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SUSTAINABLE CHEMISTRY 2015: the way forward

Sustainable Chemistry : what is it about? The concept of SC.

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WHAT IS SUSTAINABLE CHEMISTRY ?

Challenge: many areas, many topics.



- I Background of the concept**
- II The Concept of Sustainable Chemistry**
- III Indicators and examples**
- IV Your view!**

WHAT IS SUSTAINABLE CHEMISTRY ?

Challenge: many areas, many topics.



I **Background of the concept**

Sustainable chemistry: Broad diversity of aspects.....

Greenhouse Gas Emissions, Climate Protection	Resource Management	Energy	Renewable resources
Non-renewable resources	Water Quality Management	Air Quality	Land use
Waste Management	Emission of Pollutants	Biodiversity/ Ecosystems	Innovation, Technology and Knowledge
Environment and Public Health	Product design	Environment: Investments & Costs	Socio-Economy
Corporate Responsibility : Environment and international aspects		Corporate Responsibility: Social aspects	Corporate Responsibility: Education

Sustainable chemistry: broad diversity of aspects.....

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Many aspects... how much chemistry inside?

What makes the difference between

- sustainable chemistry;**
- sustainable food production;**
- sustainable textile production.....?**

21 approaches, guidelines, programmes...

→ **AROUND 700 CRITERIA FOR SUSTAINABILITY !**

→ **REPORT: ANKE JOAS, REINHARD JOAS, BIPRO.**

Important approaches (examples)			
International approaches	European approaches	National approaches	Approaches without specific criteria
Green Chemistry	Europa 2020	Chemie ³	Responsible Care
Global Reporting Initiative (GRI)	SusChem	Leitfaden nachhaltige Chemikalien	SusChem
UN Global Compact		Workshop von UBA und OECD von 2004	OECD Sustainable Chemistry Platform (SCP)
		ProgRess	
		Chemikalienleasing	

Broad diversity of aspects.....

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.. Many aspects... how much chemistry inside?

Key aspects ..from the beginning of sustainable chemistry:

- Reduction of emissions and exposure of man and the environment;
- Design of inherently safe chemicals;
- Increased use of less problematic substitutes

2014: What is sustainable chemistry about nowadays?

WHAT IS SUSTAINABLE CHEMISTRY ?

2014: The Concept of Sustainable Chemistry

- Analysis of currently existing, quantifiable sustainability criteria + development of a target system
- What has to be strengthened ? → inherent safety; reduction of emissions and exposure; substitution
- What is missing ? → indicators, education, employment, consumer protection

■ **Draft: The Concept of Sustainable Chemistry**



Discussion with national and international stakeholders

Discussion with YOU!



WHAT IS SUSTAINABLE CHEMISTRY ?



II The concept of sustainable chemistry

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Draft for comments



The Concept of Sustainable Chemistry

Sustainable Chemistry – what is it about? Summary of the Concept

Sustainable Chemistry recognizes the stress limit of humans and the limited carrying capacity of the environment as well as the demands placed on a long-term sustainable development. It is rooted in society, the environment and economy, and contributes to the improvement of occupational safety, environmental and consumer protection. The application of new approaches and technologies

Sustainable Chemistry 2015: What is it about? The concept in a nutshell - 1 -

Sustainable Chemistry recognizes the stress limit of humans and the limited carrying capacity of the environment as well as the demands placed on a long-term sustainable development. It is rooted in society, the environment and economy, and contributes to the improvement of occupational safety, environmental and consumer protection.



The application of new approaches and technologies makes it possible to generate durable products and attractive services, thus meeting the needs of civil society, and ensuring that Sustainable Chemistry will be economically and financially viable in the long term.

Sustainable Chemistry 2015: What is it about? The concept in a nutshell - 2 -

Sustainable Chemistry makes increased use of materials and procedures the possible adverse effects of which are as low as possible. It thus reduces the strain put on human beings and the environment as a result of the exposure to dangerous substances, and furthermore conserves natural resources.



Moreover, substitutes and alternative procedures are used instead of hazardous conventional applications, avoiding damage as well as interference with ecosystems.

Sustainable Chemistry 2015: What is it about? The concept in a nutshell - 3 finally ...

Sustainable Chemistry is a continuous process of change, which measures its success on the basis of criteria and indicators. If the current process is to be successful, Education for Sustainable Development needs to start with schools and must be continued in vocational training.



How to measure sustainable chemistry?

WHAT IS SUSTAINABLE CHEMISTRY ?



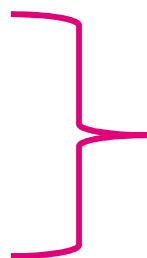
III Indicators and examples

Greenhouse Gas Emissions, Climate Protection	Resource Management	Energy	Renewable resources
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Broad diversity of aspects.....

The consolidation task:

> 700 criteria and indicators



6 key criteria (What should be achieved?)

78 indicators (How can it be measured?)

WHAT IS SUSTAINABLE CHEMISTRY ?



The six key criteria:

- i) Minimisation of **climate impacts** from products and production processes
- ii) Minimisation of negative impacts on **environment, energy and resources** from chemicals that are used in production and application processes
- iii) Optimisation of **product design** considering the entire life cycle via technical innovation and knowledge transfer and via optimised integration of environmental, economic and social aspects into operational processes
- iv) Minimisation of **health risks** from substances, production and products
- v) Creation of **economic benefits** via environmental investment and sustainable cooperation
- vi) Optimised integration of **environmental, economic and social aspects** into operational processes regarding transparency, training, social standards, dialogue and international cooperation

WHAT IS SUSTAINABLE CHEMISTRY ?



The development of feasible indicators:

Key criteria
i)
ii)
iii)
iv)
v)
vi)

Indicators
Indicator 1.1. Indicator 1.2 ...
Indicator 2.1 Indicator 2.2 ...
Indicator 3.1 Indicator 3.2 ..
Indicator 4.1 Indicator 4.2 ...
Indicator 5.1 Indicator 5.2 ...
Indicator 6.1 Indicator 6.2

Questionnaires and
interviews with
stakeholders

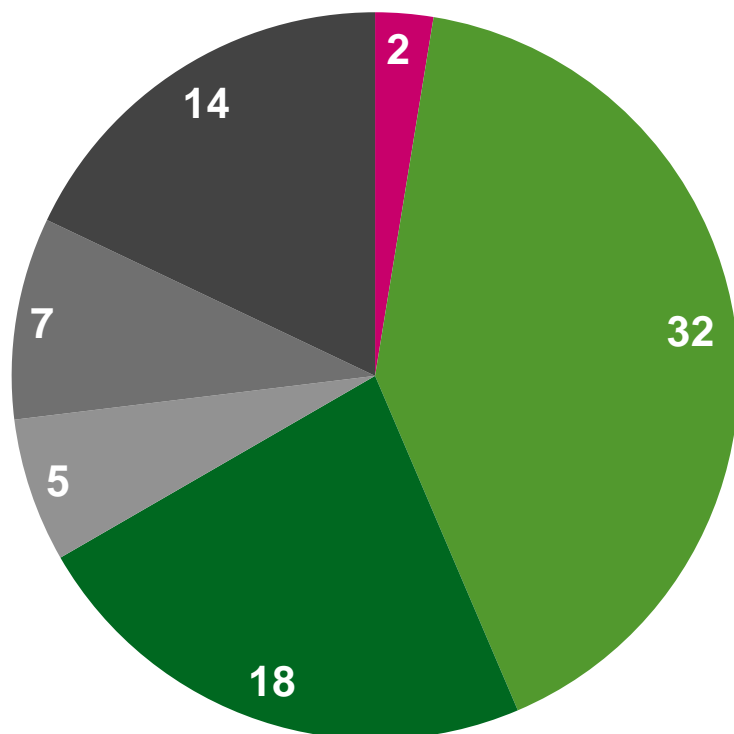


Suitability,
measurement unit
Importance of
indicators

WHAT IS SUSTAINABLE CHEMISTRY ?



Number of indicators per key criterion



- i) minimisation of climate impacts
- ii) minimisation of environmental impacts
- iii) optimisation of product design
- iv) minimisation of health risks
- v) creation of economic benefits
- vi) integration of environmental, economic and social aspects



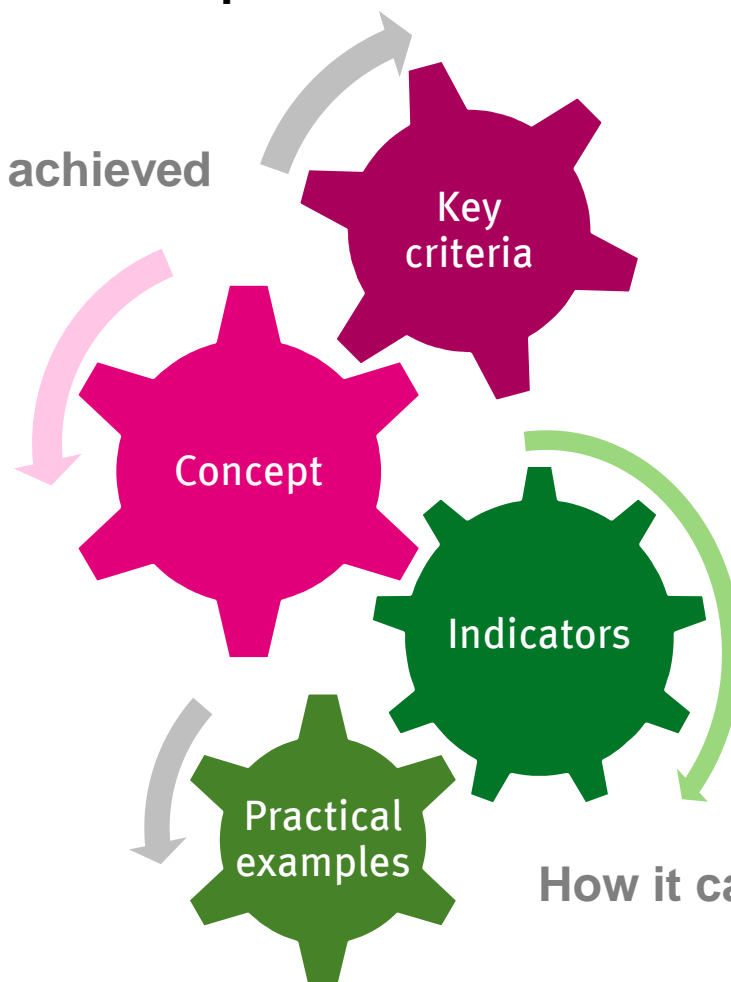
<20 highly ranked indicators

WHAT IS SUSTAINABLE CHEMISTRY ?



**Concept – key criteria –
indicators – practical examples**

What should be achieved



How it can be measured

WHAT IS SUSTAINABLE CHEMISTRY ?



Example 1: Clear evidence for sustainable chemistry

Chemical leasing and substitution for conveyor lubrication in the beverage sector: dry lubrication (Knjaz Miloš & Ecolab, Serbia)

Key criterion	Indicator	Unit	Result (absolute/share)
i)	GHG emissions	Difference in %	0
ii)	Water demand	m ³ per year and line	-1500
		Difference in %	-100
iii)	Share of hazardous substances	% of applied chemicals	- 10
		Difference in %	- 100
iv)	Amount of accidents at work	Number per year	0
		Difference in %	0
v)	Economic benefits	Cost reduction € per year and line	5700
		Difference in %	- 39
vi)	Certification	Number + name of certificates	5 (ISO, OHSAS, ...)
		Difference in %	0

WHAT IS SUSTAINABLE CHEMISTRY ?

Example 2: Contradicting results – sustainable chemistry?



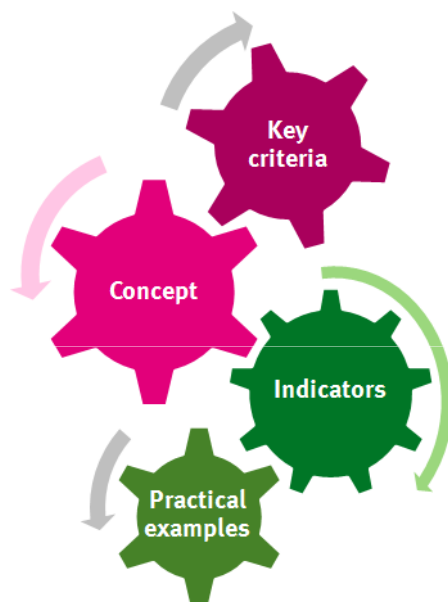
Process optimisation for industrial use of solvents (improved destillation)

Indicator	Simplified results (difference)
Energy demand	+20%
Water demand	+20%
Waste reduction	-80%
Workplace concentration of hazardous substances	-60%

WHAT IS SUSTAINABLE CHEMISTRY ?



Conclusions



Clear criteria and measurable indicators are a prerequisite but the approach needs further development.

Open questions?

1. Weighing of criteria and indicators in case of opposing effects
2. Data availability in the light of confidentiality
3. Etc.

WHAT IS SUSTAINABLE CHEMISTRY ?



IV Your view!

Sustainable Chemistry 2015: What is it about?

Comments on our Concept



Please give your comments now ...
and send your comments to:

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Many thanks for your attention!



Dr. Christopher Blum
Section IV 1.1 / International Chemicals Management

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Back-up for Discussion

WHAT IS SUSTAINABLE CHEMISTRY ?



Examples of indicators

Criterion	Indicator	Measurement unit
iii) Product design	Share of hazardous substances	% of applied substances % of product mass
	Share of substances with high mobility and persistence	% of applied substances
	Share of degradable substances in the product	
	Share of reusable or recyclable materials in the product	% of product mass % of product volume
	Share of renewable material in the product	
	...	

Criterion	Indicator	Measurement unit
iv) Health risks	Amount of accidents at work	Number per year Number of fatalities per year
	Amount of occupational diseases	% of employees
	Number of incidents with emissions of hazardous substances	Number per year
	Workplace concentration of contaminants	$\mu\text{g per m}^3$ and day

WHAT IS SUSTAINABLE CHEMISTRY ?



Examples of highly ranked indicators and their units

Quantitative indicators for sustainable chemistry	Unit
Direct emissions of GHG	t CO ₂ -equ./product mass
Direct raw material demand	t raw material/product mass
Direct energy demand	MJ/product mass
Total water demand	m ³ /year
Amount of waste generated	t/year
Renewable resources	% of total raw material consumption
Emission of pollutants to air	µg/year or µg/product mass
Amount of accidents at work	number/year
ISO, EMAS, etc. certification	List of all certifications
Education and training of employees	h/employee and year
Audited suppliers and customers (social or environmental)	% of all suppliers and customers
Expenditure on/investment in environmental protection	%/€ turnover or % of total expenditure