



HOW TO MEASURE WITH INDICATORS: CRITERIA AND METHODS FOR INDICATOR ASSESSMENT

Indicators of environmental sustainability in transport.
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Overview

- *Measuring* with indicators
- *Approach* of the work
 - Top down approach
 - Bottom-up approach
- *Criteria* for the assessment of indicators
- *Frameworks* for the assessment of indicators
- Conclusions and recommendations for next steps

‘Measuring’ with indicators

- Indicators are not exact tools... but should be as accurate as possible
- Indicators are not neutral tools... but should be as appropriate to for the situation as possible
- Focus in this section: Indicators for individual impacts (not aggregates or joint consideration of impacts)
- Main reference: Chapter 4 in Final Report
 - Background report: “Criteria and methods for indicator assessment and validation”

Approach of the work

Top-down approach:

- Indicator assessment criteria and methods in general + specific literature (sustainability, environment, transport)

Bottom-up approach:

- Working group: Suitable set of criteria and relevant method for the scope of COST 356, dealing with,
 - Full range of environmental impacts, one by one (at first)
 - Potentially all modes and planning situations
 - Not a specific, exclusive concept of sustainability

General observations from literature

- Many criteria for assessment and selection of ‘ideal’ indicators (up to 34 in one reference)
- Broad consensus about many criteria across domains
- Limited agreement on specific definitions of criteria
- Considerable overlap among definitions
- Very low agreement of an overall categorisation => no common logic as to purpose of each criterion

Heterogeneity of categories across references

NCHOD 2005 (Clinical Health)	Niemeijer & de Groot 2008 (environment)	Jackson et al 2000 (ecosystems)	OECD 2003 (env. policy)
Scientific criteria	Scientific dimension	Conceptual Relevance	Analytically sound
Policy Criteria	Policy and management	Feasibility of Implementation	Policy relevant and useful
Methodological criteria	Systemic dimension	Response Variability	Measurable
Statistical criteria	Intrinsic dimension	Interpretation and Utility	
	Historic dimension		
	Financial and practical dimensions		

**Responsiveness/
sensitivity**

Three broad categories of criteria

- **Measurement** related criteria
 - Indicators assessed with regard to accurate representation of an impact (as accurate as possible and necessary)
- **Monitoring** related criteria:
 - Indicators assessed with regard to how operational they are for practical and continued monitoring
- **Management** related criteria:
 - Indicators assessed for their pertinence to and usefulness for policy and decision making

Criteria in sustainable transport literature

- Similar criteria, as in other areas, but...
 - Need for criteria to identify indicators that can measure/distinguish transport 'share' of an impact; a 'transport sensitivity' criterion
 - Emphasis on monitoring and management related criteria (decision support function)

Contributions from working group process

- Comprehensive list of criteria
- Preliminary testing
- Constructon of a logical structure of criteria
- A ‘core list of criteria’ with few overlaps and redundancies as guidance for subsequent testing

Representation

Validity

Reliability

Sensitivity (to specific factor)

Operation

Measurability

Data availability

Ethical concerns

Application

Transparency

Interpretability

Target Relevance

Actionability

Representation criteria

Validity	A valid indicator must actually measure the issue or factor it is supposed to measure	+ GWP for emission impact on climate - ‘Potential Odor ‘ for annoyance (smell)
Reliability	A reliable indicator must give the same value if its measurement is repeated in the same way on the same population and at almost the same time	+ Modern thermometer for air temperature - Air temperature for road ice warning
Sensitivity (to factor transport)	A sensitive indicator must be able to reveal important changes in the factor of interest	+ Quick steering adjustments for driver fatigue - VMT for ‘sustainable transport’
		+ example fulfilling criterion (see report for reference) - example not fulfilling criterion (see report for reference)

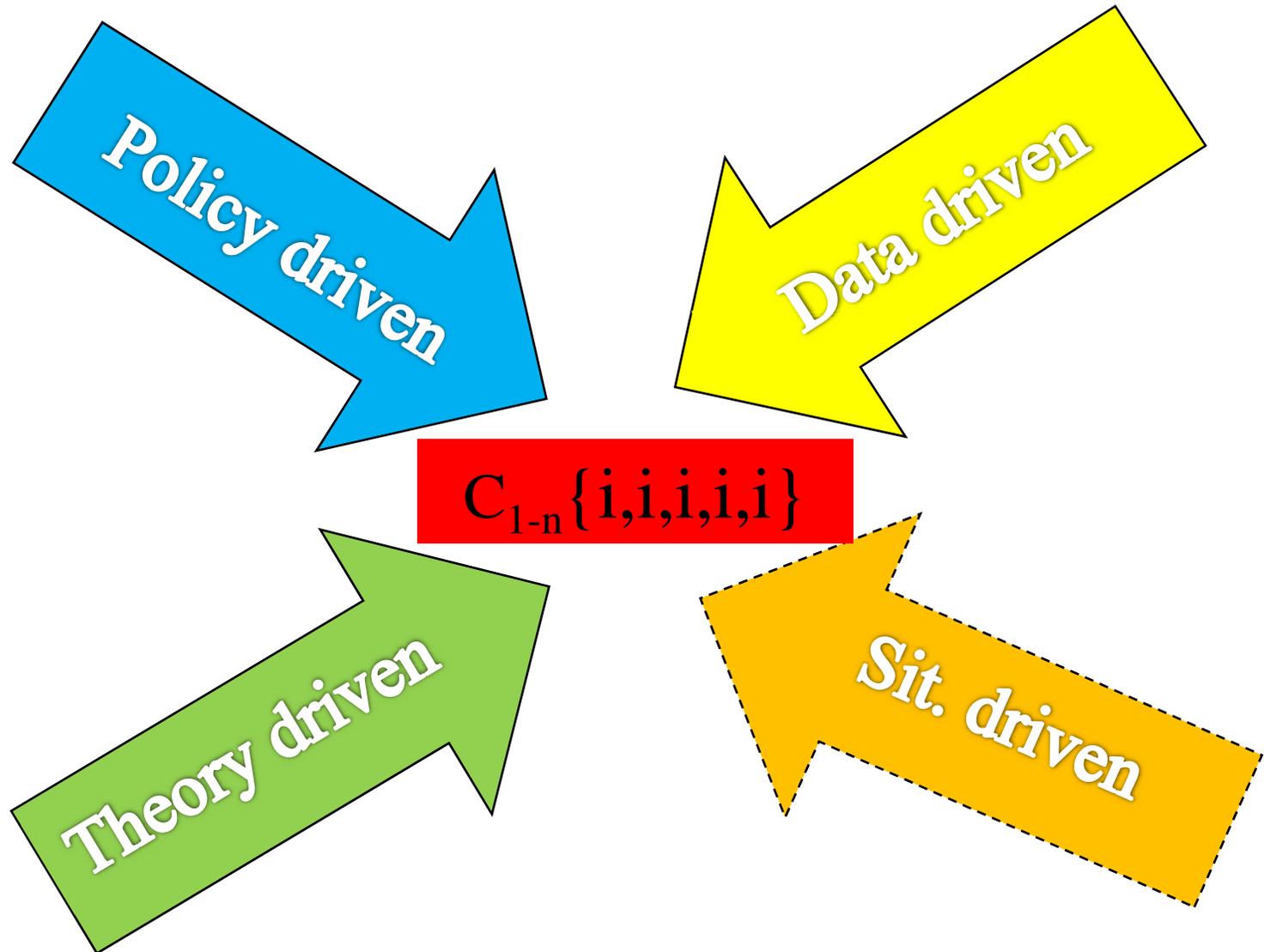
Operation criteria

Measurability	A measurable indicator should be straightforward and relatively inexpensive to measure	+ Auto registrations, for vehicle number - 'Average satisfaction' with Publ. Transp.
Data availability	Data available indicators are based on (input) data that should be readily available or at reasonable cost and time	+ Average length of cycle lanes for 32 European cities - TERM 39 'Uptake of environmental management systems for transport. Comp
Ethical acceptability	An indicator must comply with fundamental human rights and must require only data that are consistent with morals, beliefs or values of the population	+ Anonymised travel survey data - Blood alcohol data from autopsies
		+ example fulfilling criterion (see report for reference) - example not fulfilling criterion (see report for reference)

Application criteria

Transparency	A transparent indicator is one which is feasible to understand and possible to reproduce for intended users	+ Transparency through stakeholder involvement in indicator selection (Cal.) - Benefits of transfer of goods from road to rail (Norway)
Interpre- tability	An interpretable indicator allows an intuitive and unambiguous reading.	+ Number of people killed in traffic - Air pollution indicator shown as decreasing function of concentrations
Target relevance	A target relevant indicator must measure performance with regard to articulated goals, objectives, targets or thresholds	+ European Road Safety Observatory reporting road fatalities/year - Lacking targets for all-cause mortality and child poverty in <i>Healthy People</i> (US)
Actionable	An actionable indicator is one which measures factors that can be changed or influenced directly by management or policy action	+ Number of Ecosystem Initiatives implemented (US) - Weather conditions contributing to explain accidents
		+ example fulfilling criterion (see report for reference) - example not fulfilling criterion (see report for reference)

From criteria to frameworks



Frameworks of validation/selection (1)

Overall elements:

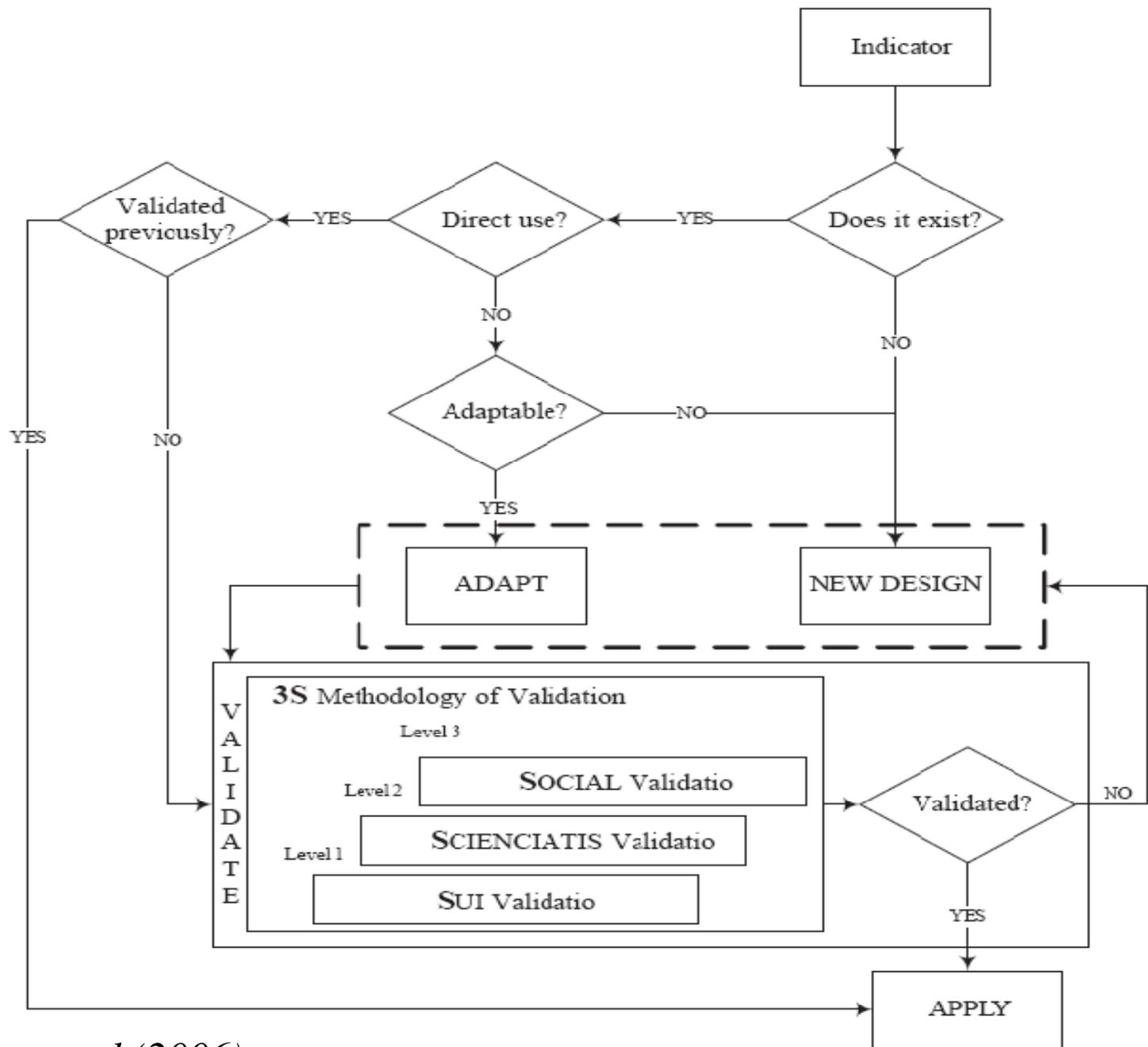
- Generation of indicator selection criteria
- Generation of potential indicators
- Selection of indicators.

Frameworks of validation/selection (2)

Example procedure :

1. Determine user needs
2. Develop a list of candidate indicators
3. Determine screening criteria
4. Score indicators against criteria (e.g 1-5)
5. Summarize scoring results
6. Decide how many indicators are needed
7. Make final selection
8. Report on the suite of indicators

(Rice & Rochet 2005)



Approach adapted in COST 356

- Selection of a number of impacts for trial assessment
- Individual/expert group assessment
- ‘Generic’ assessment (not policy/application)
- Description of impact chain (what is to be indicated)
- Application of 10 criteria to a range of indicators
- Simple ordinary scoring 1-4
- No attempt to find ‘ideal’ indicator
- Report on result and feasibility of method

Conclusions

- A wide range of criteria for assessment of indicators
- No general consistency, but possible to improve structure
- Several frameworks/approaches/procedures in litt.
- Limited experience reported on transport indicator assessment (few policy applications described)
- Criteria based scoring can help improve transparency of indicator selection
- Criteria based scoring does not eliminate subjective elements (even among experts)

Some key points for selection framework

- Scope of assessment (range of issues; state of knowledge)
- Identification of criteria (few clear; many overlapping?)
- Who is to be involved (experts/stakeholders, together/separate)
- How to score (from simple ordinal, to multi-criteria methods)

Is there need/scope for continued systematic review of transport environmental indicators?

- **for generic impacts?**
- **for particular applications?**