International Transport Forum

State-of-Practice in Incorporating Reliability into Cost-Benefit Analysis

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OECD

International Transport Forum at the OECD

- An **inter-governmental organisation** with 53 member countries focussing on transport
- A strategic **think tank** for global transport policy issues
- An **annual summit** of Ministers

Key messages

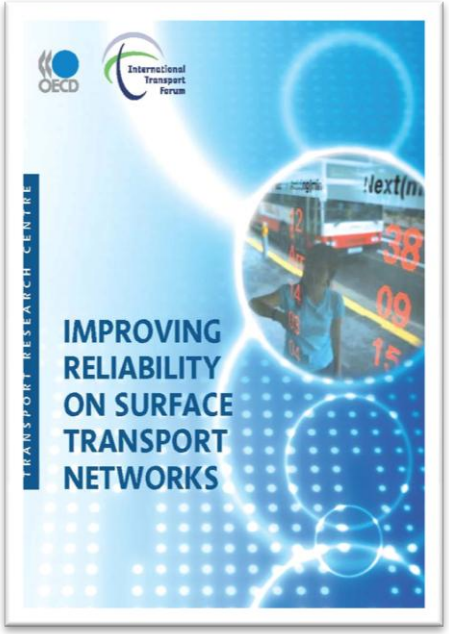
- **Reliability** is a major network characteristics that **should be recognised when considering investment options**

- **We know enough** to start incorporating reliability into CBA

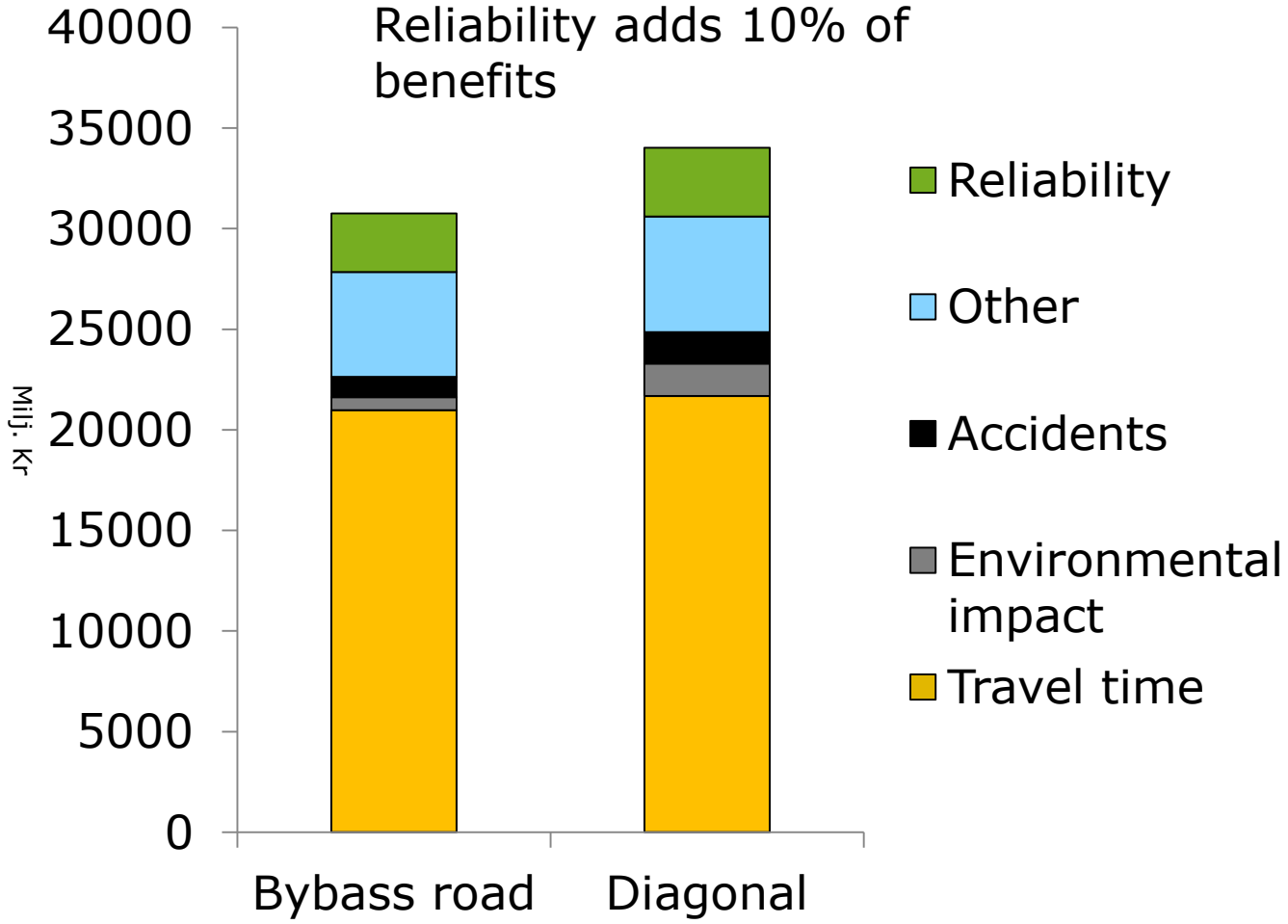
- Need to make sure **research is not falling behind implementation**

Importance of reliability

- Review of ITF/OECD countries
- Importance of reliability is acknowledged
- Costs of unreliable travel may rival those of congestion

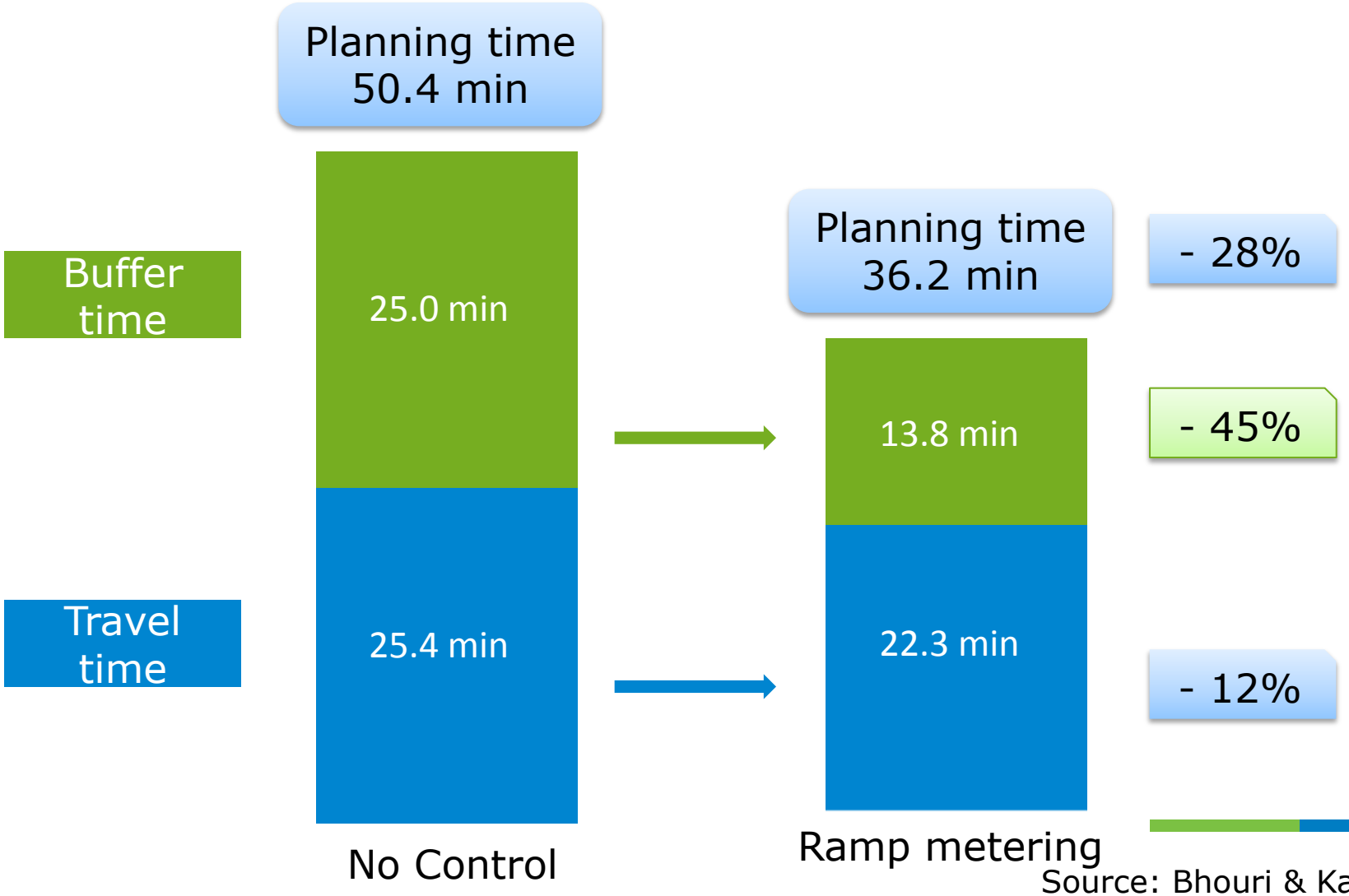


Applications: Stockholm bypass road



Source: Transek 2006

Applications: Ramp metering at A6W, France



Source: Bhouri & Kauppila 2011

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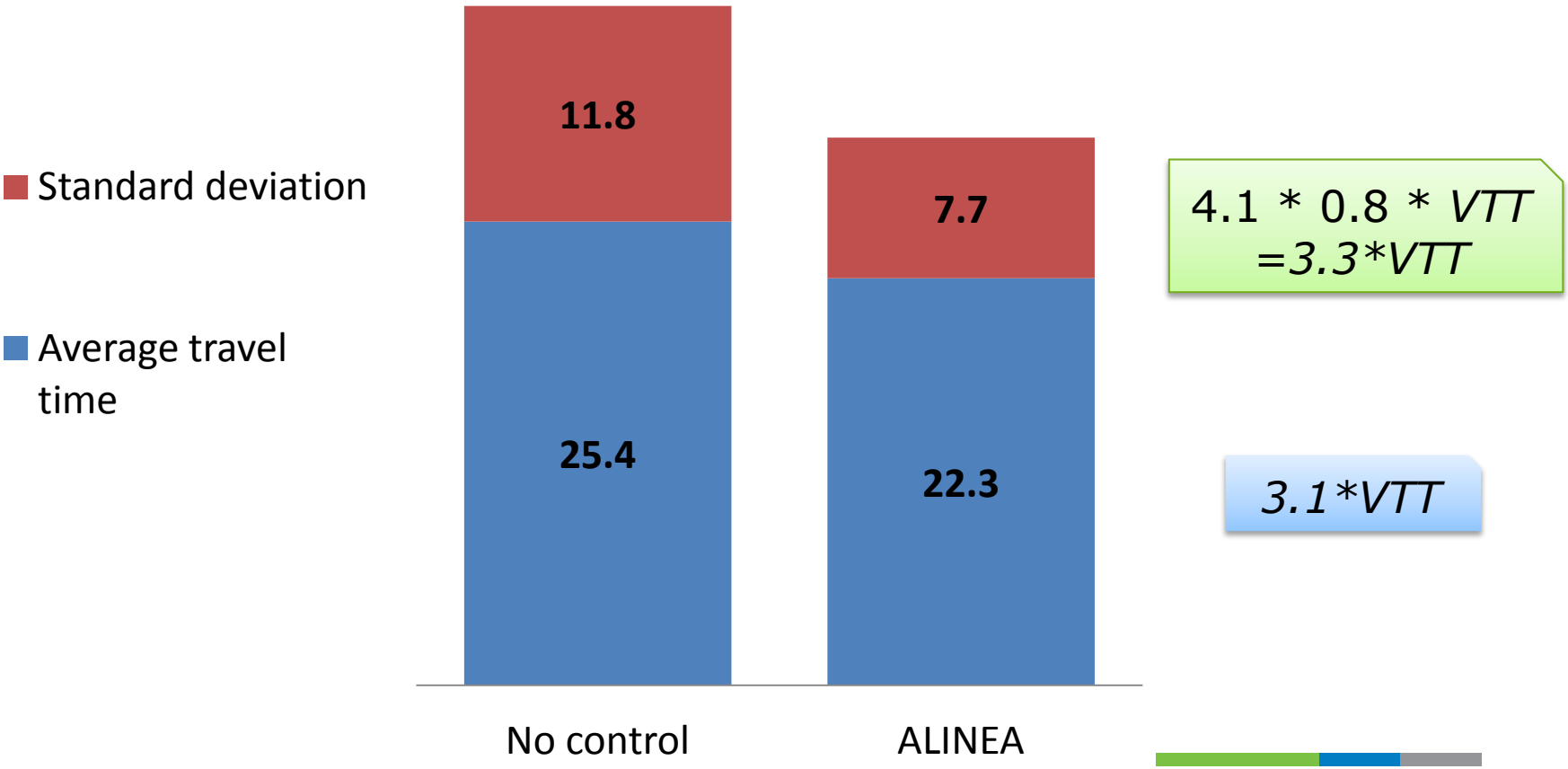

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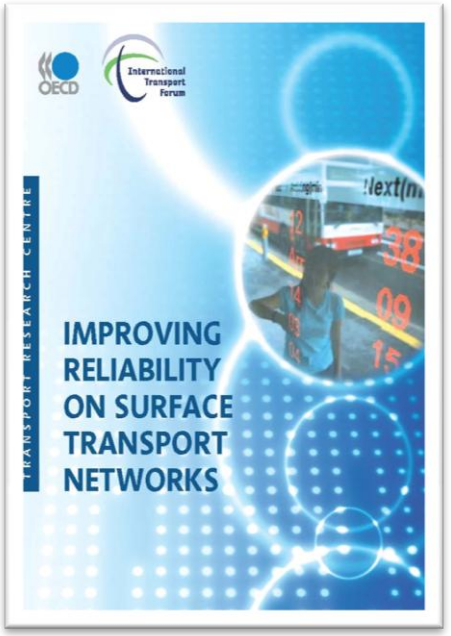
Importance of reliability

- Review of ITF/OECD countries
- Importance of reliability is acknowledged
- Costs of unreliable travel may rival those of congestion
- Shift in policy focus



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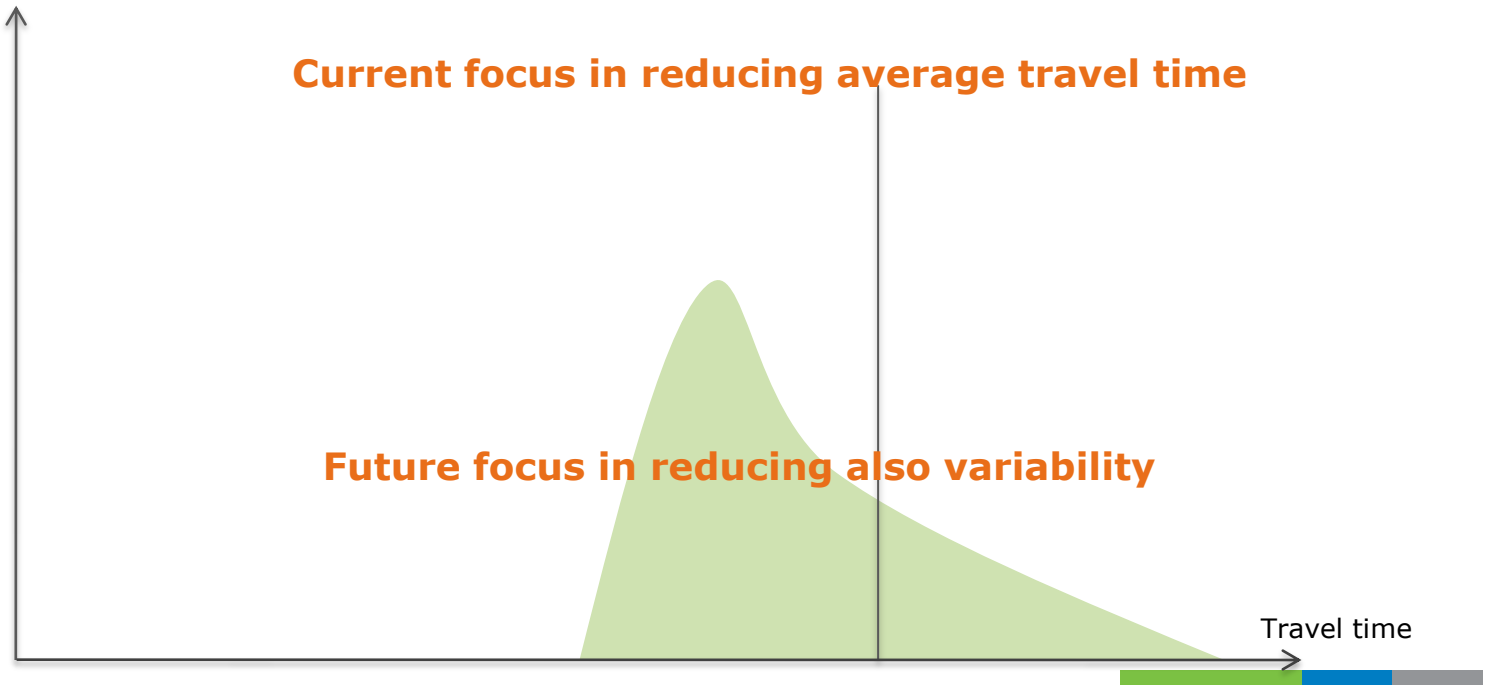
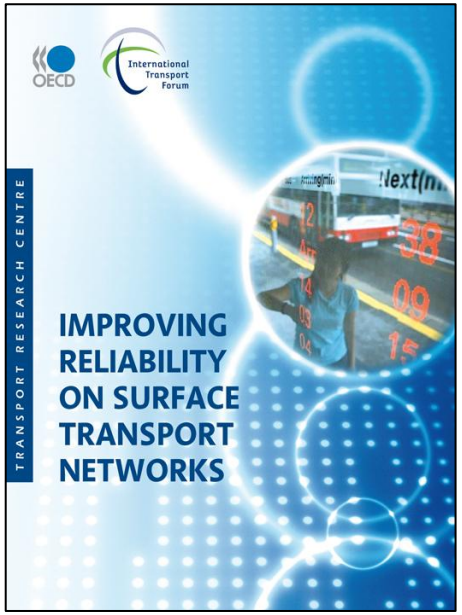


Importance of reliability

- Projects are designed to improve reliability
- Cost-benefit assessment represents the best option to deliver optimal levels of reliability
- Still, assessments often disregard variability and only use mean travel time
- Lack of systematic analysis of the economic benefits is a major drawback



State-of-practice

- Review shows that **few countries have started incorporating reliability** into transport planning or project assessment

- Few countries have incorporated reliability into **appraisal guidelines**...

  ...while others have used on a pilot basis

State-of-practice

Basically requires three sets of data:

1. Existing travel time variability

2. Anticipated reliability levels after policy initiative

3. Monetary values of reliability

Netherlands

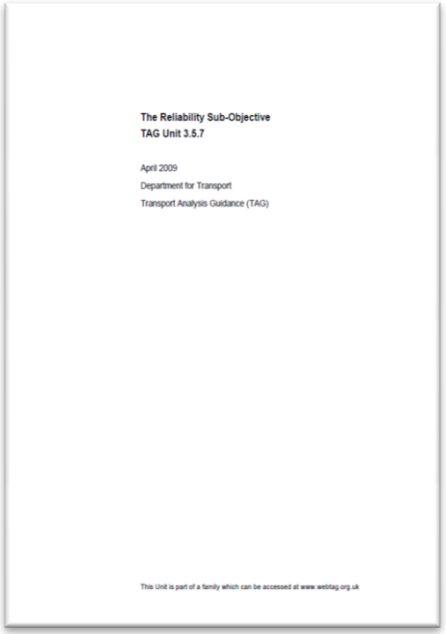
"*CBA must be carried out for large governmental infrastructure projects" – 2004 annex on reliability*

- If possible, use **standard deviation** as a measure
- Work is done to **incorporate reliability into national transport models** to estimate reliability impact
- The value of reliability based on **reliability ratios** (0.8 for pass tr by car;1.4 for public tr; 1.2 road freight)
- Defined in an international expert meeting as value of one minute of standard deviation / value of one minute of travel time
- SP and RP study on-going

United Kingdom

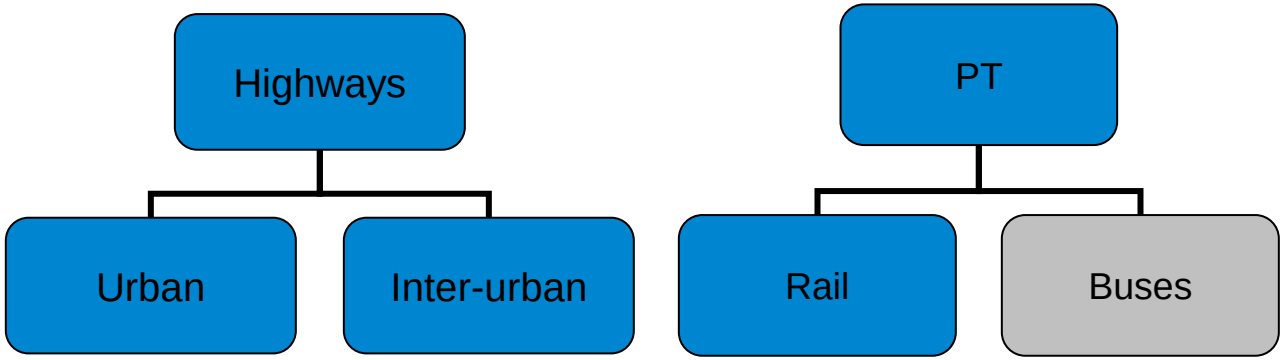
"TAG guidance on the appraisal of transport projects should be seen as a requirement for all projects that need governmental approval"

- Most recent document recommends ways to assess improving journey time reliability for private vehicle travel and public transport


The Reliability Sub-Objective
TAG Unit 3.5.7

April 2009
Department for Transport
Transport Analysis Guidance (TAG)

This Unit is part of a family which can be accessed at www.webtag.org.uk



United Kingdom (private vehicle travel)

- Reliability measured by the **standard deviation of travel time**

- **Forecasting the change** in the level of reliability
  - Urban roads: day-to-day variability main source of unreliability – DfT data to forecast std from journey time and distance for each origin destination flow
  - Inter urban: incidents main cause of unpredictable variability – use of INCA model (reflects how incidents affect delays)

- Value of reliability: use **reliability ratios** derived from the Dutch study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United Kingdom (rail)

- Delay measured as **difference between scheduled arrival time and actual arrival time**

- Scheduled arrival time as a proxy for preferred arrival time

- Disutility of arriving late measured as **lateness factor** (value of arriving late in relation to in-vehicle time)
  - Recommends factor of three (1 min late = 3 min in-vehicle)
- Includes also disutility related to unpredictable variation in delay


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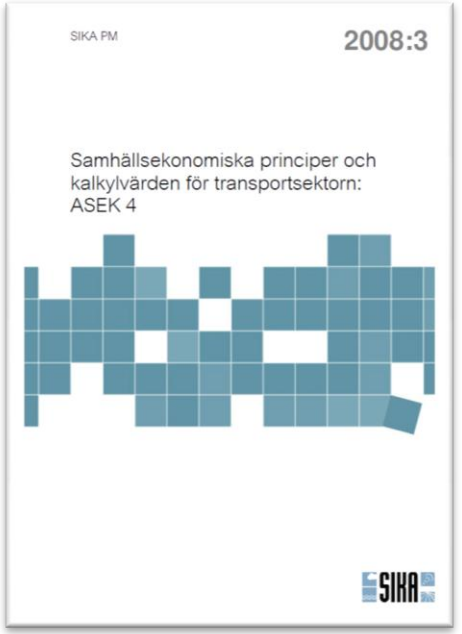
Sweden (road traffic)

"Delay and unreliability should be included into cost-benefit analysis"

- National Transport Investment Plan 2010-2021: reliability included in CBA for the first time
- Valuation based on the **standard deviation** of travel time
- **Forecasting impacts**: estimated relationship between congestion and std.dev. of travel time (Eliasson 2006) - implemented in Emme/2 model
- Relative value of variability – **"reliability ratio" recommended 0.9** based on Eliasson (2003)
- All trips (private, business, freight)

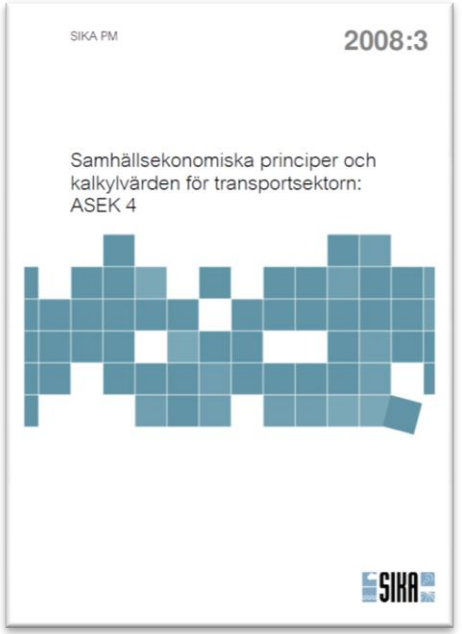


Sweden (long distance rail)

- "Delays" are defined as the **difference between actual and scheduled arrival time**

- **No official modeling method** for forecasting impacts of investments/measures/timetables on delays
- Practice: use statistics and subjective judgments

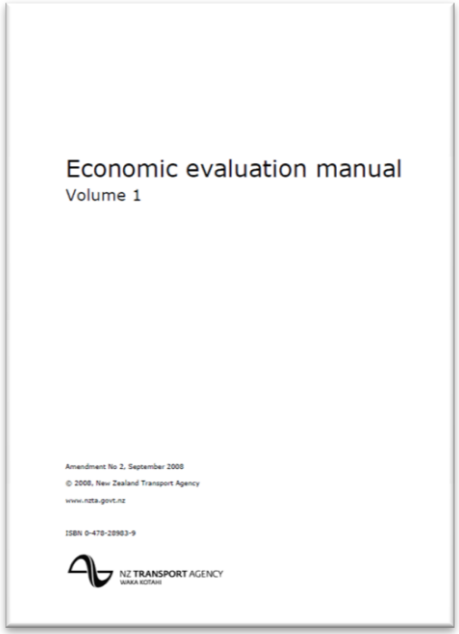
- Average delay (risk*length) **valued as 2 times travel time**
  - should be higher?
  - Freight treated as person travel



New Zealand

"*Improved trip reliability should be incorporated in economic efficiency evaluation of projects*"

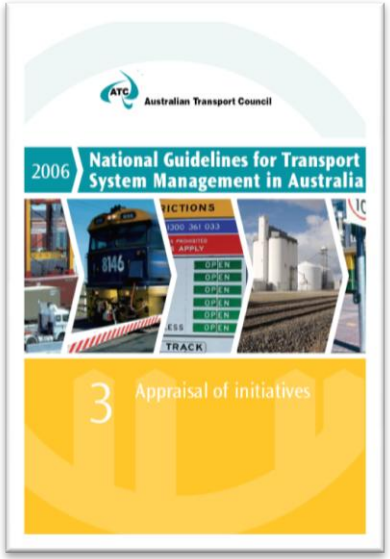
- Day-to-day variation (not incident related delay) measured by the **standard deviation**
- Data to forecast std for different road types, intersection types, and road environments
- The value is derived by **multiplying the value of time by 0.9** (urban traffic mix) or by 0.8 for cars and 1.2 for trucks (other vehicle mix)
  - adjustments made for "*% of variance occurring outside study area*"

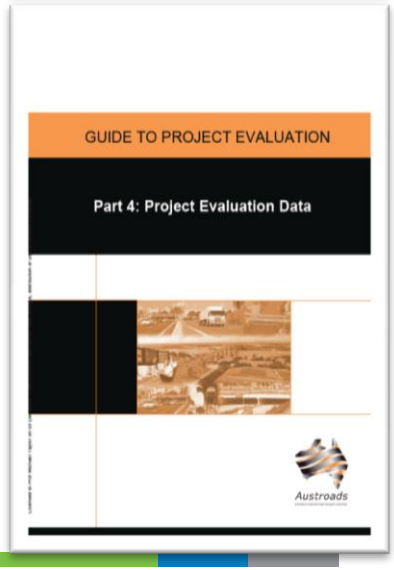


Australia

"Where benefits (costs) account for more than 10% of total benefits, they should be quantified"

- Procedures may differ in the different states
- Travel time variability measured by the **standard deviation** of travel time
  - Based on volume/capacity ratio for road link, intersection or route segment
- Value of reliability based on **reliability ratio**
  - Citing research results in Bates et al 2001
  - *"Values around 1.3 appear plausible for car travel"*
- Day-to-day variation (congestion related)



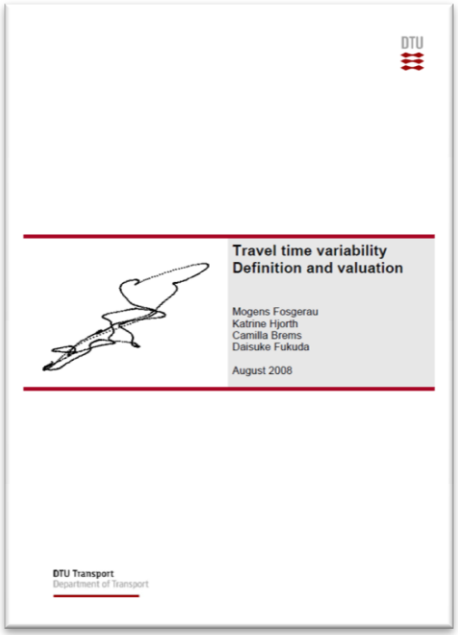


Denmark

"Travel time variability is not yet included in the general Danish economic appraisal practice"

- However, several (public transport) authorities use different reliability measures to evaluate travel time variability
- Variability is computed as the total **passenger-delay-minutes** relative to the timetable
- In 2005 a unit **price of 1.5 times VTT** was applied to assess the value of the variability (has since been changed to 2 times VTT)

• Copenhagen-Ringsted railway project analysis included the estimated benefits from both travel time savings and improved reliability



Norway

- Official cost-benefit **guidelines for rail investments include a value of delay**

- The cost-benefit guidelines for road investments has not included values of reliability so far

Recent research

- The value of reliability in freight transport in Norway

  - Stated preference (SP) survey with choice experiments involving time, variability and delays

  - Derived both a value for reductions in the standard deviation and values of early and late arrival (TØI report 1083/2010) www.toi.no

- Dutch valuation study

  – Results available second half 2012

  – VoTs and VoRs to be used in official Dutch CBAs

- Germany

  – Feasibility study underway – SP survey planned for coming years

- Sweden

  – Revision of official variability valuation guidelines underway

Lessons from current practices (road)

1. Existing travel time variability

- Standard deviation can be applied with relatively little difficulty in CBA

2. Anticipated reliability levels after policy initiative

- Traffic forecasting tools need to be improved to provide estimates of changes in standard deviations and numbers of trips on links

- Existing models could be expanded to identify impact of investment on reliability (INCA UK, EMME/2 SWE, National Model System NL)

3. Monetary values of reliability

- Reliability ratio used in many countries; but value of reliability is inevitably granular with spectrum of values (varying from one circumstance to another)

- How to ensure we capture representative distribution

- How to measure the relevant wtp for improved reliability

Appraisal Summary Table			
Qualitative/quantitative assessment		Monetized Values (BCR)	
Areas for development	**Some valuation evidence**		
Townscape	Wider Economic Benefits	Risk of death/injury	Time savings
Water Environment	Landscape	Noise	Operating costs
Accessibility	Air quality	Carbon	Private sector impacts
Social inclusion	Journey ambience	Physical fitness	Cost to Exchequer
Integration	**Reliability**		
Biodiversity	Regeneration		
Heritage			

Conclusions

- Reliability a major network characteristics that should be recognised when considering investment options
  - Need to ensure optimal levels of reliability are delivered
- Reliability should be incorporated in the assessment
  - Can be done for road and rail
  - Will change priorities / ranking of projects
- Reliability is a rapidly developing area – new research will likely bring new insights
- At the same time countries are moving ahead using the existing knowledge base
  - Make sure research is not behind of implementation

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Thank you

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