Indicators for sustainability in transport - from conceptualization to utilization

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ITS Leeds, November 9, 2012
Overview

1. Indicator phenomenon –

2. Conceptualisation
   - Sustainability indicators
   - ‘Sustainable transport’ and indicators

4. Utilization

5. Conclusions
1. Indicator phenomenon
Contributions to indicator reports
Canary birds were taken into the early mines in cages in order to detect the presence of the odorless and lethal gas, carbon monoxide.
An indicator of Climate Change

MAUNA LOA OBSERVATORY, HAWAII
MONTHLY AVERAGE CARBON DIOXIDE CONCENTRATION

Variable

Values

Phenomenon of interest
An indicator of congestion

Variable: Hours of Delay per Traveler

Phenomenon of interest

Values

Population Area Size

Very Large = more than 3 million
Large = 1 million to 3 million
Medium = 500,000 to 1 million
Small = Less than 500,000

1982
1995
2005
A Definition of an indicator

• An indicator is a **variable**, which is selected for its ability to **represent** a wider **phenomenon of interest**; which is measurable in corresponding **value units**, and which supports **interpretation, evaluation or action** with regard to the phenomenon of interest

• Based on the Latin verb **indicare**, meaning to point out, to announce, to give notice of, to determine, to estimate, to **betray**....
"Notwithstanding the tragic loss of life in the Gulf of Mexico, we achieved an exemplary statistical safety record as measured by our total recordable incident rate and total potential severity rate . . . As measured by these standards, we recorded the best year in safety performance in our company’s history."

(Source: Perrin 2011)
Ways to communicate an indicator

Headline

Text

What is it about?

What do we see?

What does it mean?

Signifier

Graph

Image

Table

Map

Emissions are falling

- wy hfg
- fffk g ggh bb
- bbbb b b f fb fb
1. Sustainability
Global sustainability policy

1972

UN Stockholm Summit

Global political environmental awareness

‘Sustainable Development’ term coined

1980

World Conservation Strategy

‘Sustainable Development’ defined:
- Present and future needs
- Within environmental limits
- Eliminate absolute poverty
- SD a process

1987

WCED

UN Rio Summit

UN Millennium Summit

UN Rio +20

Global political environmental awareness

‘Sustainable Development’ term coined

‘Sustainable Development’ defined:
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2000

UN Millennium Summit

‘Millenium Development Goals’

Environmental integration

3 pillars canonized

‘Major Groups’ to be involved

SD a process

2012

UN Rio +20

‘Renew commitment to SD’

‘Green Economy’ as means to achieve SD

Integration among 3 pillars

Strengthen institutional Framew.

Goals and indicators of SD 2015?
Sustainability: Scientific strains

1805

‘Use forests in a way that future generations will have at least as much benefit as the living generation’

1931

Fisheries: ‘Maximum Sustainable Yield’ ≈ 50% of carrying capacity (1931)

1939

Ecoomy: Hicks’ Income: ‘The maximum amount that could be spent on consumption in one period without reducing real consumption in future periods’

1975

Hartwick Rule: ‘To maintain income over time all rents extracted from non-renewable capital must be reinvested in other capital’

1991

‘Weak Sustainability’

Ecology: Vulnerability and complexity of ecosystems

Renewable resources more critical

Diversity and Resilience essential

‘MSY’ is problematic because of multiple ecosystem services

Ecological Economics:

‘Limit scale of the economy to what the biosphere can sustain’

‘Preserve Natural Capital intact’

‘Strong sustainability’

TNC = NNC+RNC to be constant
Environment

HUMANS

PRESENT

Noise
Air quality
Water quality
Cultural heritage

FUTURE

Landscapes
Natural resources
Toxic and radioactive waste
Global warming
Ecosystems and Biodiversity

NATURE
Economy

**PRESENT**

- Welfare
- Consumption
- Income
- Production

**FUTURE**

- Savings
- Depriciation
- Capital
Society

Present
- Equity within present generation
- Eliminate poverty
- Quality of life
- Health
- Education

Future
- Equity towards future generations
- Social coherence
- Social stability
- .....
### INSTITUTIONAL DIMENSION

- Integrate decision making
- Ensure participation of major groups

<table>
<thead>
<tr>
<th>PRESENT GENERATION (Development)</th>
<th>ECONOMIC PILLAR</th>
<th>SOCIAL PILLAR</th>
<th>ENVIRONMENT PILLAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Ensure rising income level for the present generation</td>
<td>• Ensure rising income level for the present generation</td>
<td>• Ensure human well-being and development;</td>
<td>• Ensure environmental quality for the present;</td>
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<tr>
<td>• Ensure fair distribution</td>
<td>• Ensure fair distribution and eliminate poverty</td>
<td>• Ensure environmental justice</td>
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</table>

<table>
<thead>
<tr>
<th>FUTURE GENERATIONS (Sustainability)</th>
<th>ECONOMIC PILLAR</th>
<th>SOCIAL PILLAR</th>
<th>ENVIRONMENT PILLAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Safeguard income opportunities for future generations (economic capital)</td>
<td>• Maintain capacity for interaction and stability of social systems (social capital)</td>
<td>• Protect nature’s life-support systems and resources (Ecosystems, Climate, Biodiversity)</td>
<td></td>
</tr>
</tbody>
</table>
3) Sustainable Transport
Project level impacts

- Noise
- Landscape intrusion
- Aesthetics
- Air Quality
- Water flows
- Safety
- Costs/benefits

System level impacts

- Total energy consumption
- Total material requirement
- Total emissions and waste
- Total consumption of land
- Economic development
- Connectivity
- Social coesion
## Indicators of sustainable transport

<table>
<thead>
<tr>
<th>INSTITUTIONAL DIMENSION</th>
</tr>
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<tbody>
<tr>
<td>Transportation/land use integration; Multi-modal planning; interagency coordination Participatory planning; Partnerships</td>
</tr>
</tbody>
</table>

### Economic Pillar
- Transportation contributions to economic access
- Transportation costs (time and money)
- External costs associated with congestion and accidents
- Maintenance costs

### Social Pillar
- Social accessibility; Mobility; Safety
- Liveability
- Mobility barriers for the disadvantaged
- Health effects (obesity/Exercise)
- Social exclusion

### Environment Pillar
- Air quality effects on health
- Air pollution effects on vegetation
- Noise effects
- Visual intrusion
- Soil and water pollution
- Waste production

### Institutional Dimension
- Transportation/land use integration
- Multi-modal planning
- Interagency coordination
- Participatory planning
- Partnerships

#### Present Generation (Development)
- *Fair distribution between generations*
- Value of transportation assets
- Contribution to innovations
- Use of non-renewable resources and energy

#### Future Generations (Sustainability)
- Connectivity
- Effects on cultural heritage

#### Indicators of sustainable transport
Indicator frameworks

- **Conceptual** dimension: *What to measure*  
  (which impacts, system boundary, system interactions...)

- **Intentional** dimension: *Why to measure?*  
  (which purpose, function, users)

- **Procedural** dimension: *How to measure?*  
  (which indicators, measurement methods, reporting formats)
Starting point

Other Phenomena

Other entities

Benchmark

'Milestone development'

Target
4. Utilization
What can we do with indicators?

Alert – What is going on?

Forecast – Where are we heading?

Review – How are we doing?

Diagnose – How did we get here?

Decide – What should we do?

Account – Who is responsible?

Learn – How can we do better?
Non – use?

• “A substantial literature on knowledge utilization documents how little, on the whole, formal analysis and information influence decisions…”

• “…when information is most influential, it is also most invisible. That is, it influences most when it is part of policy participants’ assumptions and their problem definitions, which they rarely examine”  
  *(J.E. Innes 1998)*

• “…Indicators do not drive policy. People are not suddenly converted because they are confronted with data, no matter how expertly or how collaboratively designed. Compendia of indicators are not used by policy makers as aids to decision”  
  *(Innes & Booher 2000)*
Concepts to analyse use and influence

Use:
• Indicators are observed and processed
• Indicators are referred to

Influence:
• Indicators affect policy content (goals, measures), or processes

Different influence roles:
• Instrumental: Indicators have direct influence on decisions
• Conceptual: Indicators increase knowledge or create new ideas
• Symbolic: Indicators justify existing decisions
• Process: Indicators structure the policy making process
Flow: Production - Uses - Influences - Impacts

Indicator Factors
- Validity
- Reliability
- Timeliness
- Operationality
- etc

Dynamics
- Individual
- Interpersonal
- Collective
- etc

User factors
- Position/role
- Beliefs
- Values
- Interests
- etc

Policy factors
- Policy type
- Task type
- Adm. Culture
- Institutional regime
- etc

Socio-economic, political, cultural, contexts and trends
Transport policy study in POINT

Two transport cases:

- **Sweden**: Indicators in annual reports that *Follow-up on the Swedish Transport Policy Objectives* (Focus on 2008-report)

- **European Union**: indicators developed for the Mid-term Review of a transport white paper, *Keep Europe Moving*, 2006, in the so-called ASSESS study
Swedish case (1) - Governance model

• Significant independence for government agencies

• “Management by objectives” (MBO) as a key philosophy: political objectives combined with some agency discretion

• Transport policy objective: “to ensure socially and economically efficient and long-term sustainable transport resources for the public and industry throughout Sweden.”

• Six subsidiary objectives (until 2009), and intermediate targets
Swedish case (2) - ‘SIKA’ report

- Published annually since 1996
- Partly based on detailed annual reports from transport agencies
- Aims,
  - to inform the annual State Budget
  - to inform strategic planning
- Includes statistics, quantitative indicators and qualitative assessments
- Some indicators are descriptive, other evaluative
- Structured according to the transport policy objective and targets
## Swedish case (3) - ‘SIKA’ report

<table>
<thead>
<tr>
<th>SUBSIDIARY OBJECTIVE</th>
<th>Development towards the long term subsidiary in 2005</th>
<th>Are the subsidiary objectives complied with by the decisions made</th>
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<td>Accessibility</td>
<td>Yes</td>
<td>Yes?</td>
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<tr>
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<td>Uncertain</td>
<td>Objective lacking</td>
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<tr>
<td>Gender equality</td>
<td>No</td>
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<tr>
<td>Transport quality</td>
<td>Yes</td>
<td>Yes?</td>
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<tr>
<td>Safe traffic</td>
<td>Uncertain</td>
<td>No</td>
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<tr>
<td>Environment</td>
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<tr>
<td>- Effect on climate (CO₂)</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>- Air pollution (SO₂, NOₓ, VOC)</td>
<td>No</td>
<td>No</td>
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<tr>
<td>- Noise</td>
<td>No</td>
<td>No</td>
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<tr>
<td>- Ecocycle adaptation</td>
<td>Uncertain</td>
<td>Objective lacking</td>
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<tr>
<td>- Impact on natural and cultural environment</td>
<td>Uncertain</td>
<td>Objective lacking</td>
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</tbody>
</table>

*Note: SIKA (2006) – but indicative of subsequent reports*
Swedish case (4) - observations

• The reports are known and sometimes referred to by civil servants, transport politicians, and stakeholders (= it is used), although less so by politicians.

• It was not possible to confirm cases where the indicators had a direct instrumental role in any decisions (except possibly one).

• It seems likely that the indicators has some conceptual and process role, and particularly a symbolic role: to confirm the MBO philosophy as a rational approach.
EU case (1) – European Transport Policy

• ‘White Papers’ as key strategic documents (1992; 2001; 2011)

• Key objectives in the 2001 White Paper “Time to decide”:
  • “to decouple economic growth from transport growth,
  • “modal shift - returning by 2010 to the 1998 modal split

• Focus on Mid-term review of 2001 WP; Only ‘internal’ process in the Commission studied

• After Mid-term review these objectives were abandoned
EU case (2) - ASSESS report

• The ASSESS study contributed to the Mid term evaluation, “Keep Europe Moving” in 2006.
• ASSESS used indicators to evaluate European Transport performance
• adopting an ex ante approach (forecasting to 2010; 2010) based on series of models
• Approach developed in close contact with Commission staff
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Source: 'Keep Europe Moving', (EC 2006)
EU case (4) - observations

• The ASSESS study is used in the Mid-term review; evidenced in the documents and interviews
• The ASSESS study supports policy changes:
  • Former objectives impossible to reach with adopted measures
  • Modal split (and decoupling) of limited effects to reach sustainability objectives; technology (pricing) more effective
• The influence is probably not directly instrumental
• The influence in to demonstrate and rationalize reasons for policy changes underway for other reasons
Conclusions - Transport Policy cases (1)

- Indicators are referred to in documents, the reports are processed to; interviewees talk about use => use.
- Influence is more evident in the EU case than the Swedish case.
- The EU case indicates influence on policy agenda and objectives – indicators contribute to rationalizing.
- In the Swedish case influence is mainly conceptual (confirm targets), and procedural (confirm philosophy of MBO).
What makes indicators influential? (1)

‘Positivist’ approach:
• Indicators explaining the causes of a development will point to effective policy levers (diagnostics)

‘Historicist approach:
• Indicators must tell a convincing story, and thereby compel actors to act (alert)

(Source: Cobb & Rixford 1998)
What makes indicators influential? (2)

Government approach:
• Provides useful information to formal decision making; Institutional integration

Governance approach:
• Provides stakeholders with a common perspective; support to collaborative processes

(Source: Eckerberg & Mineur 2003)
Conclusion - Why do we need indicators?

- The world is complex; there is a need for knowledge and measurement to manage it; “what gets measured, gets done”

- Everything cannot be considered, there is a need for selected information about the most important issues

- Some problems cannot be measured or modelled directly, it is necessary to use indirect/approximate variables

- All tools and methods for assessment require some form of indicators

- “Sustainable Transport” is a good example of all these
What can we do with indicators?

• Negotiate and carve a niche for the future!
Final conclusions

• Indicators are necessary to guide policy

• Sustainability indicators: to carve a niche for the future

• Indicator ‘existence’ does not mean ‘use’

• Indicator ‘use’ does not mean ‘influence’

• Indicator ‘influence’ does not mean ‘positive influence’