The UK Approach to Reliability & CBA

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Integrated Transport Economics & Appraisal

Department for Transport, UK

An outline:

- Department for Transport's aims and objectives
- Appraisal system
- General approach
- Theoretical challenges
- An analogy…

DfT's aims and objectives

- The Department for Transport's aim is transport that works for everyone. This means a transport system that balances the needs of the **economy**, the **environment** and **society**. In support of this aim the Department has five strategic objectives which focus on the core area of our business:
- **One**: To support national economic competitiveness and growth, by delivering **reliable** and efficient transport networks.
- **Two**: To reduce transport's emissions of carbon dioxide and other greenhouse gases, with the desired outcome of avoiding dangerous climate change.
- **Three**: To contribute to better safety, security and health and longer life-expectancy through reducing the risk of death, injury or illness arising from transport, and promoting travel modes that are beneficial to health.
- **Four**: To promote greater equality of opportunity for all citizens, with the desired outcome of achieving a fairer society.
- **Five**: To improve quality of life for transport users and non-transport users, and to promote a healthy natural environment.

New Approach To Appraisal

- 'New Approach To Appraisal' – is the analytical framework used to appraise major transport schemes seeking funding and/or approval from DfT. NATA was introduced 10 years ago at the time of the Integrated Transport White Paper 'A New Deal for Transport' (DETR, 1998).

- Four distinct parts:
  - **Appraisal Summary Table, AST (achievement of Government objectives)**
  - Achievement of regional and local objectives
  - Effectiveness of problem solving
  - Supporting analyses

- **Value for Money (VfM)**:
  - Important factor in decision making, helps prioritization
  - AST is starting point, includes information on all NATA objectives

What goes into a VfM assessment?

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	Reliability	Carbon	Private sector impacts
Social inclusion	Air quality	Physical fitness	Cost to Exchequer
Integration	Journey ambience		
Biodiversity	Regeneration		
Heritage			

Scheme Appraisal – AST

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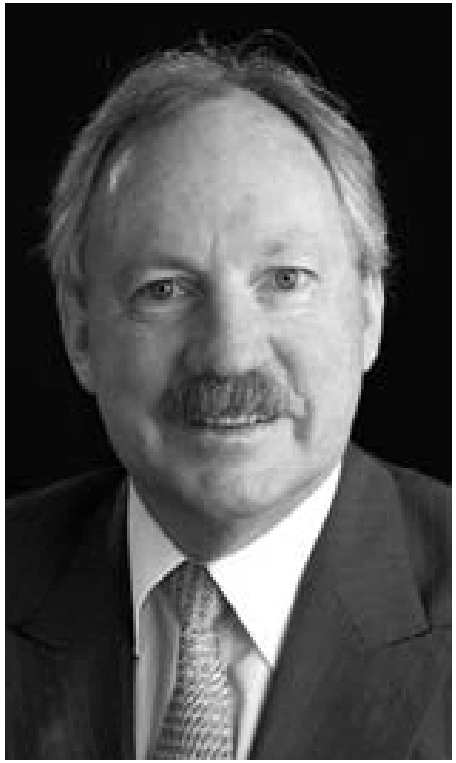
Appraisal Summary Table

Option		Description	Problems	Present Value of Costs to Public Accounts £m
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
ENVIRONMENT	Noise			net population win / lose NPV £m
	Local Air Quality			Concs wtd for exposure
	Greenhouse Gases			tonnes of CO_2
	Landscape			Score
	Townscape			Score
	Heritage of Historic Resources			Score
	Biodiversity			Score
	Water Environment			Score
	Physical Fitness			Score
	Journey Ambience			Score
SAFETY	Accidents			PVB £m
	Security			Score
ECONOMY	Public Accounts		Central Govt PVC, Local Govt PVC	PVC £m
	Transport Economic Efficiency: Business Users & Transport Providers		Users PVB, Transport Providers PVB, Other PVB	PVB £m
	Transport Economic Efficiency: Consumers		Users PVB	PVB £m
	Reliability			Score
	Wider Economic Impacts			Score
ACCESSIBILITY	Option values			PVB £m
	Severance			Score
	Access to the Transport System			Score
INTEGRATION	Transport Interchange			Score
	Land-Use Policy			Score
	Other Government Policies			Score

Motivation for Reliability



The Eddington Transport Study (2005):

Transport improvements can influence **reliability** …

Journey **reliability** is becoming an increasingly important requirement for many transport users..

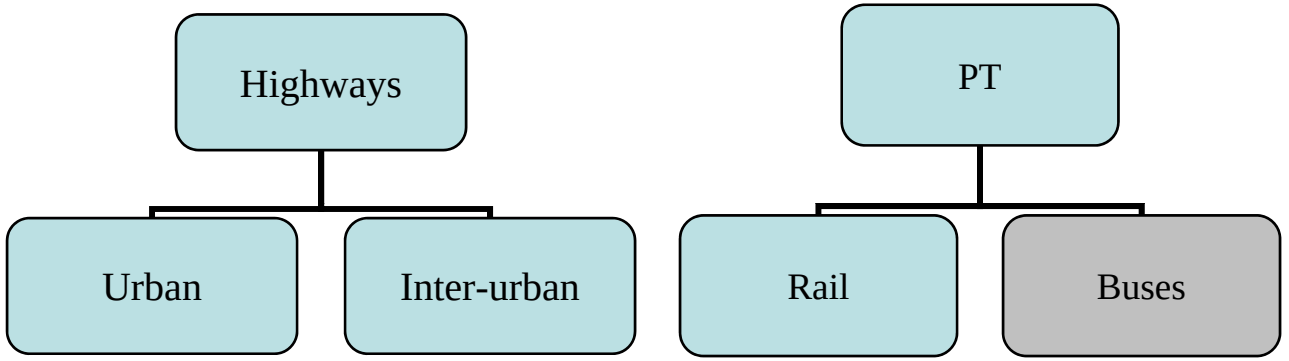
..significance of **reliability** increases as transport systems become more congested ..

…**reliability** is highly valued by business travellers and commuters ..

..for motorway widening schemes, the total value of reliability benefits are in the order of an additional 50% above the value of total time savings …

Reliability in appraisal - guidance

- WebTAG Unit 3.5.7



Measurement	Standard deviation	Average lateness about scheduled arrival time
Basis	Continuous departures	Infrequent departures
Valuation	Value of 1 min SD JT = 0.8*VOT	Value of 1 min avg lateness = 3*VOT

General approach to appraising reliability on ….

Source: Trainmountain

Rail:

- More data collected (PSA targets)
- Transport user less responsible for performance
- Supply issues better understood (NMF model)
- Better confidence of reliability assessments

-> Goes into Cost-Benefit Analysis!

Road:

- Data requirements are more complex
- Transport user responsible for performance
- Still seeking to understand supply side
- Less confidence of reliability assessments

-> Goes into AST!

Source: RAC

Recent developments on highway ….

2001: Decision to trial hard shoulder running on the M42

Objectives:
- Optimise safety and performance
- **Provide more consistent journey times**
- Minimise harmful emissions and fuel consumption
- **Reduce delays and disruption due to accidents and incidents**
- Provide improved warnings and traffic management, routine maintenance operations

Phased operation began in January 2005 and dynamic peak period hard shoulder running was implemented in September 2006.

Managed Motorway – Dynamic Hard Shoulder Running

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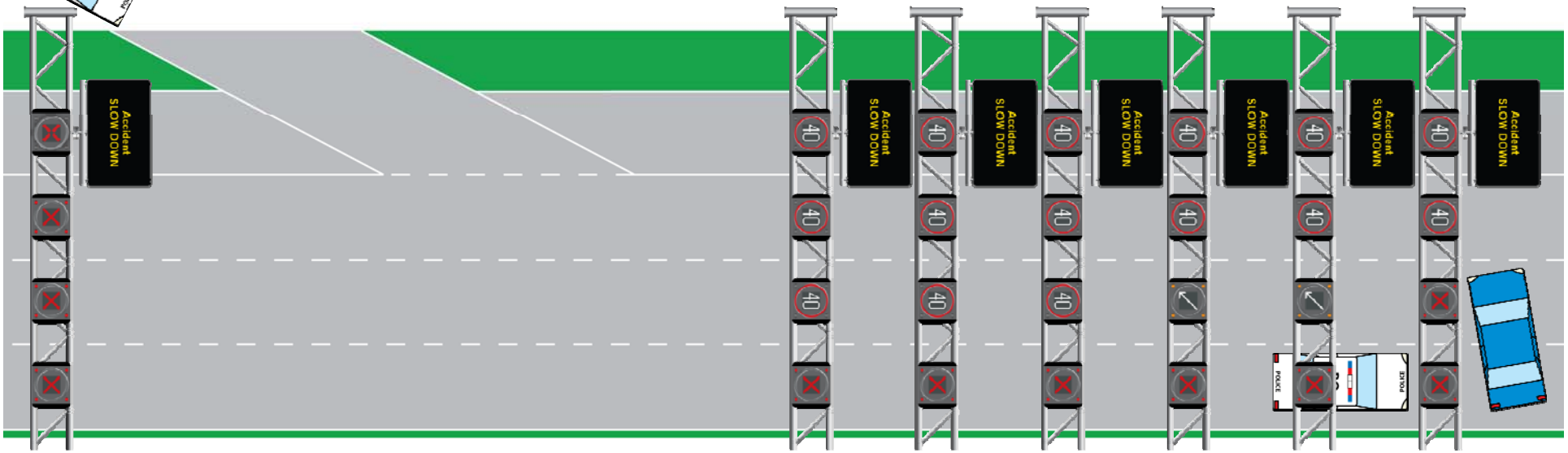
Requirements:

- lightweight gantries with Variable Message Signs around every 500m
- appropriate road markings and fixed signing
- continuous safety fencing
- Pan Tilt and Zoom (PTZ) cameras
- fixed CCTV cameras typically up to 250m intervals.
- MIDAS
- semi-automatic control system (SCS)
- lighting throughout the length of the scheme
- the necessary optical fibre cabling and communications links.

- Emergency services gain access to accident in appropriate lane



Source: Highways Agency (UK)

Managed Motorway – Dynamic Hard Shoulder Running

Department for Transport

Main benefits:

- Congestion relief
- Improved reliability ← But how to evaluate?

Managed Motorway – Dynamic Hard Shoulder Running

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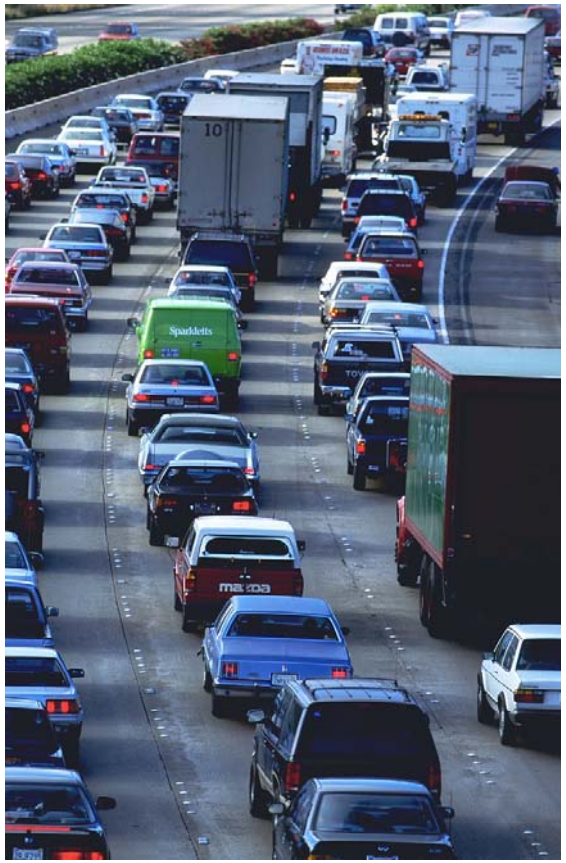
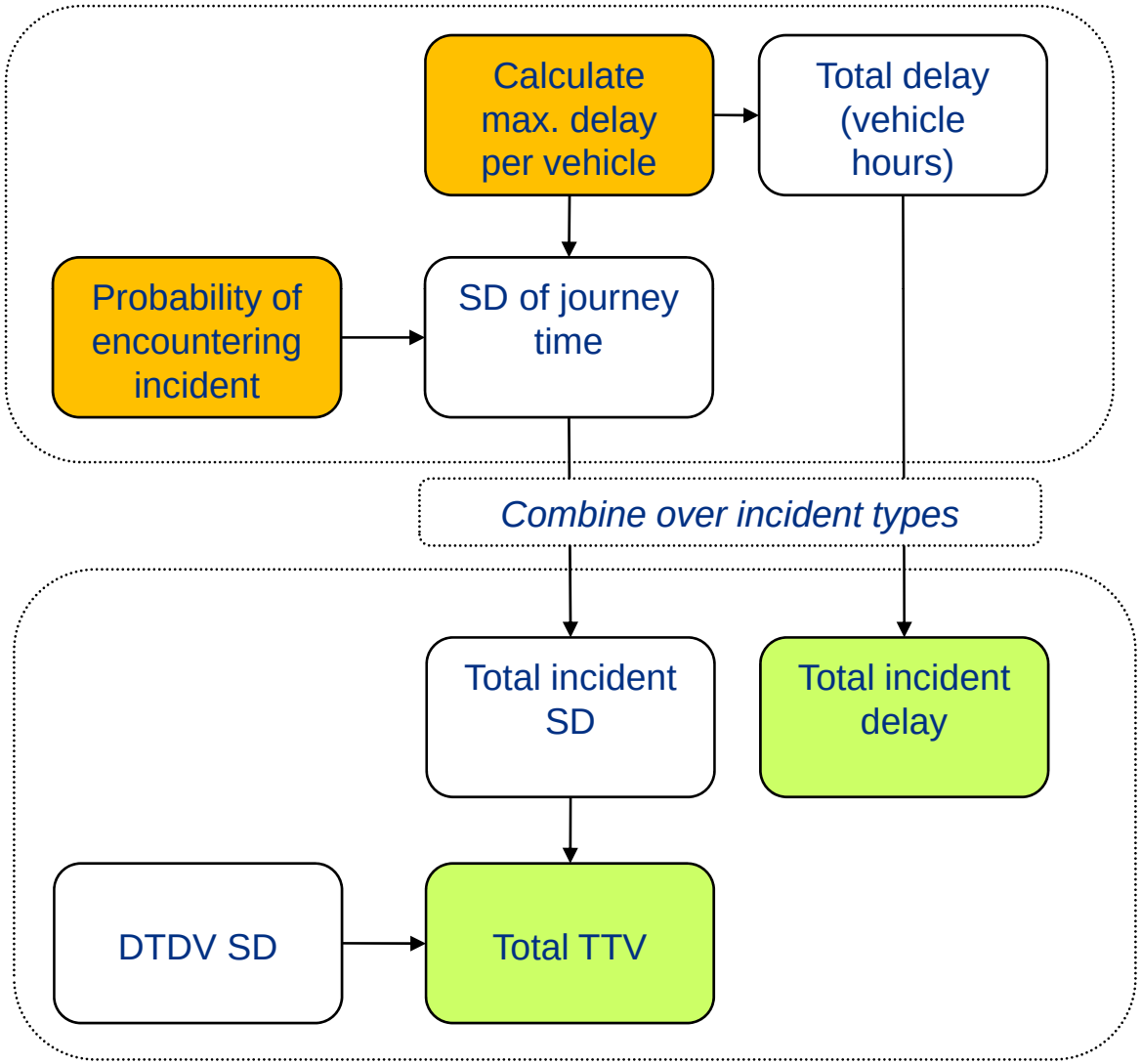
INCA: **IN**cident **C**ost-benefit **A**ssessment.

- Spreadsheet-based tool
- Add-on to existing modelling
- INCA calculates:
  - Delays due to queuing caused by incidents
  - Variability impacts of those queues
  - Residual day to day variability



(Incident = any reduction in capacity)

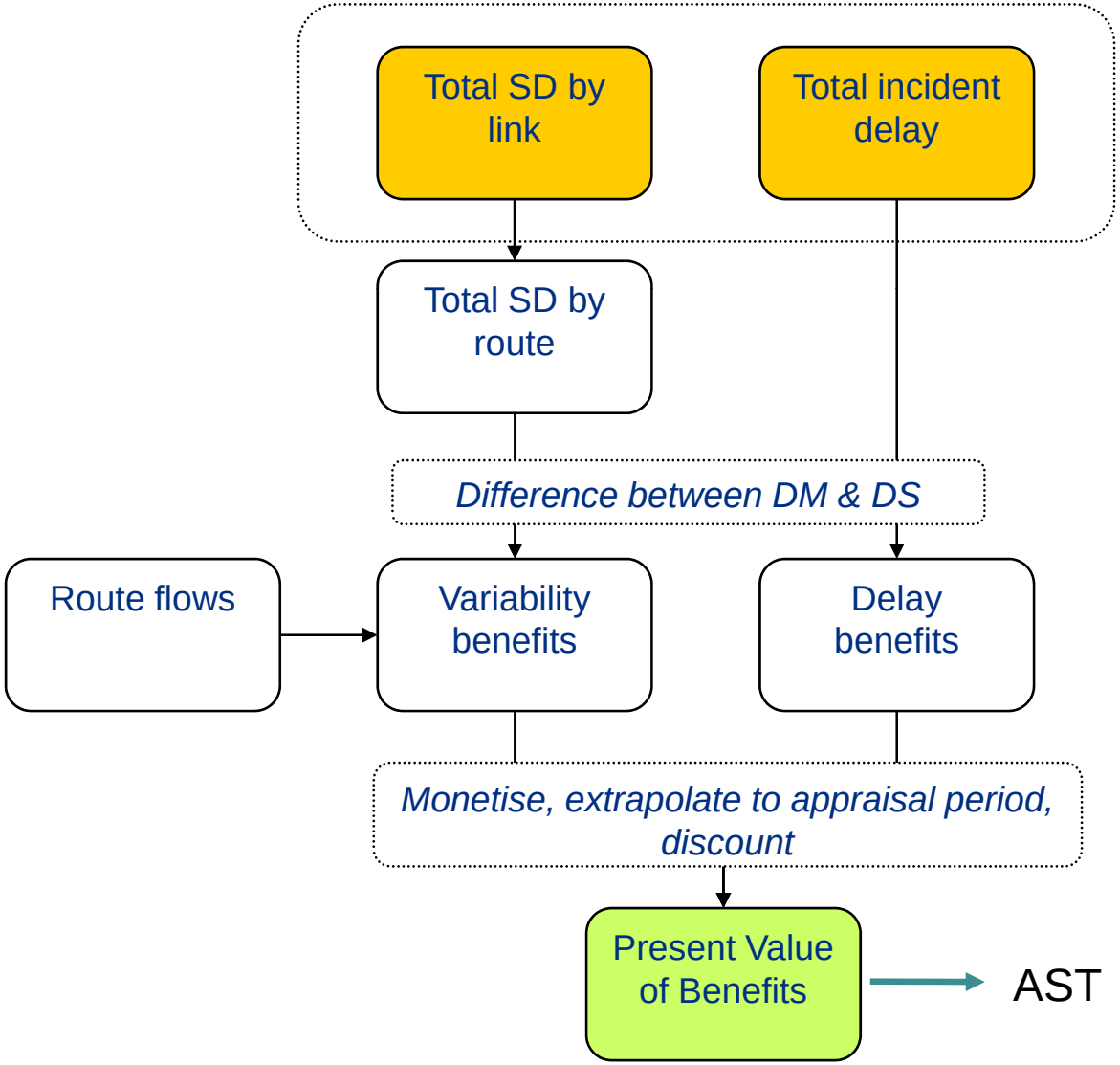
INCA: Link-based calculations



For each link/scenario/flow group/incident type

For each link/scenario/flow group

INCA: Benefit calculations



For each link/scenario/flow group

Benefit calculations

- Before INCA was used, it was assumed that reliability benefits = 50% of travel time savings
- With INCA, a more robust calculation can be made for reliability.

Why are highway reliability benefits from INCA not included in CBA?

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- The incident database for different road types is key to the central calculations within INCA..
- However, there is currently limited understanding of the incident parameters to be used for new schemes such as the MM-DHS ..
- Only recently been applied to understand reliability benefits for motorway improvement schemes..
- Presenting results in AST is first step to presenting relative reliability benefits delivered across different schemes, as we try to improve on the capabilities in estimating reliability..
- Over time, as we collect more evidence, fine-tune our techniques and gain more confidence of the results, we might then consider moving ‘reliability’ into the BCR metric.

Reliability in appraisal – Future work

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Limitations

- Currently, reliability for highway and PT schemes appraised separately.
- Do not have the same approach across modes.

Way forward

- Develop better understanding of the relationship between reliability, demand and network characteristics, and valuation of reliability.
- Ensure that resultant guidance does not significantly increase burden of effort associated with appraisal by considering how it can be supported by appraisal tools

We need to ensure that we provide the relevant tools …

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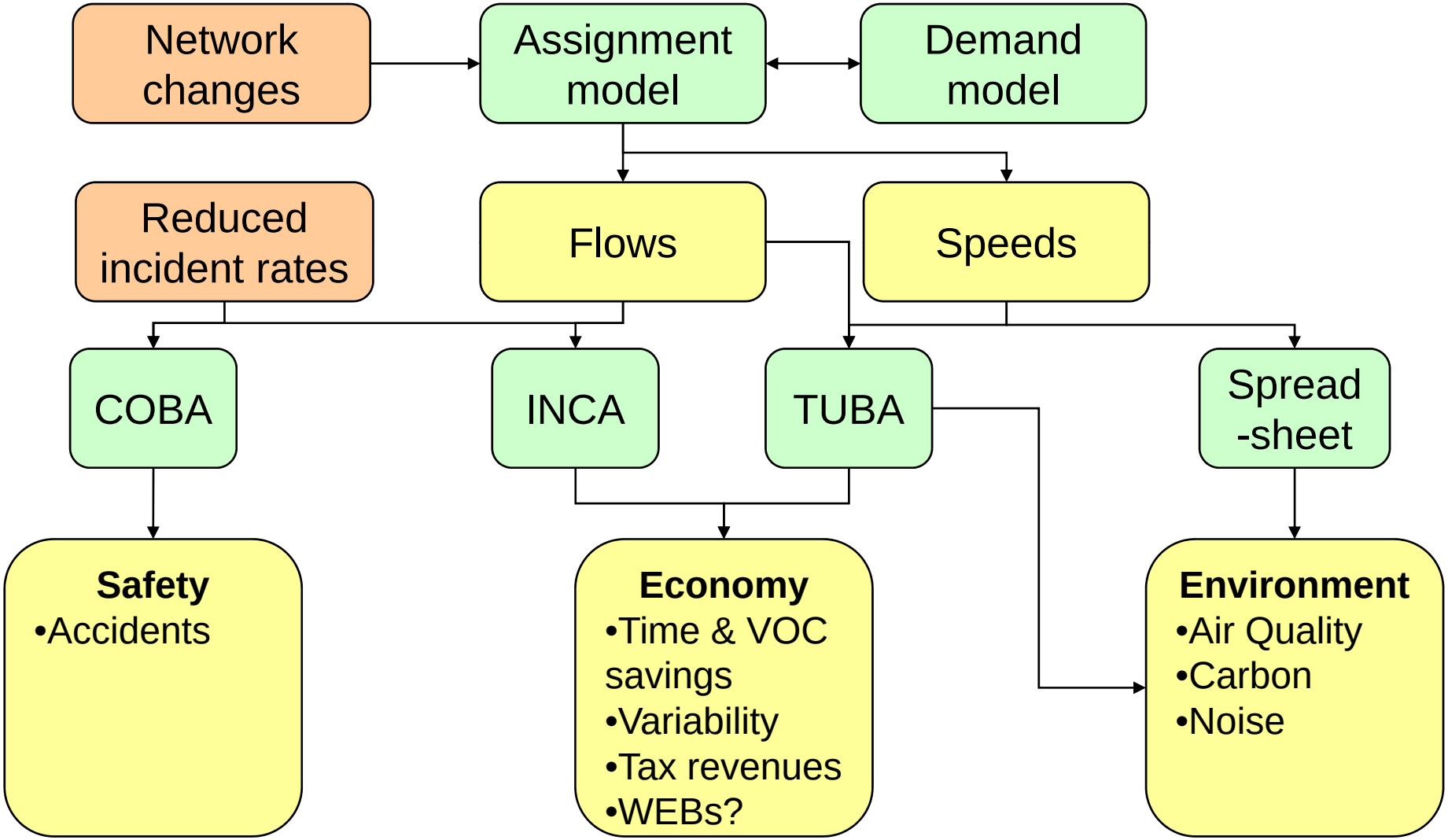

NB: only shows parts of appraisal that use model outputs

We need to ensure that we provide the relevant tools …

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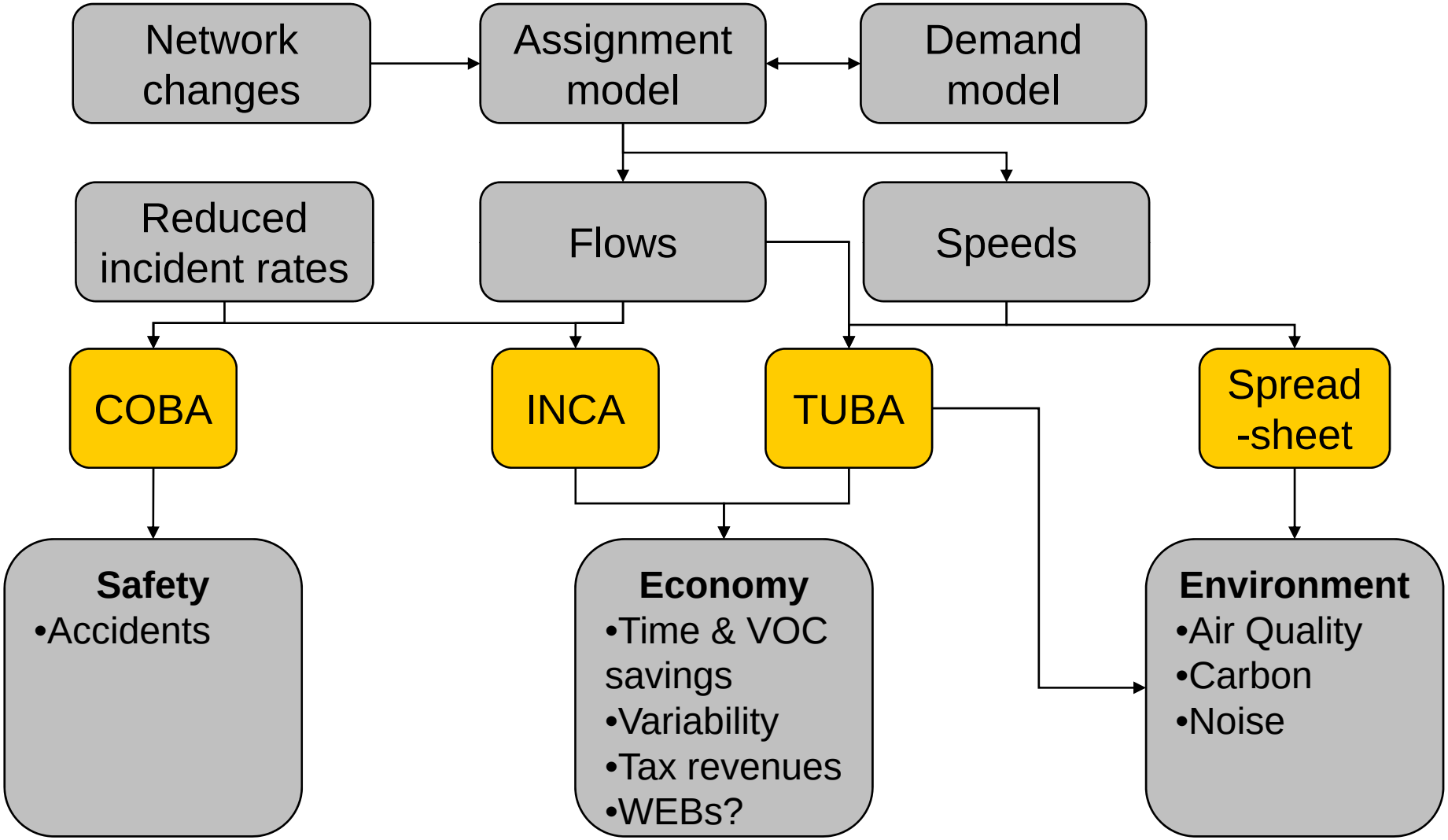


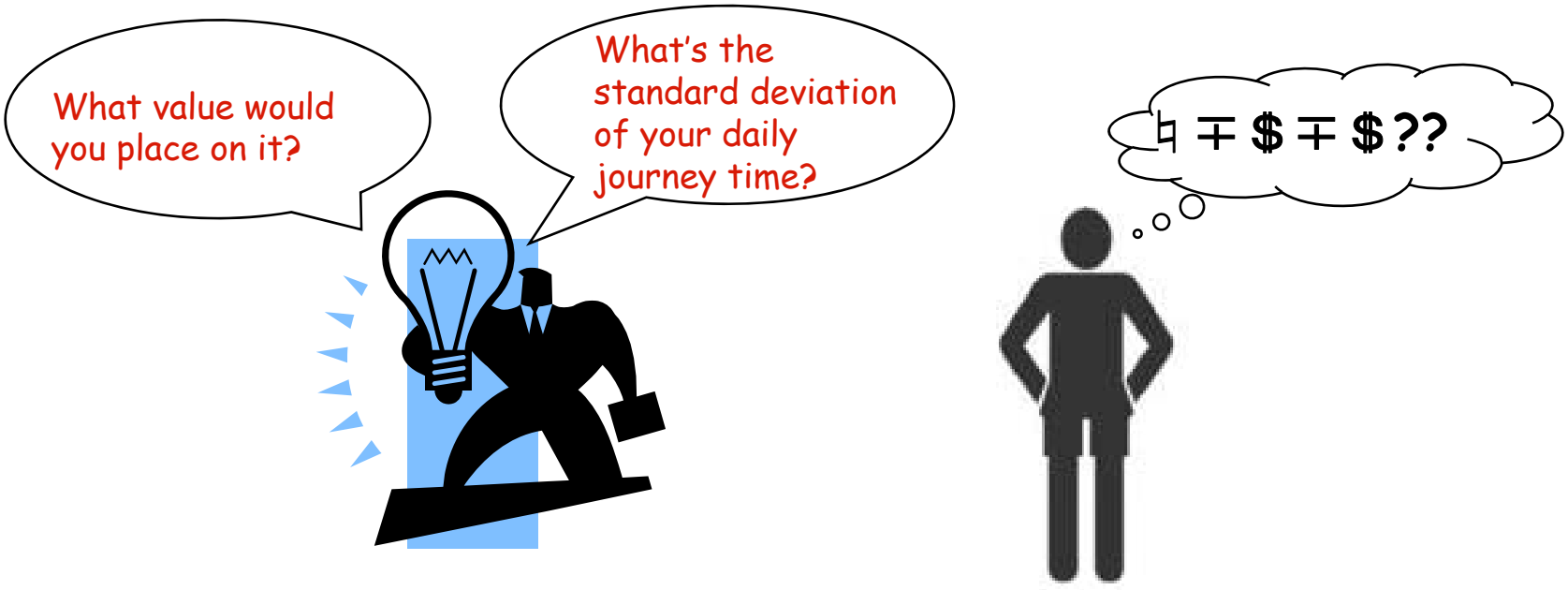
NB: only shows parts of appraisal that use model outputs

How can we value reliability?

How can we value reliability?

Valuation:

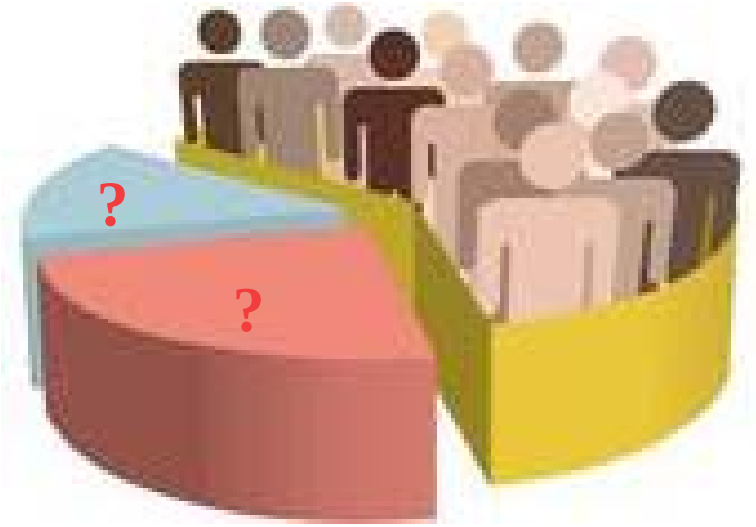
- How to derive a Value of Reliability?
- Based on Stated Preference and Revealed Preference surveys?



How can we value reliability?

Valuation:

- How to derive a Value of Reliability?
- Ensure we capture representative distribution across income and educational level



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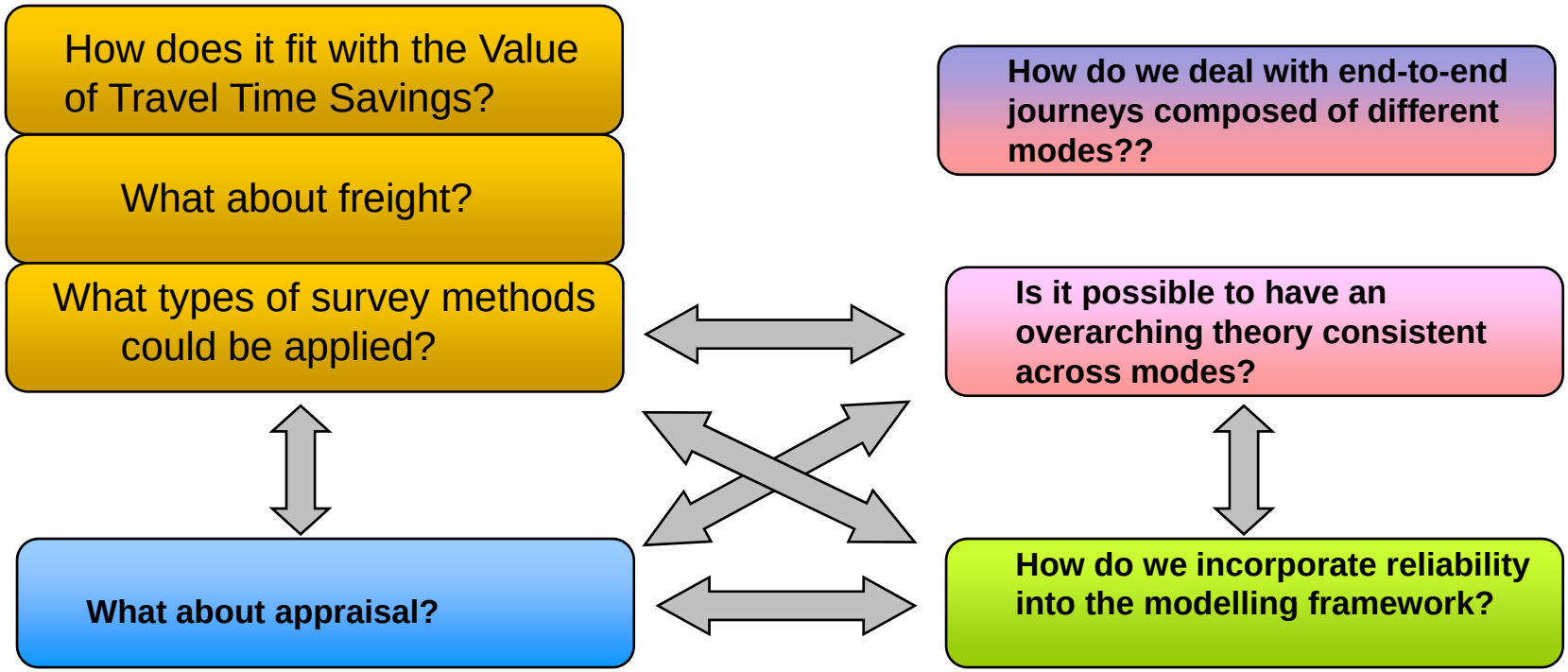

Policy, guidance and research

- Aviation
- Crime and public transport
- **Economics and appraisal**
  - The National Transport Model
  - Software
  - **Research and development of guidance**
  - Standing Advisory Committee for Trunk Road Assessment (SACTRA)
  - Integrated Transport Economics and Appraisal
  - An introduction to our economics and appraisal work
- Transport evaluation
- Freight
- Railways
- Regional and local transport
- Road safety
- Roads and vehicles
- Science and research
- Shipping and ports
- Social inclusion
- Sustainable travel
- Transport security
- Transport statistics
- Transport and Works Act

Travel time variability

Background studies

Back ground studies into travel time variability.

Highway travel time variability

Information on highway travel time variability.

INCA Research

INCA research documents.

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Background studies

Back ground studies into travel time variability.

Travel time variability. Follow-on research

These reports describe the development and implementation of 3 alternative methods for incorporating the cost of variable travel times in assignment models. The background to and derivation of these methods can be found in reports 1.1 and 1.2. The conceptual and methodological issues report identifies and discusses the outstanding issues related to the understanding and modelling of traveller's responses to TTV.

Multimodal travel time variability: final report (1 Mb)

This report contains a comprehensive review of the theory and evidence on: the impact of journey time variability on travel behaviour; the value that transport users place on increasing the reliability of journey times; and incorporating journey time variability into transport models. This review was commissioned in response to the 2006 Eddington Report. Institute of Transport Studies, University of Leeds, 11 November 2008.

Published: 23 April 2009

Advancing methods for evaluating network reliability

The detailed findings of a study funded under the Department's "New Horizons" programme by David Watling, Agachai Sumalee, Richard Connors, Chandra Balijepalli - ITS. Institute of Transport Studies, University of Leeds. 30 April 2004.

Frameworks for modelling the variability of highway journey times - December 2003

Final report of research into frameworks for modelling the variability of journey times (JTV) excluding the predictable variation by time of day, day of week, and seasonal effects. Arup consultants.

Modelling and appraisal of journey time variability - interim report

Review in May 2002 of earlier research, research on this contract, and detailed proposals for further research. Arup consultants.

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INCA Research

Journey Time Variability: Working Papers 1 to 6

DfT define travel time variability (TTV) as unpredictable variation in journey times. Hence TTV is confined to random effects. It excludes predictable variation relating to varying levels of demand by time of day, day of week, and seasonal effects. TRL and John Fearon Consultancy.

Updating and validating parameters for incident appraisal model INCA

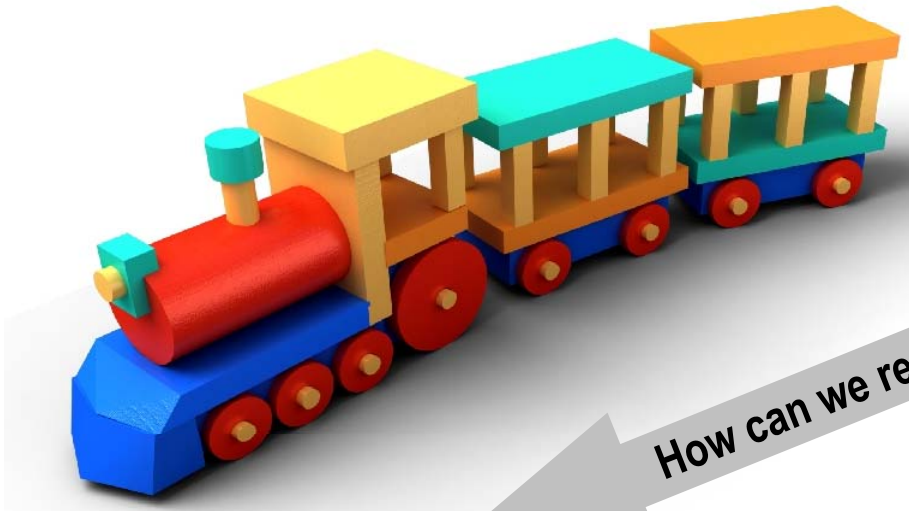
Final report of research into updating and reviewing parameters in the INCA (INcident Cost-benefit Analysis) economic appraisal software. TRL and John Fearon Consultancy.

Development of INCA to incorporate single carriageways and managed motorways (710 kb)

This report provides an algorithm specifying how INCA can accommodate the analysis of inter-urban single carriageways and explores the sources of data for inter-urban single carriageway incidents. Additionally, it explains the incorporation of managed Motorways and Dynamic Hard-shoulder Running in INCA and improvements to the DTDV calculations for MM-DHS schemes.

Published: 09 September 2009

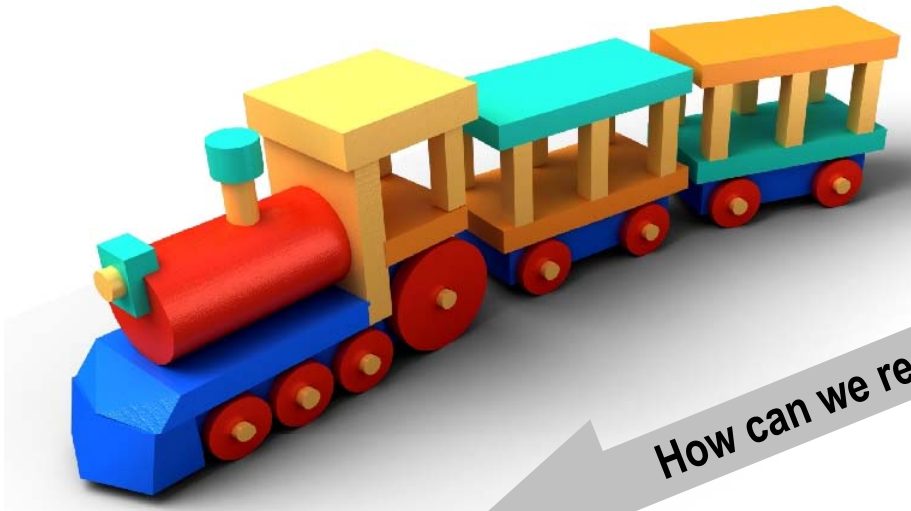
Imagine ….



Practice

How can we reduce this gap?

Theory

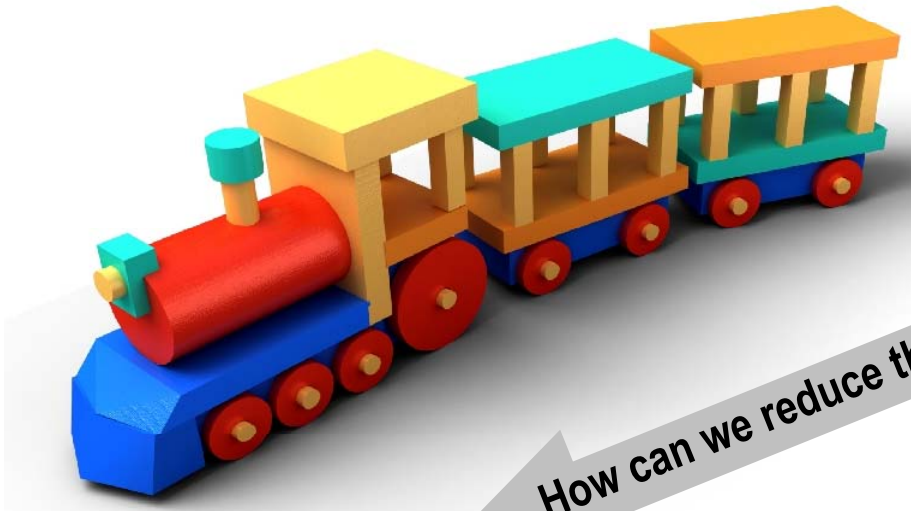


Practice

How can we reduce this gap?

Increase awareness

Theory

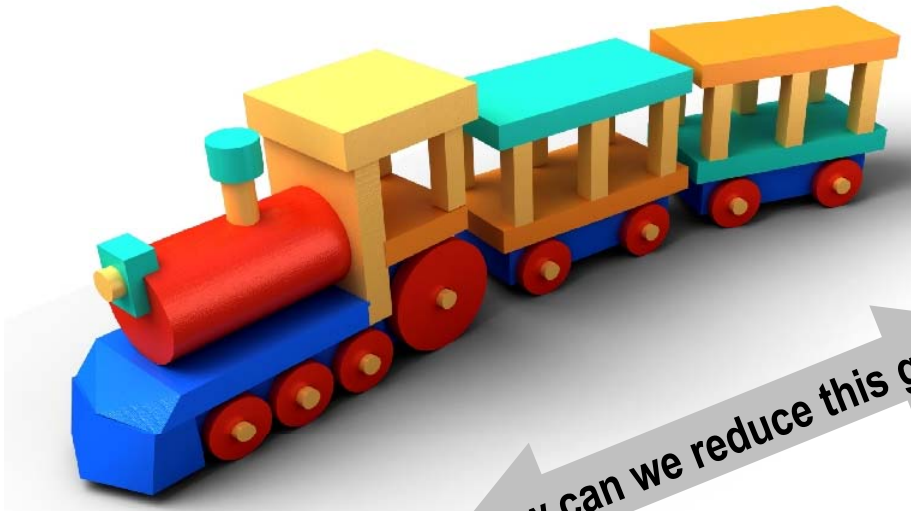


Practice

How can we reduce this gap?

Workshops with practioners

Theory



Practice

How can we reduce this gap?

Training

Theory

Practice

Better co-ordination

Theory

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Thank you…

…Questions?