Sustainable Transport – What is the Status? - an up-date from the ‘SUSTAIN’ project

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\[ P(i|V) = \frac{\partial \ln G(e^V)}{\partial V_i} \]

DTU Transport
Department of Transport
Status for ‘Sustainable Transport’ in Denmark

• Broadly accepted as a policy goal in Denmark, but
  – No official ST definition
  – No official ST plan
  – No official ST measurements

• Instead: Preliminary observations from the SUSTAIN research project and other national and international sources, considering key goals and trends
SUSTAIN project

- Transport research Project funded by the Strategic Research Council of Denmark

- 2012-2016

Main partners

International contributors

User Forum

Road Directorate
Transport Agency
CONCITO think tank

COWI
Øresund Logistics
Trafikanalys, Sweden
Purpose of SUSTAIN

- **To study** National Sustainable Transport Planning (NSTP) as it occurs in practice

- **To support** NSTP in Denmark by contributing:
  - Concepts,
  - Indicators,
  - Assessment tools, and
  - A practice framework

- **To establish** NSTP as an coherent international research topic across social and technical sciences
# Measuring Sustainable Transport

<table>
<thead>
<tr>
<th>What?</th>
<th>How?</th>
<th>Why?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable Dev. principles</td>
<td>Multiple indicators</td>
<td>Information and enlightenment</td>
</tr>
<tr>
<td>Sustainable Transport goals and strategies</td>
<td>Monetary values</td>
<td>Analysis and diagnosis</td>
</tr>
<tr>
<td>Transport impacts</td>
<td>Aggregate index</td>
<td>Performance evaluation</td>
</tr>
</tbody>
</table>

![Diagram]

- **1 index**
- **5 - 15 KPI**
- **Broad Indicator sets (15-300+)**
- **Data**

- Benchmarking/
- Learning
Sustainable Development: basic definition

"Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

It contains within it two key concepts:

· the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and

· the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.
Planetary boundaries

Most critical:

- **Biodiversity**
  (halt the loss of species)

- **Climate Change**
  (not exceed +2 degrees)

- **Nitrogen cycle**

Source: Rockström et al 2009
## Sustainable Development: Key Dimensions

<table>
<thead>
<tr>
<th>Environmental Dimension</th>
<th>Social Dimension</th>
<th>Economic Dimension</th>
</tr>
</thead>
</table>
| **Present generations needs** | • Environmental quality  
• Distribution of environmental impacts | • Quality of Life, Human Development; health  
• Distribution of social amenities | • Income and economic performance  
• Distribution of income and jobs |
| **Future generations needs** | • Ecosystems, Climate stability, Resources;  
• Preserving Natural Capital | • integrity and stability of the social systems  
• Maintaining Social Capital | • Savings and investments for the future  
• Preserving Man-made Capital |

### Institutional/strategic dimension
- Integrated decision making
- Involvement of stakeholders and major groups
- Change and adaptation
## Key impacts of transport

<table>
<thead>
<tr>
<th>Environmental</th>
<th>Social</th>
<th>Economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air pollution</td>
<td>Mobility</td>
<td>Travel time</td>
</tr>
<tr>
<td>Noise pollution</td>
<td>Accessibility</td>
<td>Costs of transport to customers/consumers</td>
</tr>
<tr>
<td>Vibrations</td>
<td>Accidents</td>
<td>Transportation facility construction costs</td>
</tr>
<tr>
<td>Visual intrusion</td>
<td>Barriers for the disadvantaged</td>
<td>Maintenance and disposal costs</td>
</tr>
<tr>
<td>Water pollution</td>
<td>Obesity</td>
<td>Costs relating to accidents</td>
</tr>
<tr>
<td>Solid waste</td>
<td>Community livability</td>
<td>Transportation-related health costs</td>
</tr>
<tr>
<td>Release of toxic substances</td>
<td>Gender imbalances</td>
<td>Costs relating to accidents</td>
</tr>
<tr>
<td>Consumption of land</td>
<td></td>
<td>Transportation-related health costs</td>
</tr>
<tr>
<td>Disruption of ecosystems and habitats</td>
<td>Cohesion/integration</td>
<td>Stimulation of economic growth</td>
</tr>
<tr>
<td>Hydrologic impacts/flooding</td>
<td>Opportunity</td>
<td>Agglomeration effects</td>
</tr>
<tr>
<td>Introduction of exotic species</td>
<td>Migration</td>
<td>Job/labour market effects</td>
</tr>
<tr>
<td>Depletion of the ozone layer</td>
<td>Anxiety/‘Rootlessness’</td>
<td>Opportunity costs</td>
</tr>
<tr>
<td>Global climate change</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Sustainable Transport Strategies

Avoid/Reduce
- Integration of transport and land-use planning
- Smart logistics concepts

Shift
- Transport Demand Management
- Mode shift to Non-Motorised Transport
- Mode shift to Public Transport

Improve
- Low-friction lubricants
- Optimal tire pressure
- Low Rolling Resistance Tires
- Speed limits Eco-Driving (Raising Awareness)
- Shift to alternative fuels

Source: energypedia.info/wiki
Indicator areas

Transport Policy and Governance
Goals - Strategies - Institutions

Transport System
Infrastructure – vehicles – fuels - operators

Transport Activity
Trips – Lengths – Modal splits - Speed

Transport Impacts
Environmental – Social – Economic
1. Transport policy and governance

(SUSTAINABLE DEVELOPMENT STRATEGY)

GREEN TRANSPORT POLICY (2009)

CLIMATE PLAN (2013)
40% reduction 1990-2020
20% in non-quota 2005-20
100% renewable by 2015

Public transport
To absorb most of future transport growth

Roads
To be expanded where the greatest needs are

Cycling
To be preferred where possible

Infrastructure
Must not destroy irreplaceable nature

Technology
DK as green laboratory

CO₂
To be reduced, using green taxation

Noise and Air pollution
Reduce in cities

Agency contracts
Strategic studies
Policy measures
Projects
2. Transport system

- Quantity
- Quality/efficiency
Passenger cars

- Car fleet 9% increase from 2009
- 180,000 new registrations in 2013
- Of these 647 were EVs (less than 0.5%)
- Fuel efficiency of new registrations has improved 35% since 2007, but stagnation for 2 years now
- Possibly overestimation due to inadequate test cycle
Bus fleet in Denmark by fuel

- Bus fleet slightly shrinking
- Still complete diesel dominance
- Gas buses dropped from 163 in 2008 to “0” in 2013 (but new fleets are emerging)
Infrastructure

National road network growing ca 225 km/year

National motorway network 18% growth since 2006

- Many new projects...
- Some in potential conflict with nature protection areas...
- Almost no rail added since 2006

“EU-dom sår ny tvivl om højbro over Roskilde Fjord”
Biofuel

• EU countries differ in regard to fulfilling biofuel 10% target by 2020

• Denmark has advanced rapidly the last year (now at ca 6%)

• Only including biofuel fulfilling sustainability criteria

Source: European Environment Agency 2014 (draft)
3. Transport activity

- Passenger travel growing slowly
- Main increase is on passenger car side (+6% over last 5 years) not public transport
- 10% growth in trains, but out of small share
- Decline in buses

Source: Statistics Denmark
Freight transport EU-27

- No evidence of modal split

Source: EUROSTAT 2013
4. Transport impacts

Landscape fragmentation

Figure 3.1  Bar diagram of effective mesh density values per country for FG-B2 in 2009

Source: European Environment Agency 2011)
Emissions

• Transport GHG emissions in decline, but lessss/slower than other sectors

• Transport sector shares of emissions:
  • CO₂ : 30%
  • NOₓ : 46%
  • NMVOC: 21%
  • PM2,5: 11%

• CO₂ Pass/’Freight’
  60 / 40

Source: Danish Energy Agency, Energy Statistics and: DCE, Aarhus University 2013
# Sustainable Transport at EU level

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy consumption of transport relative to GDP</td>
<td>Modal split of freight transport</td>
<td>Transport and mobility</td>
</tr>
<tr>
<td>Energy consumption of transport relative to GDP</td>
<td>Modal split of passenger transport</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transport impacts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Greenhouse gas emissions from transport</td>
</tr>
<tr>
<td></td>
<td></td>
<td>People killed in road accidents (*)</td>
</tr>
</tbody>
</table>

(*) From 2001

Source: EUROSTAT 2013
Conclusions (1)

• Sustainability is a **complex** notion, involves much more than CO$_2$

• Only very few examples given here

• **Limited evidence** of progress on sustainability in Denmark:
  - Limited **data and tracking**
  - Limited **actual policy** efforts
  - **Long lead time** for policies to be adopted, implemented and take effect (slow turnover)
  - No agreement on how to **interpret** ‘sustainability’
  - Many initiatives ‘**below the radar**’
Conclusions (2)

1. Governance and policy:
   - Sustainability widely accepted but no comprehensive strategy/plan
   - Limited interconnection between existing strategies
   - Limited implementation of ST goals in contracts, studies, policies

2. Transport system
   - Not much evidence of change towards sustainability
   - ‘Conventional’ fuels, vehicles, infrastructure tend to dominate
   - Progress in fuel efficiency, but uncertain

3. Transport activity
   - No evidence of modal shift towards public/rail

4. Transport impacts
   - Emission are starting to decline, but fast enough?
   - Alarmingly little information on other impact trends
Non-use of indicators...

“Political decision makers...gather information and do not use it; ask for more information and ignore it; make decisions first and look for relevant information afterwards; and collect and process a great deal of information that has little or no direct relevance to decisions”.

(Sager & Ravlum, 2005)
International conference

More information

SUSTAIN Homepage
http://www.sustain.transport.dtu.dk/english

Recent Publications

• Pryn; M, Coret, Y, Salling K.B, The SUSTAIN-DSS model for Sustainable Transport Assessment, Trafikdage, Aalborg 2014
• Hodge, Graeme and Greve, Carsten (2013) Public-private Partnership in Developing and Governing Mega-projects. International Handbook on Mega-projects. ed. / Hugo Priemus; Bert van Wee

Contact

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EXTRA
National Sustainable Transport planning

“Systematic, knowledge based efforts to integrate Sustainable Development principles, criteria and goals in the design, implementation, management and regulation of nationally significant transport systems and services”

(SUSTAIN definition)