



Rijkswaterstaat  
*Ministerie van Verkeer en Waterstaat*

# Role of reliability in policy, system planning and investment decisions

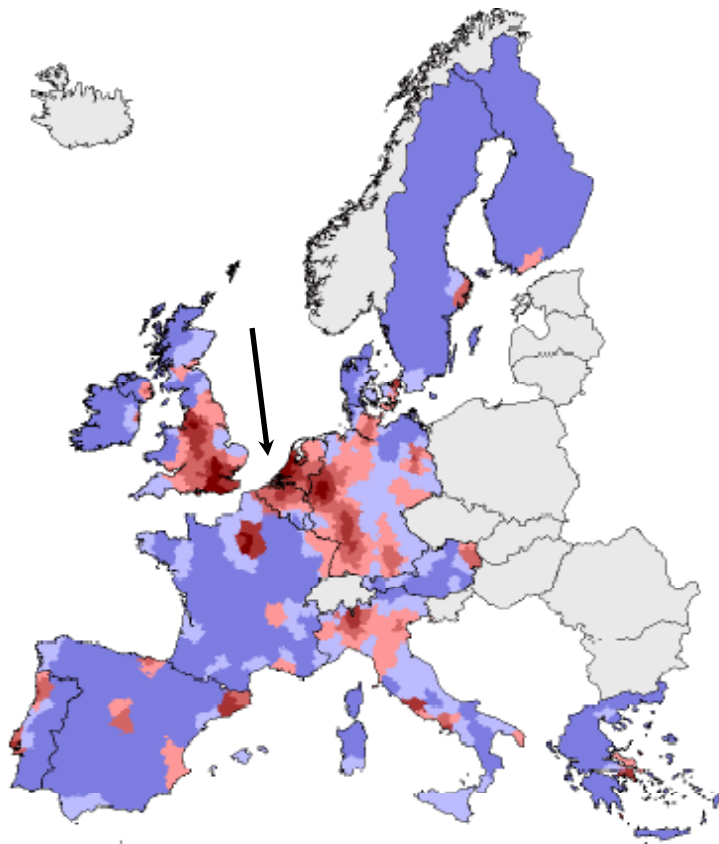
Jan van der Waard

Rijkswaterstaat  
Centre for Transport and Navigation



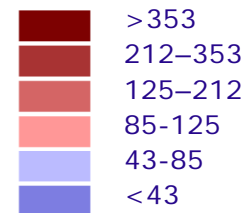
# Transport in the Netherlands

## *European context*



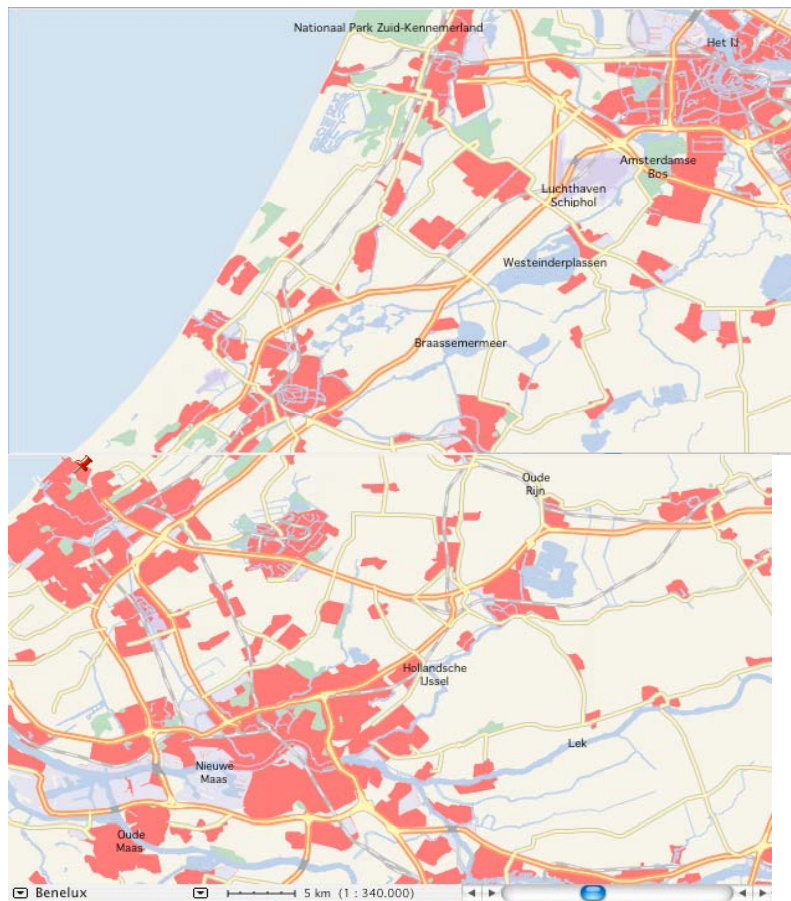
- Population: 16.5 million
- 35.000 km<sup>2</sup>
- 480 inhabitants/km<sup>2</sup>
- 40% living in Randstad metropolitan area

Employment density in EU 15, 2001  
jobs per km<sup>2</sup>





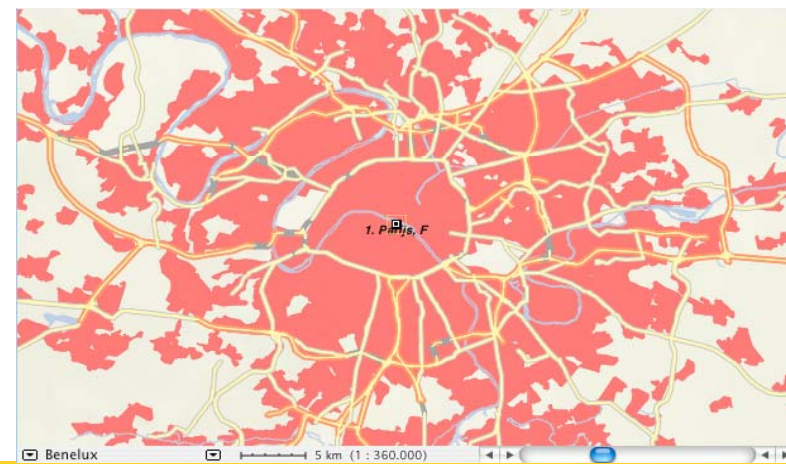
## Part of the Randstad area

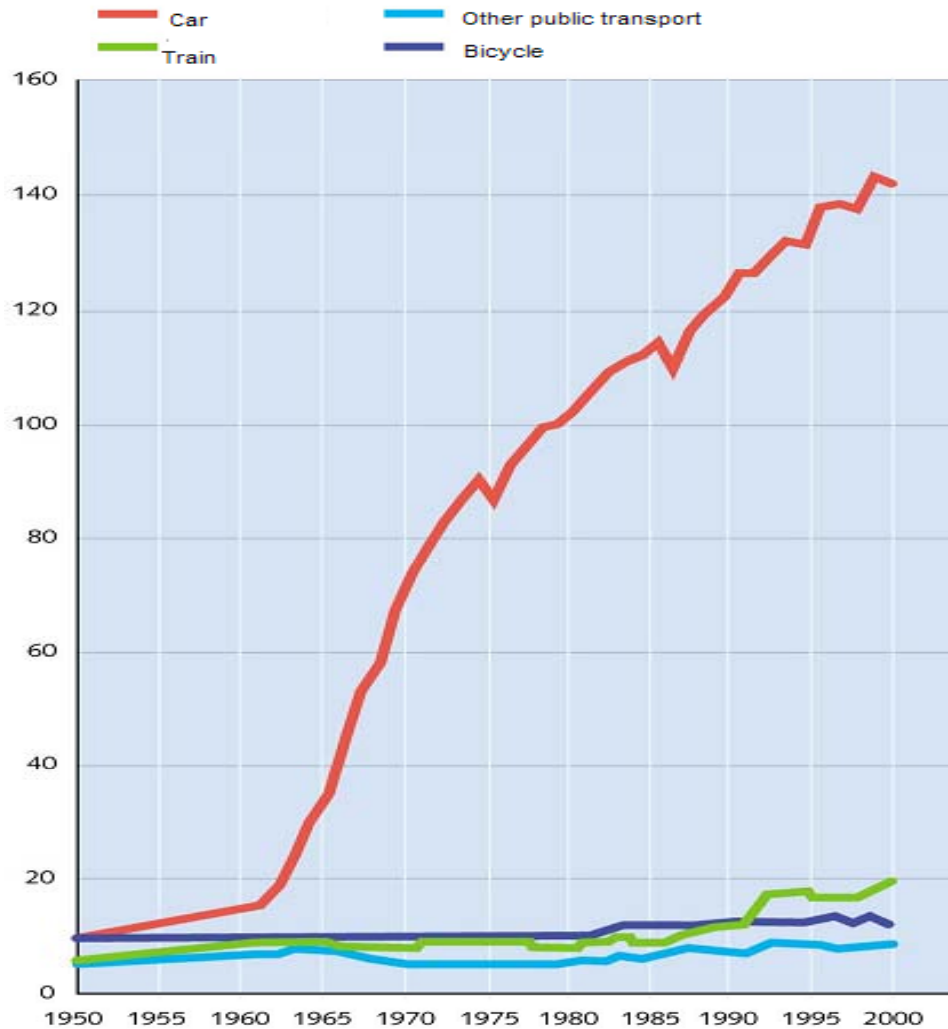


## London



## Paris





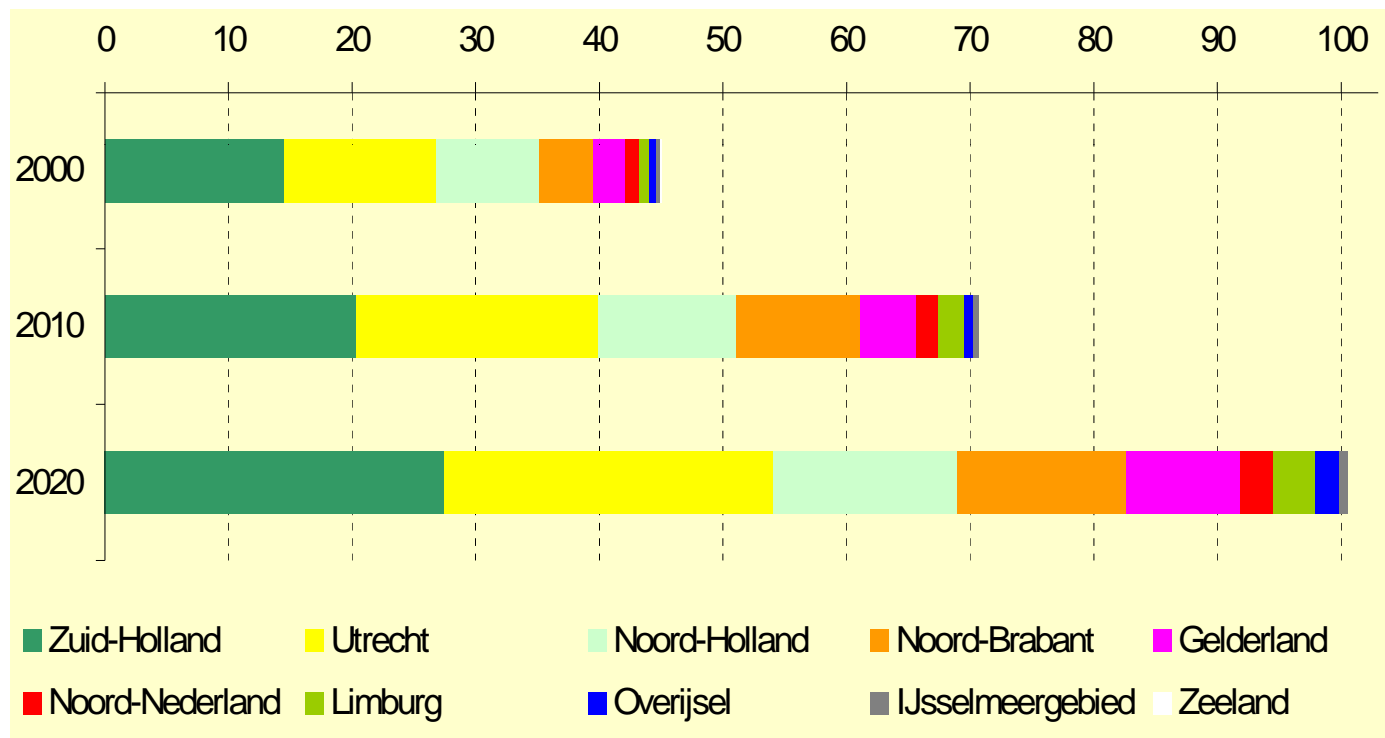
## How do we travel?

- Car is dominant
- About 50% of carkm's on motorways



# Growing congestion

Vehicle hours delay on motorways x million

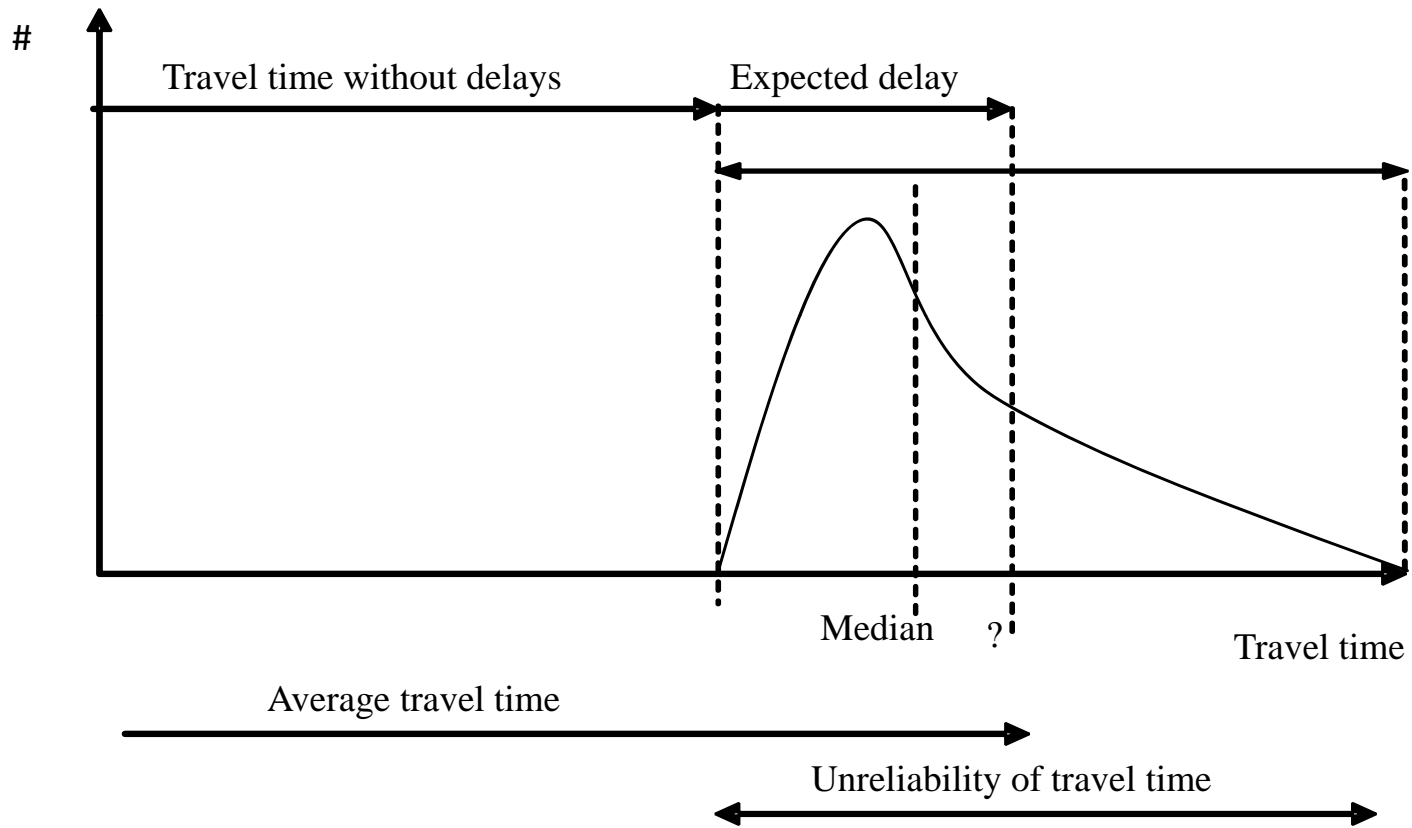




## **Reliability** appeared to be important!

*The ability of the transport system to provide the expected level of service quality, on which users have organized their activities.*

- Reliability can be improved through *changing actual travel time* or *expectation of that travel time*
- Reliability can be improved both from *supply* and *demand* side



Travel time reliability and the travel time distribution



## **Reliability** appeared to be important! .....Why?

*The ability of the transport system to provide the expected level of service quality, on which users have organized their activities.*

- The importance of scheduling in personal and freight activities has grown.
- Declining transport costs due to improvements in infrastructure and productivity have facilitated changes such as
  - Offshore production
  - Just-in-time stockholding
  - Fragmentation (larger factories in fewer locations, fewer warehouses)



## Goals Dutch Strategic Mobility Policy Document

### **“Nota Mobiliteit” (NoMo)**

*Reliable, Fast and Save*

- Door to door mobility
- Within constraints of (inter)national arrangements regarding environmental impacts



## Ambition for road travel 2020 in NoMo

- Reliable and acceptable travel times
  - *Travellers reach their destination on time in 95% of cases*
  - *Peak-hour journey time on motorways may not exceed one and a half times the off-peak journey time*
  - *or twice the off-peak journey time on urban orbital roads and non-motorway roads managed by national government*
  - *Number of hours lost in congestion reduced to level of 1992*

*Average motorway peak-hour journey time over 50 kilometres is 45 minutes at maximum (maximum delay 15 minutes).*

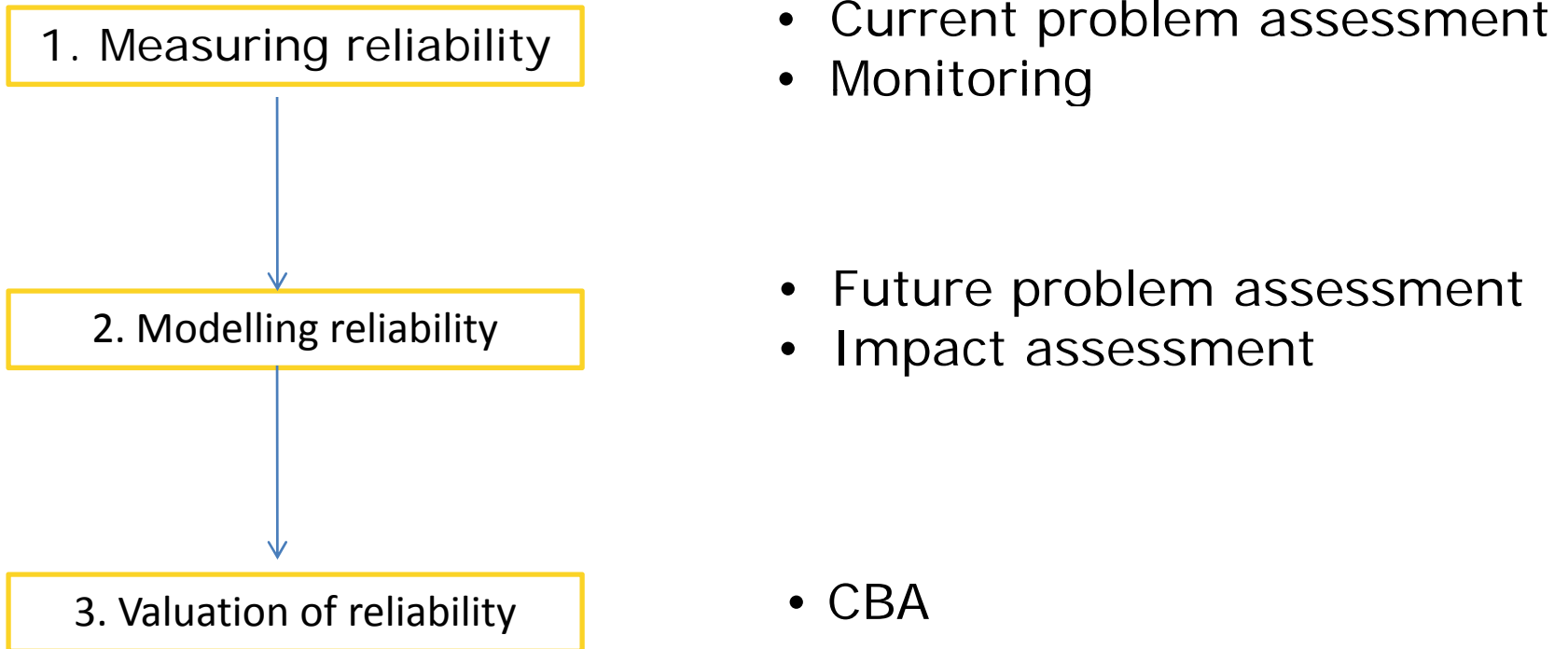


## Selecting and implementing strategies to improve reliability

- The challenge for policy makers is
  - to identify the main causes of unreliability on a given link or network
  - to ensure that the cost-effective options are adopted first
- Setting targets: enables discussion but may lead to inefficiency
- Reliability is an important aspect of transport services and should be incorporated within cost–benefit analysis
  - Currently CBAs do not consider the reliability benefits of investment schemes or assumes only one level of reliability
  - Incorporating reliability valuation in the CBA may change current priorities of policy measures
- Important to identify “low-hanging fruits”
  - Users might be in better position to improve reliability
  - Informing on travel times already reduces unreliability



## Incorporation into the policy planning process



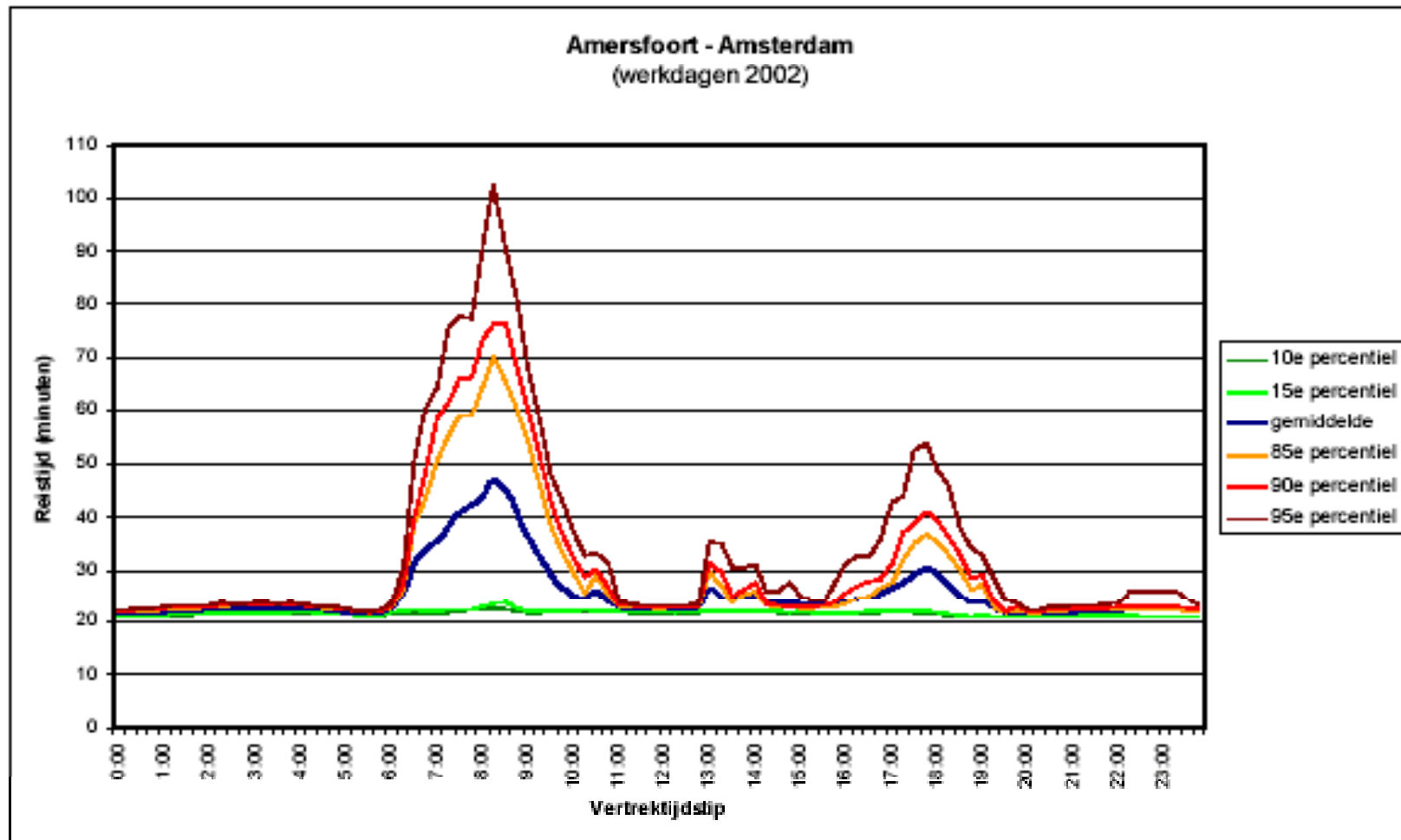


## Measuring reliability in NL (road)

- Loop detector data available for congested motorway links
- Various indicators representing characteristics of the travel time distribution
  - Indicators close to terminology of policy objectives for monitoring:
    - % of users on motorway for whom the expected travel time objectives are met (now available for a set of motorway links)
  - Indicators for research purposes:
    - Standard deviation of travel time



## Unreliability of travel times





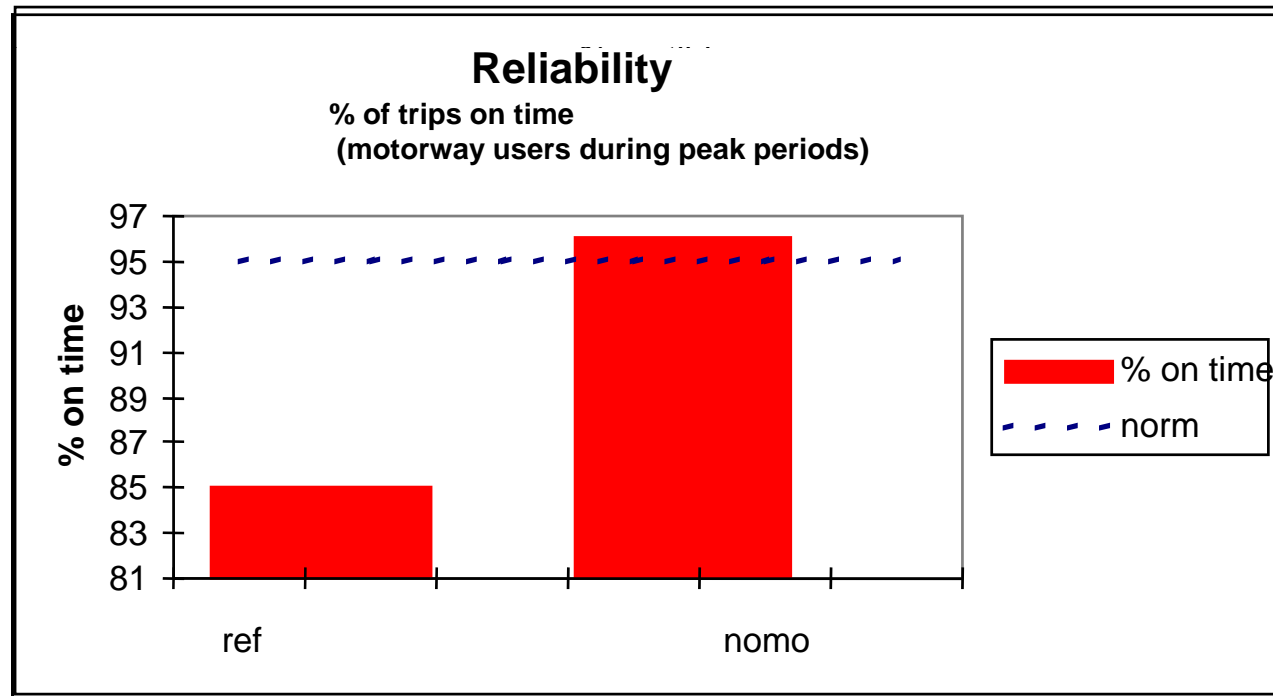
## Modelling reliability in NL (road)

- User perspective / travel time variation
  - Simulation Model for Analyzing the Reliability of Accessibility (SMARA)
    - Starts from network based travel demand model output
    - Calculates band-width for travel times between OD-pairs by re-assignments based on Monte-Carlo simulation of the input variables, travel demand and link capacity
    - Output presented as distributions of travel times (% of trips 'on time').
  - Post processing tool to the NMS to calculate reliability levels
    - Uses quantified relationships between output variables and reliability indicators
- System perspective / vulnerability of the network
  - Robustness scanner
    - Strategic tool to assess the vulnerability of the network
    - Insight in the most vulnerable links in a network



## Example of SMARA results (NoMo)

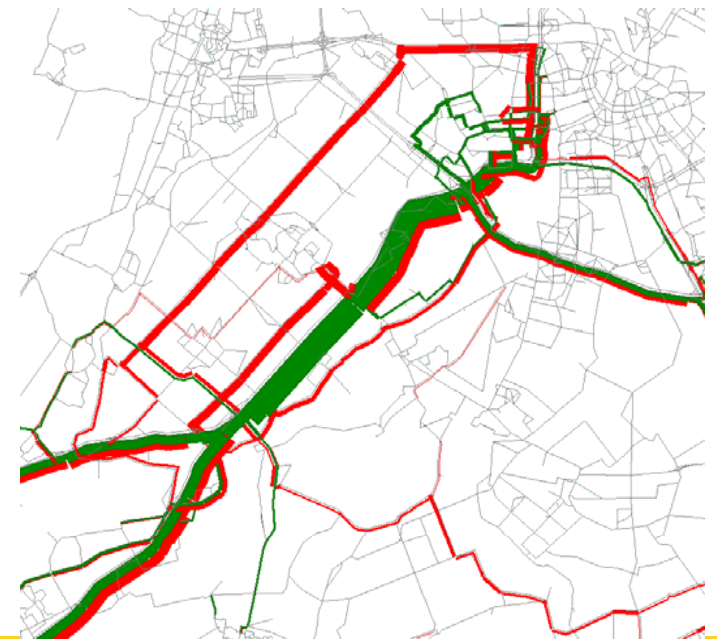
- As a result of the combination of building, utilisation and pricing measures in NoMo travel time reliability will improve.





## Example of Robustness scanner application

- Alternative routes:
  - less alternatives means a bigger problem
- Remaining capacity on alternative routes
  - # routes + remaining capacity for these routes
- Indicators:
  - Increased congestion on network level
  - # links with high V/C ratio
  - Accessibility of specific destinations
    - (hospitals, airports, etc.)



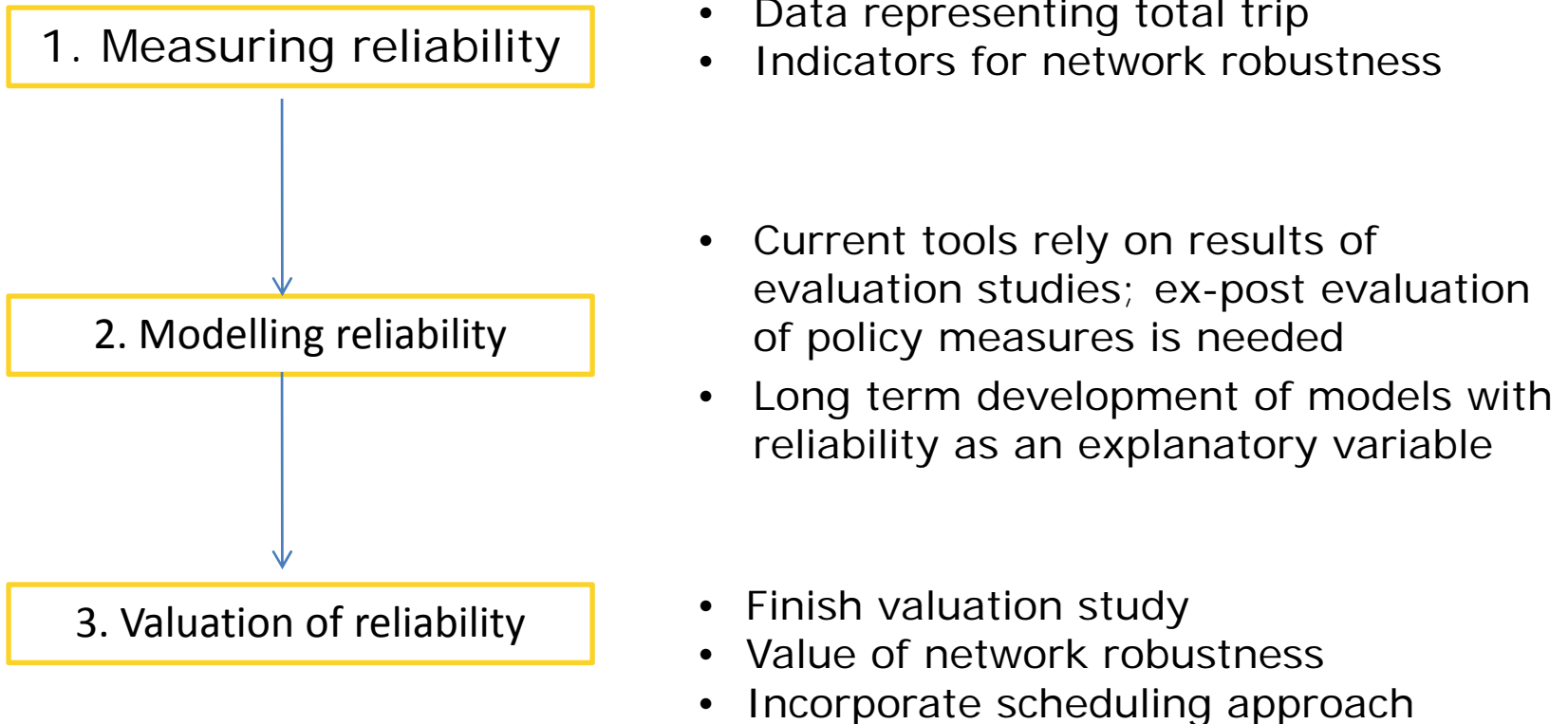


## Valuation of travel time reliability in NL

- 1998: Uniform approach for CBA of infrastructure projects introduced
- 2004: Literature study on reliability valuation
  - Reliability is to be considered as an important benefit of infrastructure, not to be neglected in CBAs
- 2005: International expert meeting
  - SD travel time as indication of reliability fits well in CBA framework
  - Provisional values of reliability (reliability ratios) to be used in CBA
  - Empirical research needed to replace these provisional values
- 2006: SP survey methodology set up in international cooperation
- 2008: CBA guidelines advise monetisation of reliability for large projects
  - Rule-of-thumb: 25% uplift to average time savings from congestion relief
    - Problem 1: Projects vary widely in their reliability benefits
    - Problem 2: Different users may value reliability differently



## Further developments needed .....





Thank you !