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


Henrik Gudmundsson
DTU Transport, Kgs. Lyngby Denmark
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

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<tbody>
<tr>
<td>Scientific criteria</td>
<td>Scientific dimension</td>
<td>Conceptual Relevance</td>
<td>Analytically sound</td>
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<td>Policy Criteria</td>
<td>Policy and management</td>
<td>Feasibility of Implementation</td>
<td>Policy relevant and useful</td>
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<td>Methodological criteria</td>
<td>Systemic dimension</td>
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<td>Statistical criteria</td>
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<td>Historic dimension</td>
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<td>Financial and practical dimensions</td>
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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
- Construction of a logical structure of criteria
- A ‘core list of criteria’ with few overlaps and redundancies as guidance for subsequent testing
# Representation criteria

<table>
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<tr>
<th>Representation criteria</th>
<th>Definition</th>
<th>Examples fulfilling criterion</th>
<th>Examples not fulfilling criterion</th>
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| **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

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

- Policy driven
- Data driven
- Theory driven
- Sit. driven

$C_{1-n}\{i,i,i,i,i\}$
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?