Smarte Ausblicke rund um Energie, Mobilität und Infrastrukturen?
Ist „smart“ das neue „nachhaltig“

André Schneider
EPFL
Ist „smart“ das neue „nachhaltig“?
Aber was ist eigentlich „nachhaltig“?
Was ist «nachhaltig»

- Equitable
- Durable
- Vivable
- Viable
- Social
- Ecologique
- Economique

Nachhaltigkeit  Einleitung
Nachhaltige Entwicklung und Wachstum: Ein Widerspruch?
• Competitiveness is mostly defined around the following important elements:
  – Key for factor-driven economies:
    • Institutions
    • Infrastructure
    • Macroeconomic environment
    • Health and primary education
  – Key for efficiency-driven economies:
    • Higher education and training
    • Goods market efficiency
    • Labour market efficiency
    • Financial market development
    • Technological readiness
    • Market size
  – Key for innovation-driven economies:
    • Business sophistication
    • Innovation
Ressourcen und Wettbewerbsfähigkeit

• Create wealth
• Combat poverty
• Create jobs
• Create social structures and support

Debt drains resources from the government
Ressourcen und Wettbewerbsfähigkeit

- Create wealth
- Combat poverty
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Debt drains resources from the government.

If resources are missing, they have to be bought on the global market, hence exposing the country and its population to price evolutions and resources scarcity on the global market.

Nachhaltigkeit  Ressourcen
Ressourcen und Wettbewerbsfähigkeit

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Debt drains resources from the government

If resources are missing, they have to be bought on the global market, hence exposing the country and its population to price evolutions and resources scarcity on the global market, which will possibly increase debt.

Nachhaltigkeit Ressourcen
**Ressourcen und Wettbewerbsfähigkeit**

- **Crucial Inputs for own use or export**
  - Create wealth
  - Combat poverty
  - Create jobs
  - Create social structures and support

**Debt drains resources from the government**

If resources are missing, they have to be bought on the global market, hence exposing the country and its population to price evolutions and resource scarcity on the global market.

Will possibly increase debt.

Will reduce the government's capability to deliver the social outcomes, and hence social unrest will increase.
Ein Beispiel: Ägypten

**Biocapacity vs Footprint**

<table>
<thead>
<tr>
<th>Landnutzung</th>
<th>Footprint</th>
<th>Biocapacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest</td>
<td>0.14</td>
<td>0.00</td>
</tr>
<tr>
<td>Fishing Ground</td>
<td>0.05</td>
<td>0.02</td>
</tr>
<tr>
<td>Grazing Land</td>
<td>0.06</td>
<td>0.00</td>
</tr>
<tr>
<td>Cropland</td>
<td>0.63</td>
<td>0.43</td>
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</tbody>
</table>
Ein Beispiel: Ägypten

**Egypt: Oil**

2009 exports decreased by 26%.

Data: BP Statistical Review 2010    Graphic: mazamascience.com
Smarte Ausblicke Energie
Smarte Energie

Decarbonisation of Energy
- CO2 Capture
- Enhanced Efficiency
- New Sources

Renewable Energies
- Centralized
- Decentralized

Storage of Energy
- Centralized
- Decentralized

Production of Energy
- Centralized
- Decentralized

New Networks
- Internet-based
- Consumer-driven

New Business Models

Research-driven and supported
EPFL Valais-Wallis
EPFL Neuchâtel
EPFL IITP
EPFL
Erforderliche Infrastrukturinvestitionen

Annual Investment in Clean Energy required to achieve "2020 Peak Scenario", stabilizing emissions by 2019

Source: Bloomberg New Energy Finance 2010

Energie Investitionen
Erforderliche Infrastrukturinvestitionen

<table>
<thead>
<tr>
<th>Region</th>
<th>Share of World</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>40.00%</td>
</tr>
<tr>
<td>North America</td>
<td>20.00%</td>
</tr>
<tr>
<td>South and Central America</td>
<td>10.00%</td>
</tr>
<tr>
<td>Non-EU Europe</td>
<td>5.00%</td>
</tr>
<tr>
<td>Middle East and Africa</td>
<td>5.00%</td>
</tr>
<tr>
<td>Asia</td>
<td>5.00%</td>
</tr>
<tr>
<td>Oceania</td>
<td>5.00%</td>
</tr>
</tbody>
</table>

Smarte Ausblicke Mobilität
Einige wichtige Entwicklungen um Mobilität

**Forecast Passenger Mobility**

**Forecast Freight Mobility**

**Mobilität Herausforderungen**
Einige wichtige Entwicklungen um Mobilität

**Passenger Transport**
- Cars + LT
- Buses
- Air
- Rail
- Other

**Surface Freight**
- Trucks
- Rail
- Other

**Forecast Mobility CO2 emissions**
- 2000: 100
- 2050: 226
- 2045: 294

**Hauptstadtregion Schweiz**
**Région capitale suisse**
• 21 of the 66 ranked countries have transport growth greater than GDP growth, more than half of the G20, and three of the five BRICS countries. For the European Union, one of them, Germany, is in this situation.

• Because of this significant number of countries exposed to the stress generated by goods mobility, we can foresee a major impact in the coming years on world trade due to saturation and overuse of transport infrastructure.

• This will also imply that the necessity to increase investment in transport infrastructure will become crucial.
• Looking at investment and maintenance decisions for the transport infrastructure in OECD countries, we can see that only Austria is actually investing more in rail and waterways (we regroup under waterways: inland waterways and seaport infrastructure) than in road and air.

• These investment choices will further contribute to the difficulty in reducing the environmental impact of transport, as it is quite clear that rail and waterways have a much higher chance of reducing the environmental impact than the other modalities.

• And a similar conclusion can be made when looking at the capacity to absorb significant increases in the transport for goods. This analysis also shows the necessity to revisit the use and the development of mobility infrastructure in a more holistic way.
Smarte Ausblicke Infrastrukturen
Die Rolle der Infrastrukturen für Nachhaltigkeit

• We need infrastructure to support a sustainable development

• This infrastructure supporting the needs for a sustainable development, examples are:
  • Support for sustainable energy
  • Support for sustainable access to crucial resources like water
  • Support for sustainable waste management
  • Support for sustainable mobility

• But confronting these challenges of climate change mitigation and adaptation, resource scarcity and energy security will require massive investment in the fundamental reconfiguration of the infrastructure that supports modern society.

• And who could do these investments: governments, developers, banks, ...

60,000 billions USD (15’000 billions USD for pension funds)