G7 Environment

Universities for Sustainable Development

G7 2017
ITALIA

MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE

Session II: Universities implementing Sustainable Development and Sustainable Development Networks

Mario Schmidt, Pforzheim University, Institute for Industrial Ecology

mario.schmidt@hs-pforzheim.de
http://umwelt.hs-pforzheim.de

G7 2017
ITALIA

In which domains of Sustainable Development, University research can contribute in advancing technology, innovation, regulations and market?

Germany (2016): 106 universities with 1.7 M students and 24,000 professors
216 universities of applied sciences with 1 M students and 19,000 professors
in total ca. 16,000 bachelor & master courses

BilRess
Education for Resource Conservation and Resource Efficiency

Survey about resource efficiency in higher education (2012/2013):

- 107 courses explicitly about sustainability or resource efficiency (< 1 % of all courses)
- But very often sustainability is implemented as module in traditional courses like Chemistry, Geography, Engineering, Management etc.
- Nearly every university offers specializations about environment/sustainability/resource efficiency within the framework of the traditional courses
- But not every student has contact with these topics during his/her studies.

✘ Could be better: more interdisziplinarity. Every student should learn basics about sustainability.

In which domains of Sustainable Development, University research can contribute in advancing technology, innovation, regulations and market?

Federal Government : 3.4 b€ / a
for research in the fields sustainability, energy, bioeconomy...

≈ 17 %

plus ? b€ from the state governments

- Many research projects are listed in other areas (e.g. production technologies, economics, innovation fundings…)
- Many projects are cooperations between universities and companies

✘ could be better: more transfer in practice, dissemination, discussion with society…

Federal Government expenditure on science, research and development, by funding areas, in millions of euros (2015/2016)

Funding area[1]	2015 Total
A Health research and health industry	2,331.3
B Bioeconomy	290.1
C Civil security research	108.4
D Nutrition, agriculture and consumer protection	841.4
E Energy research and energy technologies	1,670.0
F Climate, environment, sustainability	1,464.1
G Information and communication technologies	809.4
H Vehicle and traffic technologies including maritime technologies	435.7
I Aerospace	1,480.1
J Research and development to improve working conditions and in the service sector	150.5
K Nanotechnologies and materials technologies	560.4
L Optical technologies	187.5
M Production technologies	220.9
N Regional planning and urban development; construction research	103.7
O Innovations in education	910.7
P Humanities; economics and social sciences	1,281.5
Q Innovation funding for SMEs	1,124.8
R Innovation-relevant underlying conditions and other cross-cutting activities	553.5
T Funding organisations, restructuring of the research field in acceding areas; construction of universities and primarily university-specific special programmes	3,532.7
U Large-scale equipment for basic research	1,200.5
Z Global reduced expenditure; budget reserve	-404.2
Total of civil funding areas	**18,853.1**
S Military scientific research	892.6
Total expenditure	**19,745.7**

} 17% (B–F)

Source: http://www.datenportal.bmbf.de/portal/en/education_and_research_in_figures_2016.pdf

How can University foster entrepreneurship in the Circular Economy domain?

- In the past: disaster mentality! For the future we need solutions. An innovative and an optimistic climate at universities is necessary to motivate and inspire young people.
- Good example: The „Energiewende“ (energy transition) in Germany has mobilized many new forces, especially in science and business.
- The role of applied sciences/research must be strengthened. Internships in companies makes the students to “ambassadors” for sustainability.
- Where are the win-win-situations for economy and environment? Example: new green technologies, resource efficiency in producing companies.

✘ Could be better: The economy must be understood not only as an opponent of sustainability but as a problem-solver and partner.

✘ Mostly not known: resource efficiency can contribute to reduce greenhouse gas emissions!

How can networking between research, education/training and business facilitate Circular Economy implementation?

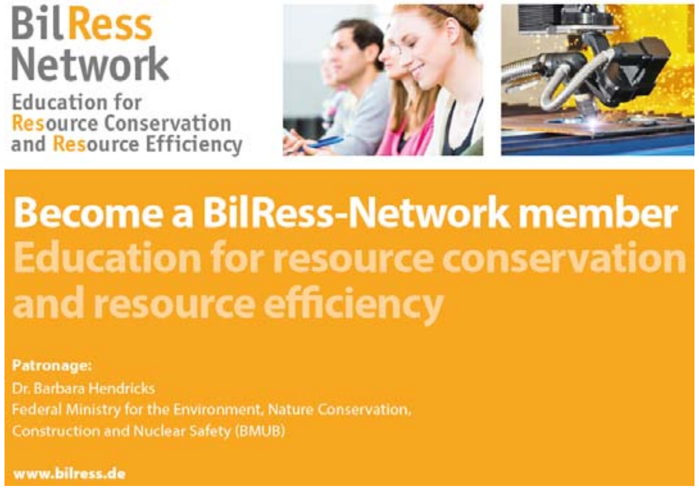
- Expertise must be offered. Example: VDI center for resource efficiency (www.vdi-zre.de).

- Standardization could help. Example: ISO 14051 “Material Flow Cost Accounting“, VDI 4075 “Cleaner Production“, VDI 4091 “Closed-loop production “, VDI 4800 “resource efficiency“

- Implementation of networks between universities and companies. Example: BilRess

- Competitions and dissemination of best practice cases. Examples: “100 companies for Resource Efficiency“

✘ Could be better: The fear of companies to talk about business secrets.
✘ Trusting in the abilities of the different actors.



Summary: Six Thesis

- We need a solid education of the scientists of **all disciplines**, in which the knowledge base and the methodological framework of sustainability is taught **interdisciplinary**. Alternative facts are not acceptable in sciences.

- Implementation of new findings requires **applied research**, which closely cooperates with industry and society, e.g. in new formats such as "**Living Laboratories**".

- The economy must be understood not only as a cause of environmental problems, but also as a **problem solver**. For this purpose, suitable fields of application have to be identified where both the economy and the environment will benefit from.

- The economical use of natural resources through highly efficient and innovative production processes and recyclable products („**resource efficiency**") also make a significant contribution to climate protection.

- State **funding programs** for science and industry, especially (but not only!) for small and medium-sized companies, help to implement innovative ideas in practice and save large amounts of resources and greenhouse gases.

- Many companies in industrialized countries are already working very efficiently and environmentally friendly. It is important to support these innovations also in **developing countries**. In these countries the savings potential is much bigger. This requires enhanced **international cooperation**.

Thank you for your attention!

Appendix: our key competence in Pforzheim:
The material & energy metabolism of industry

research institute

bachelor study program
„Resource Efficieny Management“

INEC
INSTITUTE FOR INDUSTRIAL ECOLOGY

master study program
„Life Cycle & Sustainability“

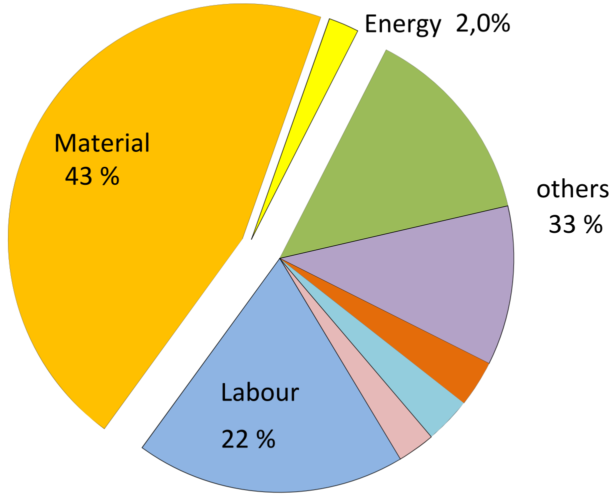
8 full professors in sustainability issues

Ph.D. program
„Energy Systems &
Resource Efficiency“

Resource efficiency as important field of action for business AND environment

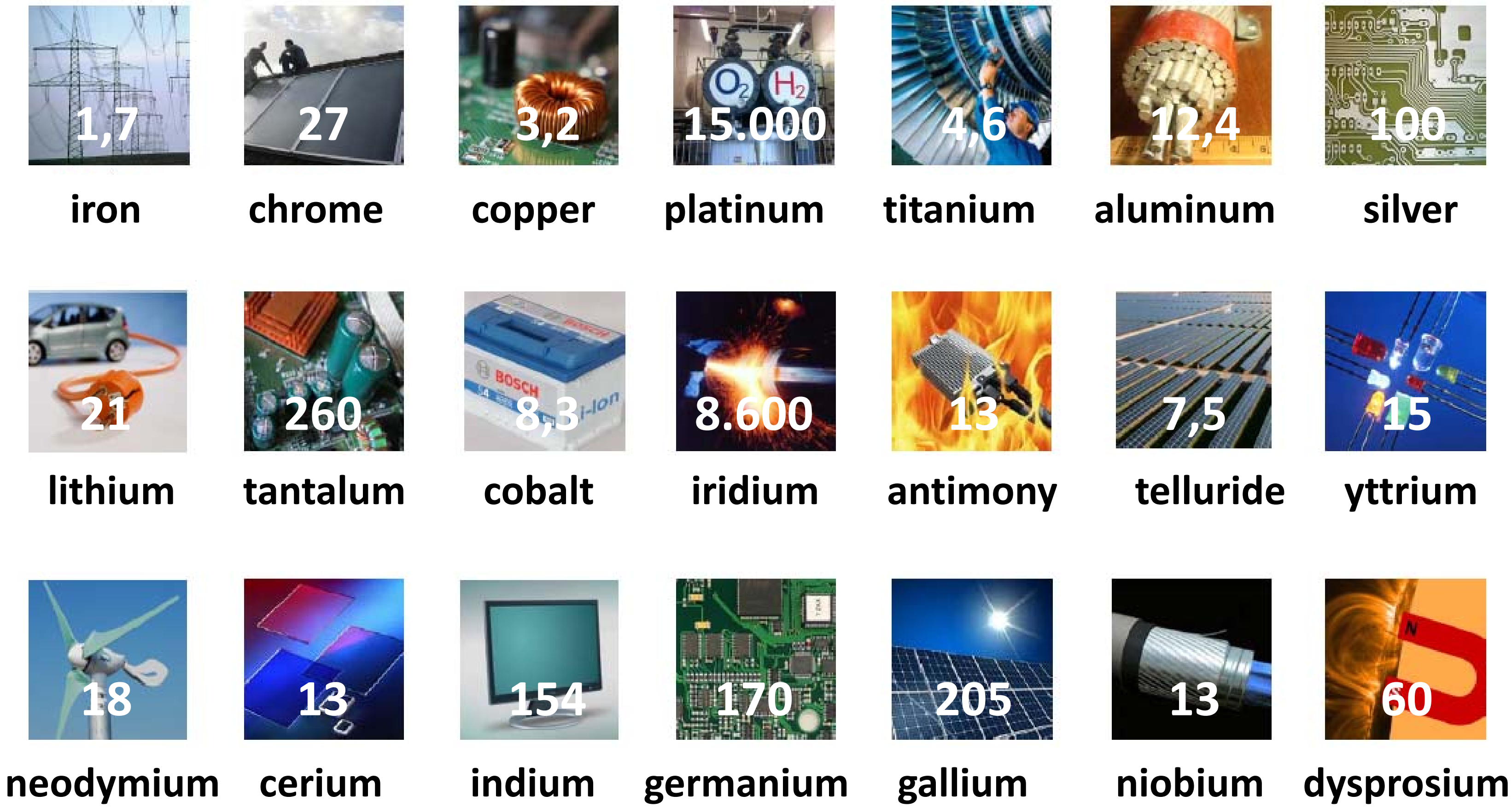
- Material costs: 43 % turnover.
- Energy costs: only 2 %
- Typical savings potential:
  10 -15 % of material costs
- Empirically validated savings potential
  in more than 1000 SME: > 2 % turnover
- In comparison: typical gross profit:
  4-6 % turnover
- Less material means less energy and less CO_2
  emissions for the production of the materials

Costs distribution in German producing industry in % turnover



Source: M. Schmidt et al. (2017). Will be published in English language in 2018 at Springer Publ.

Example: Carbon Footprint of 1 kg metal (in kg CO_{2eq})



10 % of the world energy demand is needed for the production of mineral resources

Example: “100 companies for resource efficiency – 100 best practice cases”

Source: M. Schmidt et al. (2017). Will be published in English language in 2018 at Springer Publ.