

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

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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



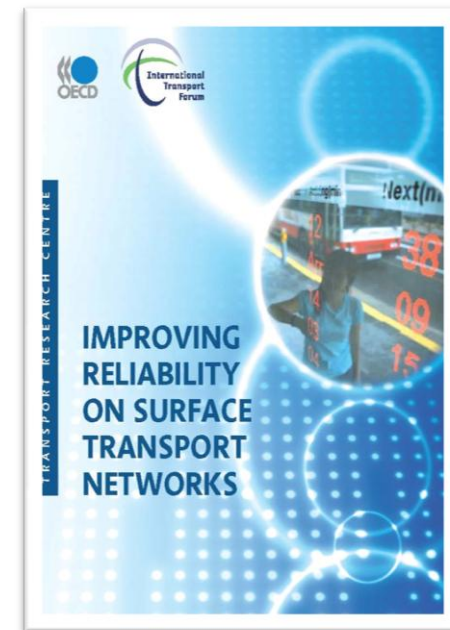
Key messages

- ▶ **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**

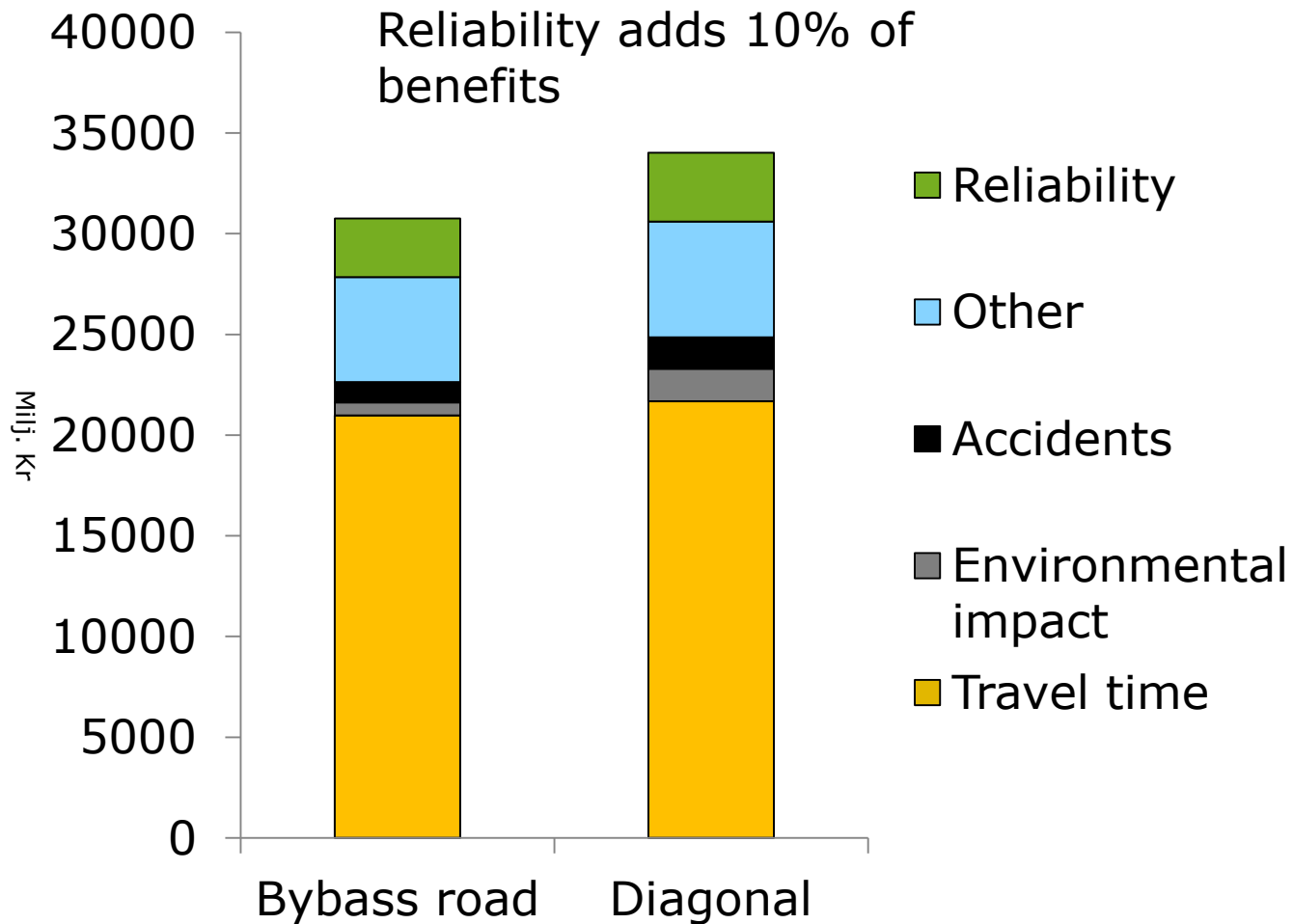


Importance of reliability

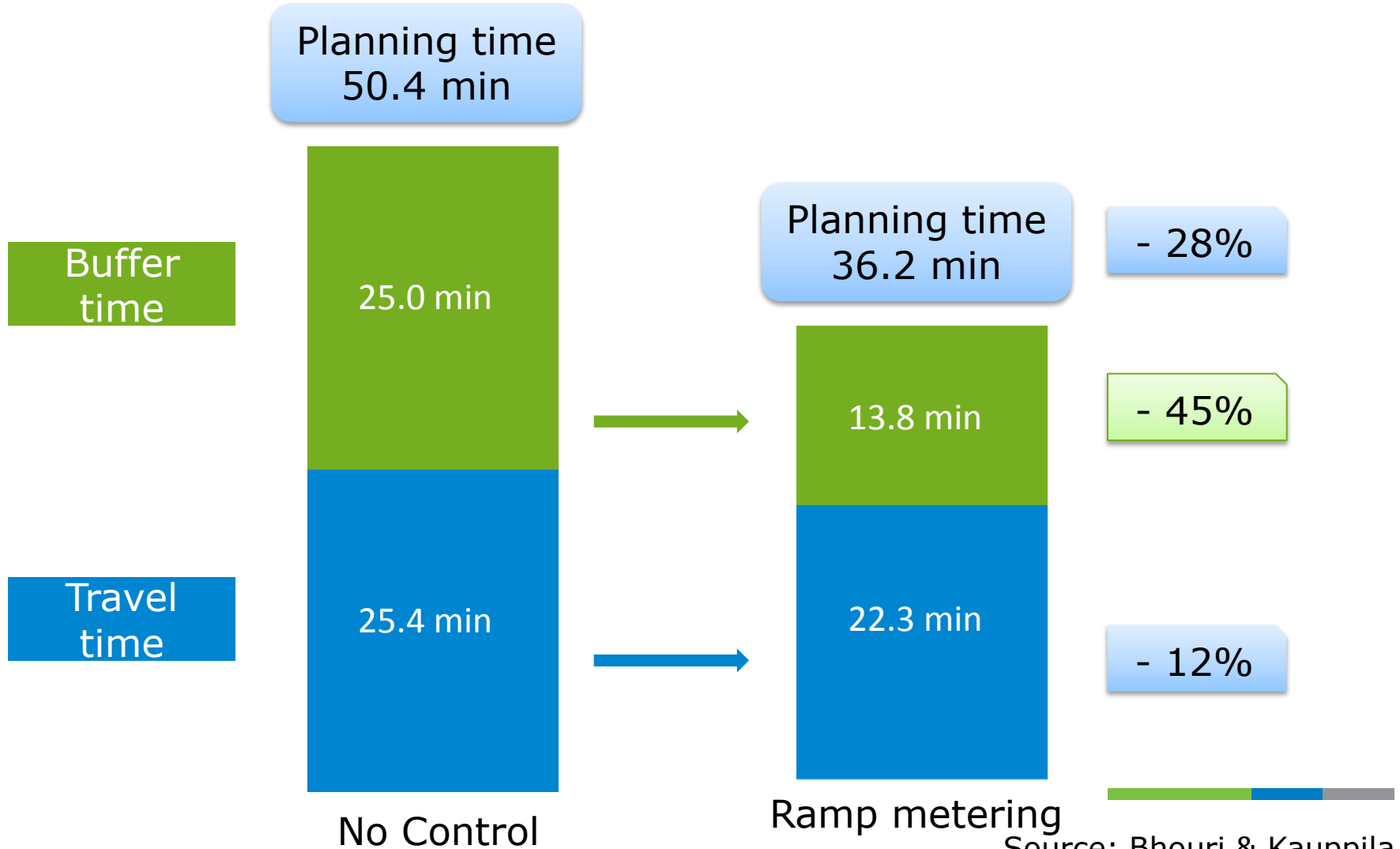
- Review of ITF/OECD countries
- Importance of reliability is acknowledged
- Costs of unreliable travel may rival those of congestion



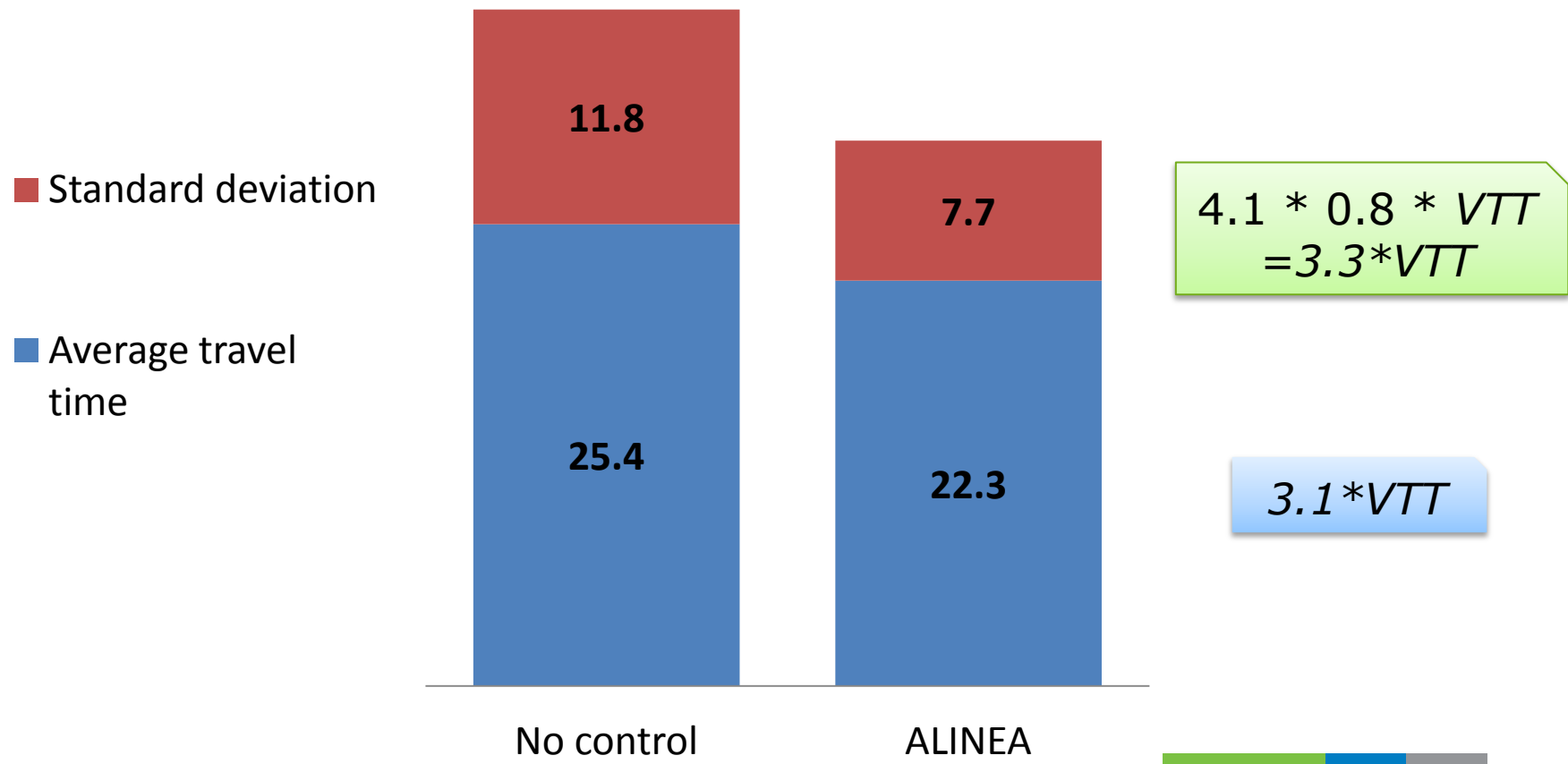
Applications: Stockholm bypass road



Applications: Ramp metering at A6W, France

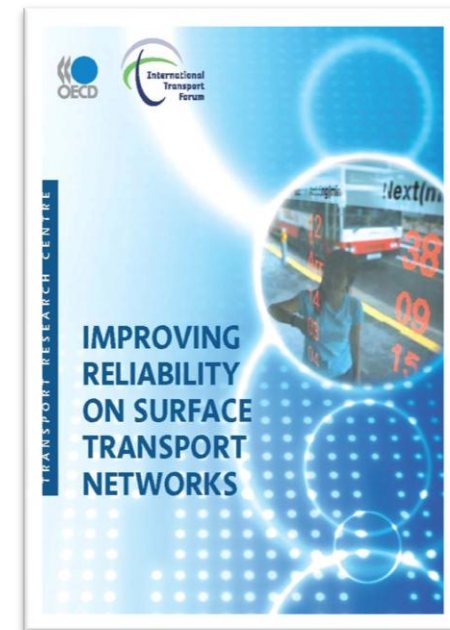


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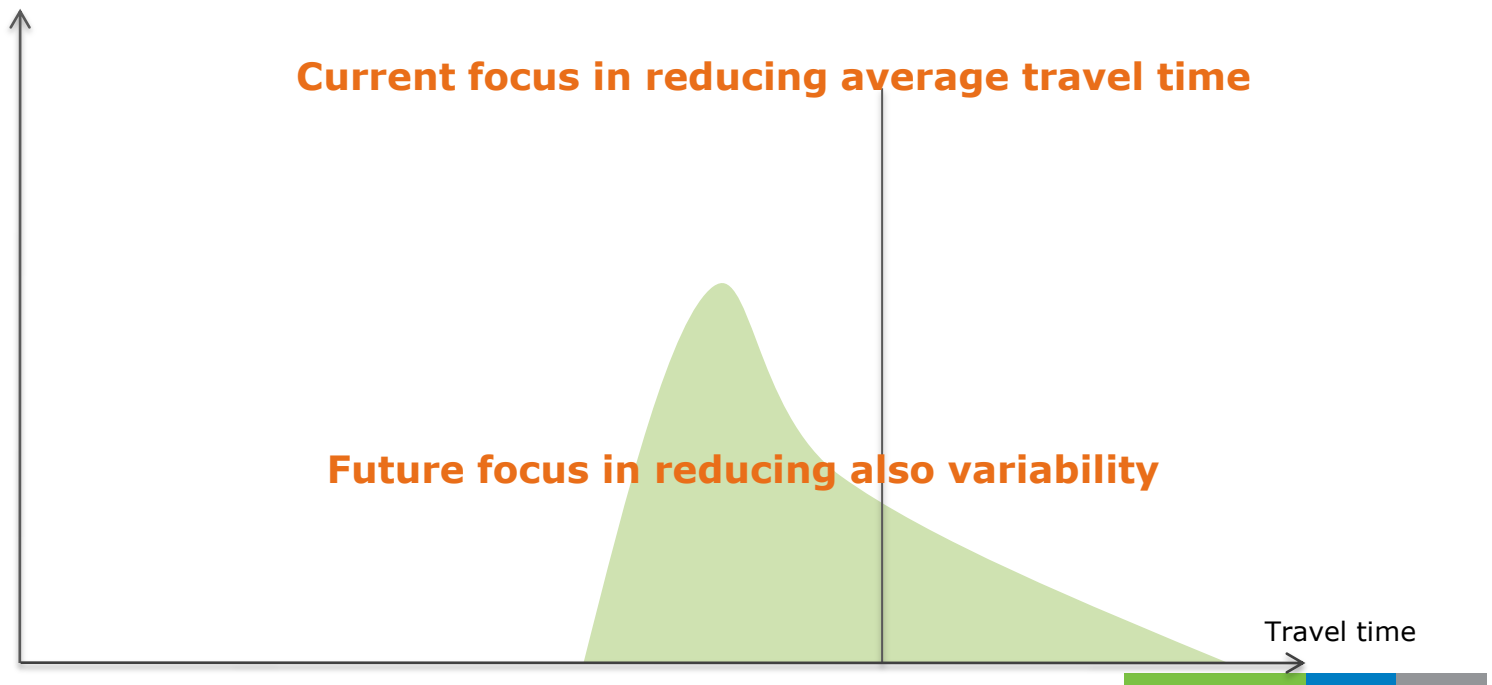


Importance of reliability

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

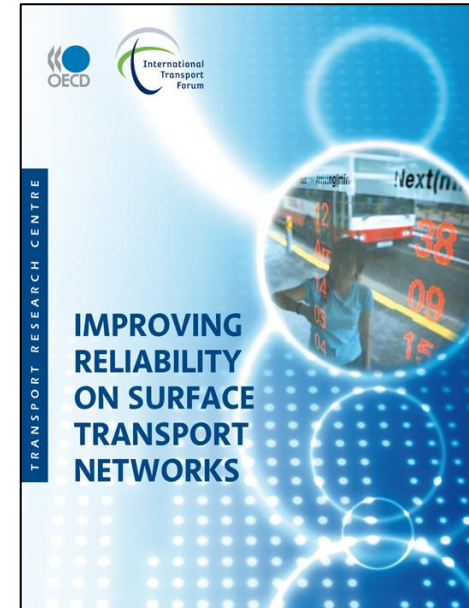


Importance of reliability



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

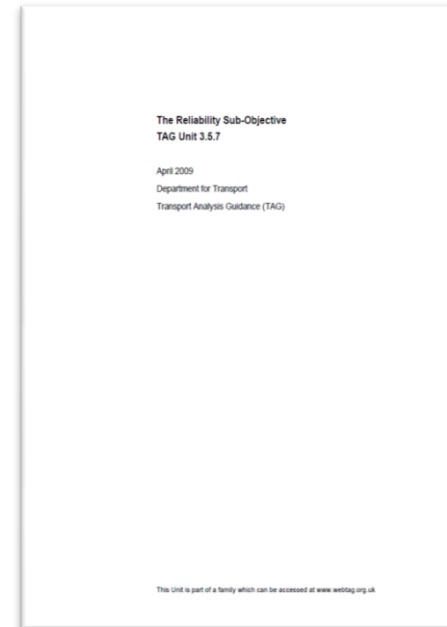
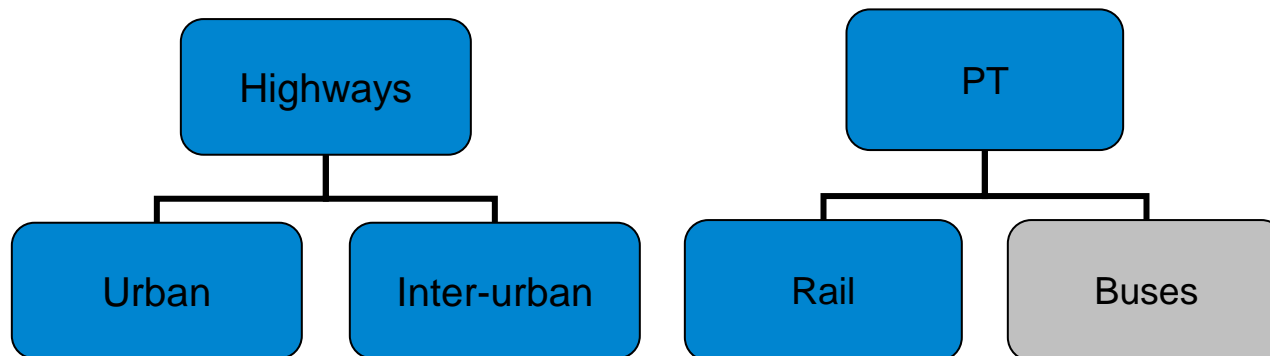
- “CBA must be carried out for large governmental infrastructure projects” – 2004 annex on reliability*
- If possible, use **standard deviation** as a measure
 - Work is done to **incorporate reliability into national transport models** to estimate reliability impact
 - The value of reliability based 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

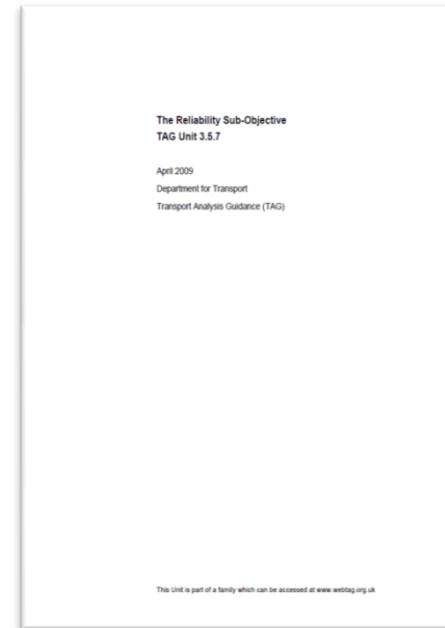
"TAG guidance on the appraisal of transport projects should be seen as a requirement for all projects that need governmental approval"

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



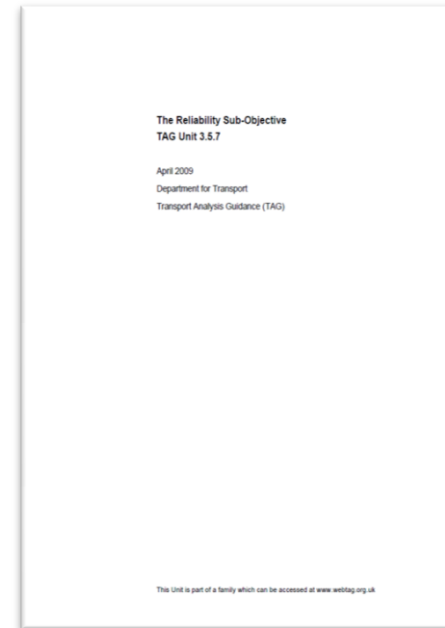
United Kingdom (private vehicle travel)

- 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



United Kingdom (rail)

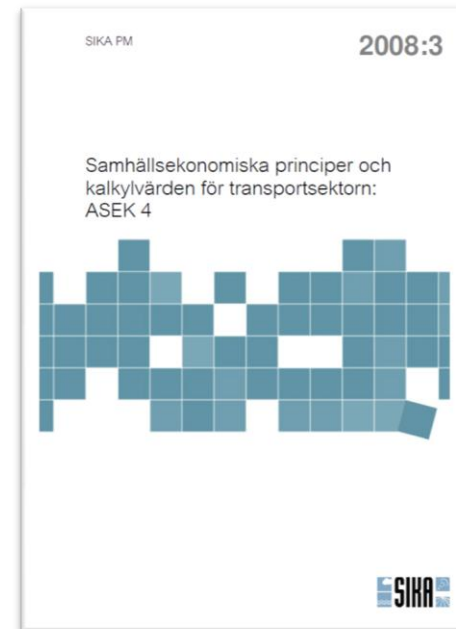
- Delay measured as **difference between scheduled arrival time and actual arrival time**
- Scheduled arrival time as a proxy for preferred arrival time
- Disutility of arriving late measured as **lateness factor** (value of arriving late in relation to in-vehicle time)
 - Recommends factor of three (1 min late = 3 min in-vehicle)
- Includes also disutility related to unpredictable variation in delay



Sweden (road traffic)

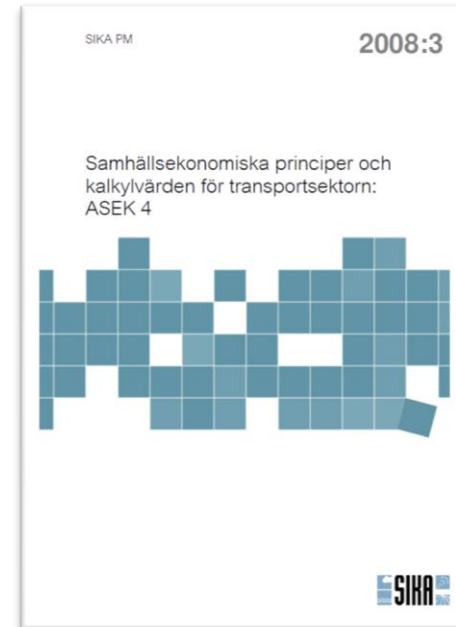
"Delay and unreliability should be included into cost-benefit analysis"

- 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)

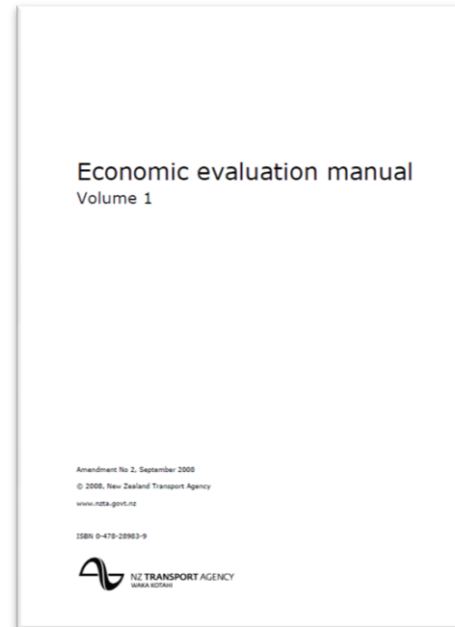
- "Delays" are defined as the **difference between actual and scheduled arrival time**
- **No official modeling method** for forecasting impacts of investments/measures/timetables on delays
- Practice: use statistics and subjective judgments
- Average delay (risk*length) **valued as 2 times travel time**
 - should be higher?
 - Freight treated as person travel



New Zealand

“Improved trip reliability should be incorporated in economic efficiency evaluation of projects”

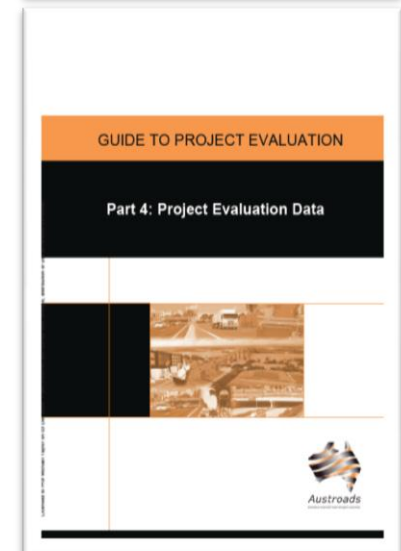
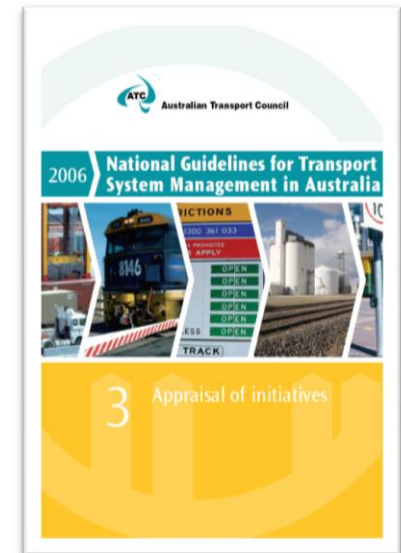
- Day-to-day variation (not incident related delay) measured by the **standard deviation**
- Data to forecast std for different road types, intersection types, and road environments
- The value is derived by **multiplying the value of time by 0.9** (urban traffic mix) or by 0.8 for cars and 1.2 for trucks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

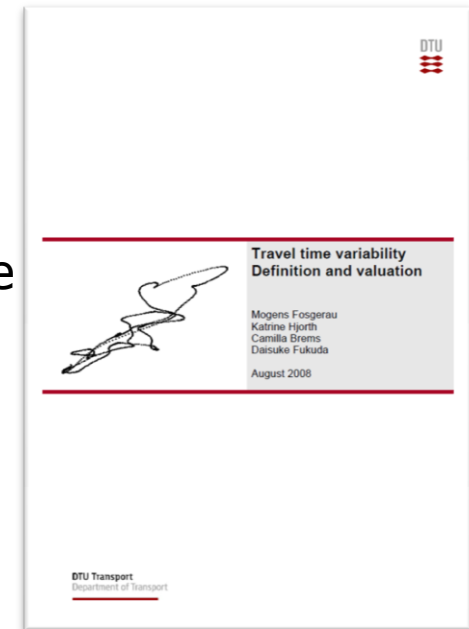
- Procedures may differ in the different states
- Travel time variability measured by the **standard deviation** of travel time
 - Based on volume/capacity ratio for road link, intersection or route segment
- Value of reliability based on **reliability ratio**
 - Citing research results in Bates et al 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
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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
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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





2012 Annual Summit Seamless Transport

2-4 May in Leipzig,
Germany
Presidency Japan

Thank you

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