-economic values for travel time reliability in this study were determined based on empirical research. In 2005, the social-economic values for improving travel time reliability were determined based on the findings of an international *expert meeting*, organized by the Dutch Ministry of Public Works, Transport and Water Management. At that time, the requirements for values of travel time reliability based on empirical research were formulated. That research has now been conducted and the research findings are described in this publication.

To date, when calculating the social-economic benefits of increased reliability of journey times in road works projects, a 25 percent mark-up of journey time benefits was applied. This was done because of a lack of sufficient information about the actual effects policy measures had on journey time reliability. This mark-up approach was meant to be temporary and replaced when information about the effects certain measures had on travel time reliability became available.

Main differences in travel time valuations

Travel behaviour changes over time. Consequently, differences between old and new values of travel time may arise, owing to, for example, an improved utilization of travel time by means of ICT (mobile phones, laptops or tablets). In addition, differences arise as a result of new scientific insights and developments that render changes in methodology necessary.

The new value of travel time for car travel is on average around 16 percent lower than the current value. The increasing use of mobile telephones during journeys could be one plausible explanation for car travel's lower valuation, since a part of the travel time can therefore be spent usefully, whereby an hour of travel time savings is valued lower. This is called 'journey time enrichment'.

Table S1: Differences between the currently used social-economic values and the new values of travel times.

Passenger transport	Difference	Freight transport	Difference
Car	-16%	**Road**	-17%
Train	+ 22%	**Rail**	-14%
Bus/ tram/metro	+ 2%	**Inland waterway, lock**	+ 2%
Airplane	+ 86%	**Sea, quay**	-6%
		Air	-7%

For trains, we note an increase in the value of travel time, but here travel time enrichment plays a smaller role than with cars, which is perhaps owing to the fact that it has always been possible to read work reports in the train, for example. For trains in particular the upwards effect between long and short journey distances can be clearly distinguished. In the previous study (1997), it was not yet possible to draw distinctions between longer and shorter journeys, but this is now possible. Longer travel distances have on average a higher value of travel time than shorter travel distances. This is partly due to the associated fatigue levels and lack of comfort, which are more prevalent the longer journeys last, and partly due to the fact that converting one hour of travel time into leisure time has more value if, owing to a longer journey time, people are left with less leisure time. Train passengers on average travel longer distances than people who travel by car, bus, tram or metro.

For the first time empirical values of time social-economic values for air travel have been established using a *stated preference survey*. The old, model-based values for air travel are unsuitable for making comparisons with valuations derived from this empirical study. The differences in freight transport were primarily due to a revised method.