Institute for Transport Studies
FACULTY OF ENVIRONMENT

UNIVERSITY OF LEEDS

Challenges for combining indicators

presented by

Astrid Gühnemann

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Content

- Why do we combine indicators?
- Challenges for combining indicators for appraisal
  - Selection of impacts and indicators
  - Consistency of indicator scales (impact severity, size)
  - Aggregation of impacts
- Combination of methods
  - Current applications and challenges
- Conclusions

Joint consideration of indicators

- Aims:
  - Balanced decision making
  - Reduction of complexity
- Applications:
  - Information: Monitoring, Reporting, Analysis
  - Planning: Assessment, Appraisal, Evaluation
- Forms of joint consideration
  - Definition of a subset of indicators
  - Aggregation into composite indicators / indices
  - Decision support methods using multiple indicators

Tasks for combining indicators

A. Selection of impacts (scoping) and indicators
B. Establishment of cross-comparability for impact severity
C. Establishment of relative importance of impacts

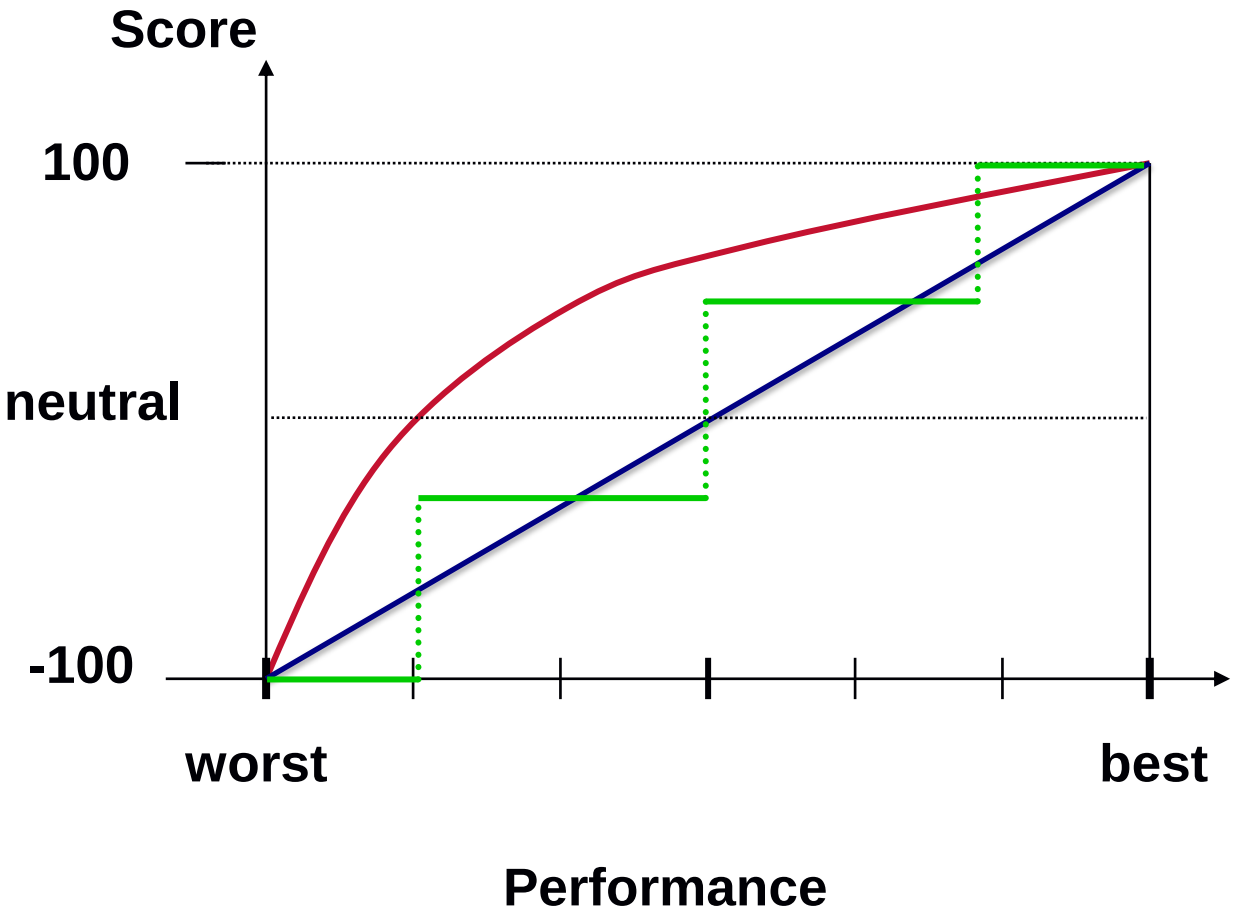
A. Impact and indicator selection

- Which impacts to select? - Scoping
  - Relevance: Policy objectives
  - Controllability: Level of decision making
  - Availability
- How many impacts and indicators to select?
  - Manageability versus completeness
  - Too many: - Implicit weighting by number of indicators per impact
    - Double counting between categories
    - Interdependencies
  - Too few: Omission of impacts (difficult to measure, accumulation)
  - Core + supporting indicators, use of composite indicators for parts

B. Cross-comparability of Impact Severity

- Challenges
  - Different character of impacts
    - nature, time horizon, duration, reversibility, risk, spatial extent
  - Different scales of intervention (small / large projects)
- Normalization required for aggregation (and comparison)
  - e.g. ranking, standardisation, re-scaling, distance to a target, categorical scale
  - normalization by e.g. costs (CBA), level of activity, size
- Further methodological challenges
  - uncertainty, long-term impacts, distribution of impacts

Intra-criteria preferences - Value functions



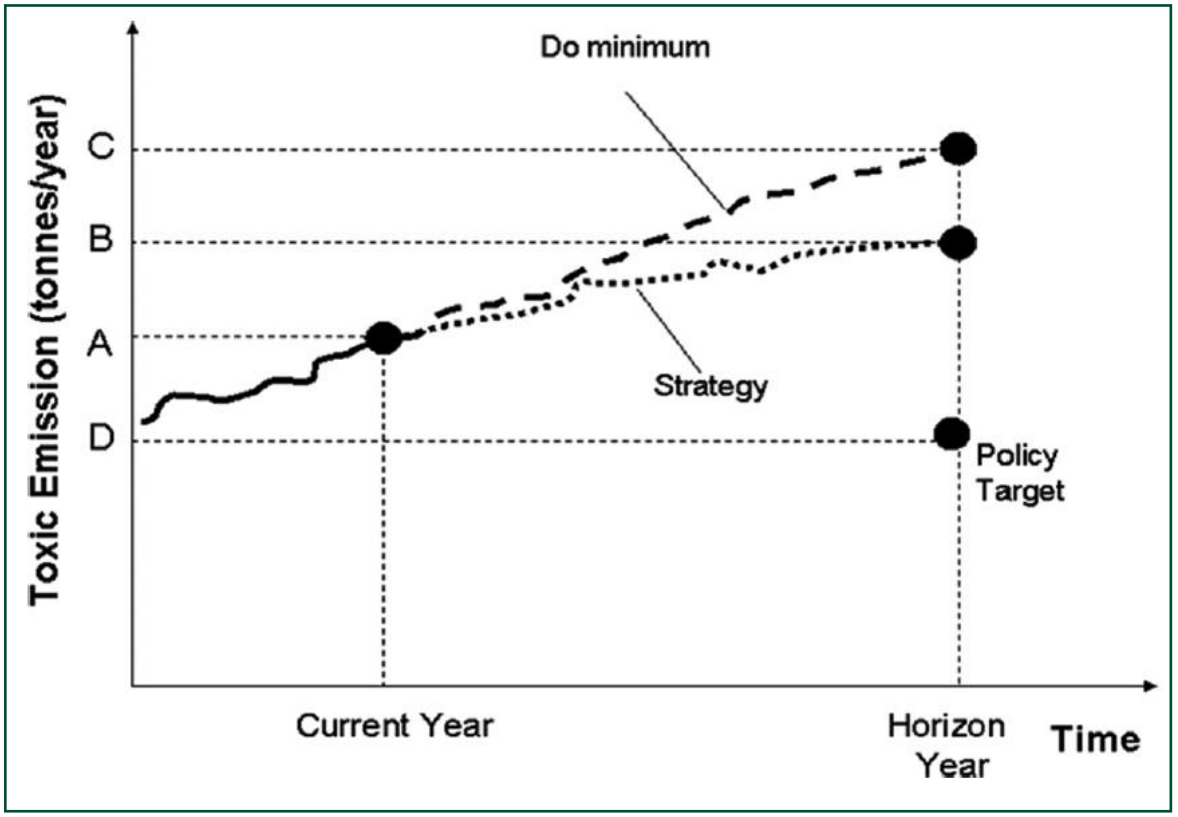
Reference Points for Assessment + Preferences

Reference Points

- Current state
- Do-minimum
- Policy targets

Preferences:

- Worst / best case?
- Neutral state?
- Indifference / outside range of experience



Source: Marsden et al., 2010

⇨**Consistency between impacts**

C. Establishing relative importance of impacts

- Should impacts be aggregated + weighted?
  - Pro: Ease of use, clear message
  - Con: Loss of information, risk of pre-determination of results
- Use of visual tools to support decision makers
- Different stakeholder views to be explored

Example Table (UK NATA)

Option:	Base Scenario: Network Management + Sustainable Travel Option (See Section 5.2)		Problems: See Chapter 3	Cost: £15 million	
Objective	Sub-Objective	Qualitative Impacts	Quantitative Assessment	Assessment	
Environment	Noise	Lower noise levels in traffic calmed residential areas and on resurfaced roads	Slightly beneficial	Net pop. win/lose	n/a
	Local Air Quality	Slightly lower exhaust emissions due to improved traffic movement and use of sustainable modes	Slightly beneficial	Concs wtd for exposure	n/a
	Greenhouse Gases	Slightly lower exhaust emissions due to improved traffic movement and use of sustainable modes	Slightly beneficial	Tonnes of CO_2	n/a
	Landscape	Largely preserves character of landscape with moderate benefits to 'tranquillity' e.g. Quiet Lanes	Slightly beneficial	Score	+1
	Townscape	Some improvement from pedestrian schemes and environmental enhancements	Slightly beneficial	Score	+1
	Heritage	Nochange	Neutral	Score	0
	Biodiversity	Nochange	Neutral	Score	0
	Water environment	No change	Neutral	Score	0
	Physical fitness	Benefits through increased walking and cycling	Slightly beneficial	Score	+1
	Journey ambience	Benefits through facilities for pedestrians / cyclists and through signing / information improvements	Moderately beneficial	Score	+2

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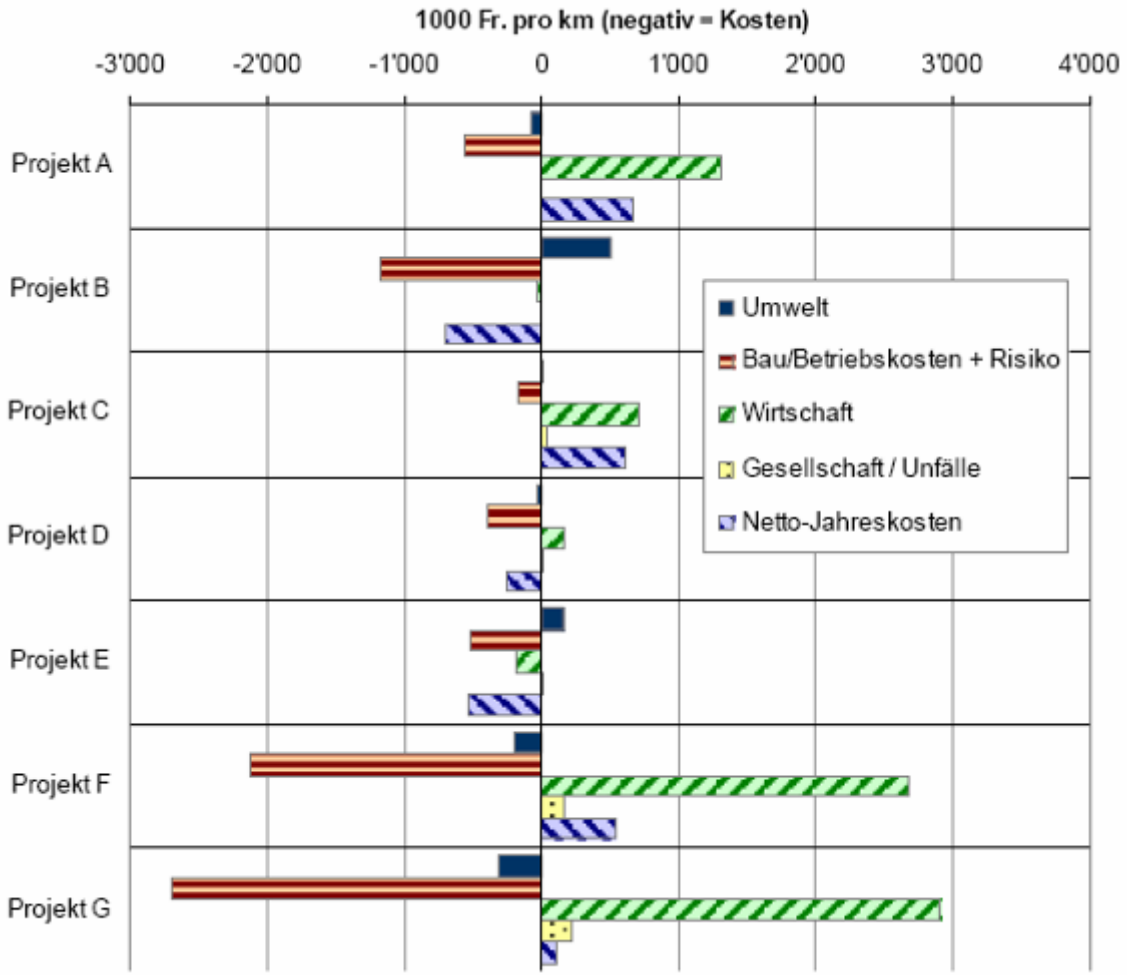
Example Visualisation

- From Swiss NISTRA approach
- Scale of impacts normalised by length of project



CBA-Indicators / 100 km

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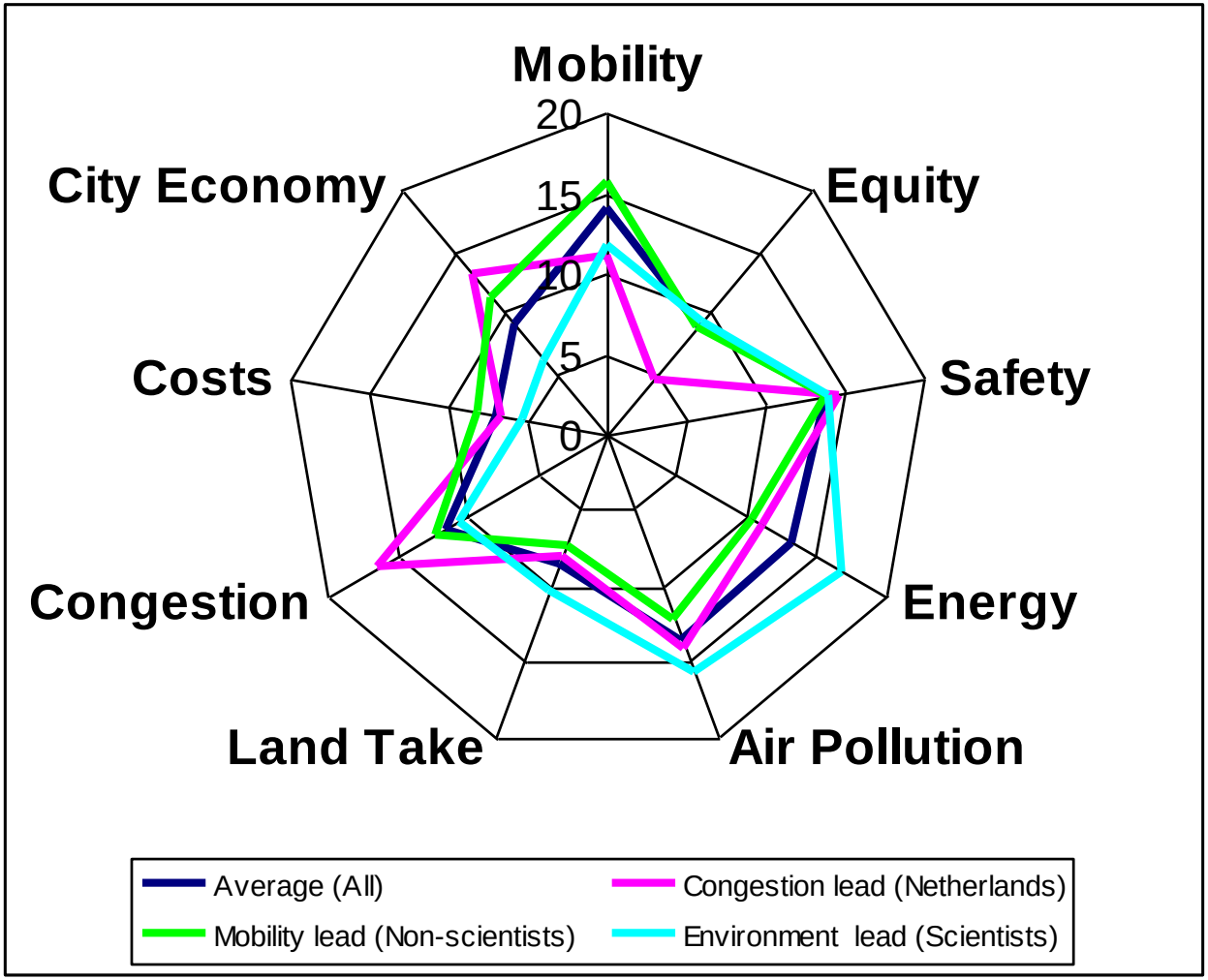
Variation of Weights by Stakeholders



Gühnemann, Kimble, 2008

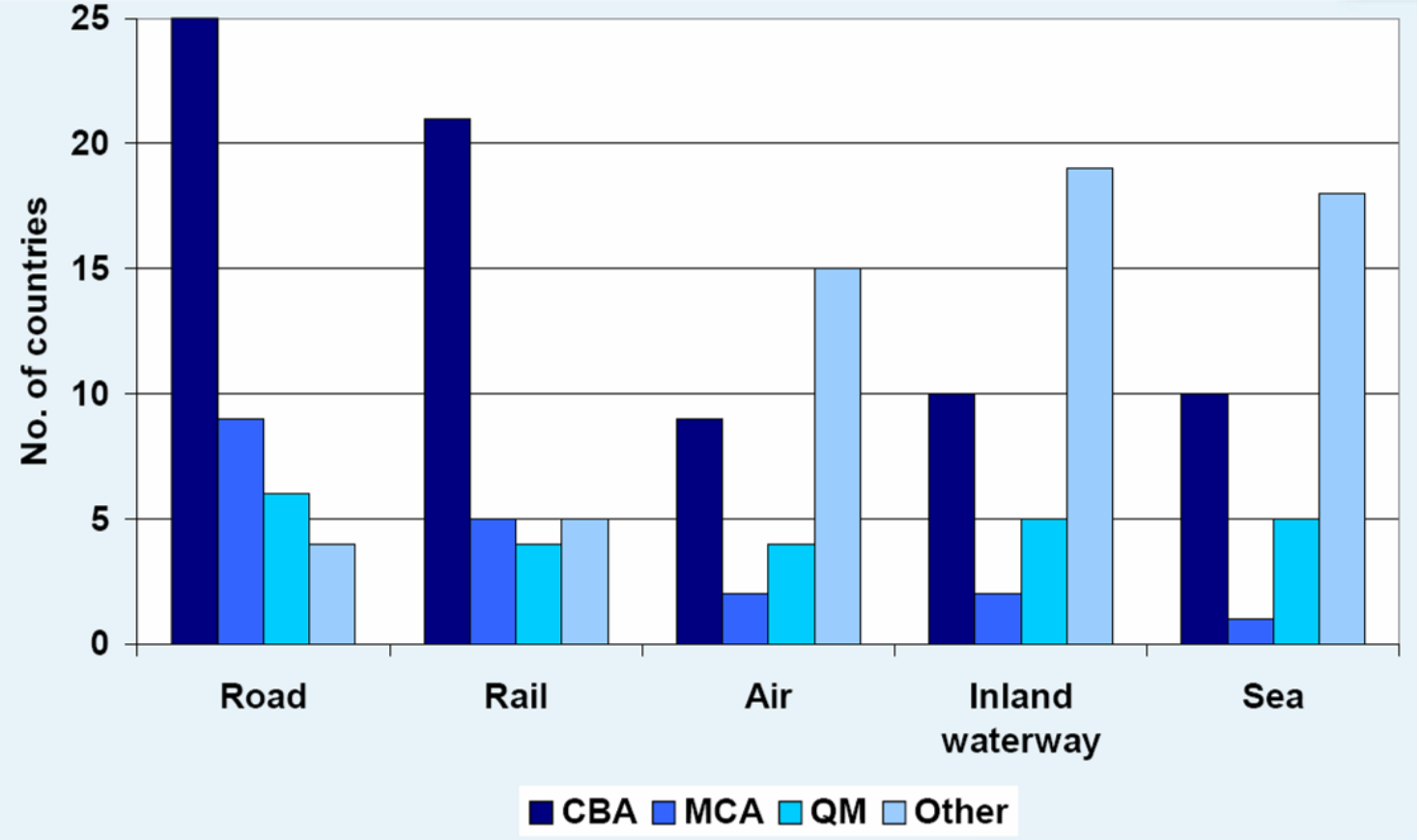
Current Use of Methods in Transport Appraisal

HEATCO (2005)

- Cost-benefit-analysis;
- Multi-criteria analysis;
- Quantitative measurements without weighting of indicators
- Qualitative measurement or not covered in a formalized method

Use of methods in transport project appraisal in Europe by mode

(No. of countries using relevant type of analysis by mode) (HEATCO project)[1]



[1] The ranking of types of appraisal is as follows: CBA – MCA – QM – QA/NC – No information/ not relevant, i.e. if for example both CBA and MCA is used the figure reflects CBA.

Examples of Mixed European Approaches

Approach	Impacts (Benefits) included in CBA	Valuing Method MCA	Aggregation of Results
Germany (FTIP)	Time Costs, Air Pollution, Severance, Safety, Noise, Maintenance, Fuel Cons.	Rating Mostly quantitative	Partly weighting, partly verbal + priotisation
England (NATA)	Time Costs, Noise, Safety, Maintenance, Fuel Consumption	Rating quantitative and qualitative	Table, verbal
Switzerland (NISTRA)	Time Costs, Safety, Noise, Air Pollution, Land Consumption, Resource Consumption, Severance, Maintenance	Rating, quantitative and qualitative	Weighting (adjustable), partly aggregated, verbal
Ireland (NRA)	Time Costs, Safety, Maintenance, Fuel Consumption	Rating, quantitative and qualitative	Weighted, CBA results included in weighting

Combination of methods: Issues to be considered

- **Selection of impacts** to included in which method
  - monetisation possible / acceptable
  - avoidance of double counting
- **Valuing and Weighting**
  - supplementary verbal / tables / graphical information -> support for decision
  - double weighting of impacts evaluated in CBA to be avoided
- **Application and Stability of results**
  - political acceptability of uncertainties
  - applicability for appraisal of plans
  - stakeholder participation

Conclusions

- Methods need to ensure consistency of assessment of severity between impacts
- Methods need to give decision makers clear information on trade-off between impacts
- No ‘one size fits all’ method -> Combination of methods and methods for synthesis required

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