Sustainability metrics for the process industry
Agenda

• Sustainability as a concept
• Drivers and Pressure
• Short overview of approaches
• Conceptual model for selecting indicators
• Summary
• Next step(s)
Four (three) dimensions of sustainable development

- Environmental
- Economic
- Social
- Good Governance
Pressure: Planetary boundary

[Diagram showing various environmental pressures such as chemical pollution, climate change, ocean acidification, etc.]
Different scales – approaches - indicators

- Society
- Economy
- Environment

- Upstream
- Company / production
- Downstream
Pressure: Public perception
Eurobarometer 2013, Chemicals

Q7. Today, in the EU, do you think that the safety of chemical substances is ensured by...?

- Authorities of the European Union: 48%
- Manufacturers themselves: 42%
- National authorities: 35%
- Nobody (DO NOT READ OUT): 6%
- Other (DO NOT READ OUT): 1%
- Don't know: 6%

Q8. And who do you think should be responsible for ensuring the safety of chemical substances on the EU market?

- Manufacturers themselves: 60%
- Authorities of the European Union: 57%
- National authorities: 40%
- Other (DO NOT READ OUT): 1%
- Nobody (DO NOT READ OUT): 0%
- Don't know: 1%
Supply chain pressure –
Green become a competitive advantage

**iPhone-Produktion**: Apple verbietet Verwendung giftiger Chemikalien

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Apple Handy von innen: Produktion künftig ohne giftige Chemikalien

Apple beugt sich dem Druck von Aktivisten: Der Nachrichtenagentur AP zufolge will der Konzern die giftigen Chemikalien Benzol und N-Hexan aus Zulieferer-Fabriken in China verbannen - und in Zukunft "grüne Chemikalien" verwenden.

Source: Spiegel online 14th August 2014
Central question: Sustaining what, for whom, where, and for how long?

- Product environmental footprint (PEF)
- Organisation environmental Footprint (OEF)
- Green Chemistry Principles
- Corporate Social Responsibility CSR
- Supplier demand
- EHS-report
- Carbon footprint
- Global reporting Initiative (GRI)
- Integrated Reporting
II

(Non-legislative acts)

RECOMMENDATIONS

COMMISSION RECOMMENDATION

of 9 April 2013

on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations

(Text with EEA relevance)

(2013/179/EU)
Reviews: Measuring Sustainability

http://www.weforum.org/reports/designing-action-principles-effective-sustainability-measurement

A Review of Footprint analysis tools for monitoring impacts on sustainability

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ABSTRACT

This study presents an overview of footprints as defined indicators that can be used to measure sustainability. An overview of the definitions and units of measurement associated with environmental, social, and economic footprints is important because the definitions of footprints vary and are often expressed unclearly. Composite footprints combining two or more individual footprints are also assessed. These combinations produce multi-objective optimisation problems. Several tools for footprint evaluation are presented, including some of the numerous carbon footprint calculators, available calculators for other footprints, some ecological footprints-based, graph-based, and mathematical programming tools. A comprehensive overview is offered of footprint-based sustainability assessment.
WEF – Main conclusions

1. Sustainability measurement systems are effective when they are embedded firmly in management and decision-making processes that promote learning.

2. There are many approaches to assessing sustainability and the field is evolving rapidly. Current thinking identifies characterizing the functioning of physical, ecological and social systems that support human life, and the interaction of these systems, as especially important.

3. Ultimately, sustainability can only be achieved on a global scale, across all sectors, over very long time frames. But it is important to recognize progress towards this ultimate goal.
Sustainability assessment: What for?

- Strategic decisions
  - Investment decisions
  - Technology decisions
  - Location
  - Product portfolio

- Consumer/Customers
  - Shows product advantages
  - Customer relations
  - Product differentiation

- R&D
  - Quantification
  - Drive product and process improvements

- Stakeholder dialogue
  - Communication with relevant groups
  - Impact assessment

- Strategic decisions
  - Drive product and process improvements

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  - Impact assessment
Sub-summary

Increasing attention regarding sustainability in chemical industry

Different purposes, e.g. Reporting, labelling, DfE, etc.

→ many approaches for sustainability assessment

Need for meaningful metrics to detect sustainability progress without forcing undue burdens
BASF – Generic SEE-Balance; specific AgBalance

Ecological Fingerprint:
- Cumulative Energy Consumption
- Consumptive Water Use
- Land Use
- Emissions
- Toxicity Potential
- Abiotic Resource Depletion
- Occupational Illnesses and Accidents

Eco-efficiency portfolio:

Impacts on environment
Impacts on environment and costs
Impacts on environment, costs and society

Costs from cradle to grave

Eco-Efficiency
SEE Balance®
Social assessment: categories, indicators and their weighting

- **25% employees**
  - 15% working accidents
  - 20% fatal working accidents
  - 15% occupational diseases
  - 25% toxicity potential + transport
  - 10% wages and salaries
  - 10% professional training
  - 5% strikes and lockouts
  - 25% number of trainees
  - 25% R&D (company expenditures)
  - 25% capital investments
  - 25% social security

- **20% consumer**
  - 60% toxicity potential
  - 40% other risks and product characteristics

- **20% local & national community**
  - 30% employees
  - 15% qualified employees
  - 15% gender equality
  - 10% integration of disabled people
  - 15% part-time employees
  - 15% family support

- **20% future generation**
  - 50% child labour
  - 25% foreign direct investment
  - 25% imports from developing countries

- **15% international community**
Ifs (Technical Community of AIChE): Sustainability Index

http://www.aiche.org/ifs/resources/sustainability-index
Level of detail

Resource use
- Emissions
- Energy use
- Land use

Air emissions
- Global warming
- Ozone depletion
- Summer smog
- Human toxicity

Water emissions

Solid wastes

 EI = \sum m_n \cdot PF_n

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EI = \sum m_n \cdot PF_n
IChemE: The sustainability metrics

The metrics in the three groups
3.1 Environmental
3.2 Economic
3.3 Social indicators

Expressed as unit of ... per ... value, mass as %
## Existing metrics’ relevant for the chemical Industry

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Life cycle based approach

Conceptual model of indicator selection

If social and ecological actions are not economic than the whole process is not sustainable.
Summary

Challenges:

• Limited knowledge - Evolving concepts
• Sustainable is requirement although no willingness to pay

Sustainability Roadmap: Fixed metrics or stepwise adaptation to evolutinary concepts?

Agreement to streamline – tiered approach

What is already applied?
Next step

Questionnaire to be send to companies via

- Federations (EFCHE, VCI, etc.)
- International cooperation (IEA Task42)
- Personal contact (direct and indirect)

Volunteers are most welcome
Many thanks for your patience!

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