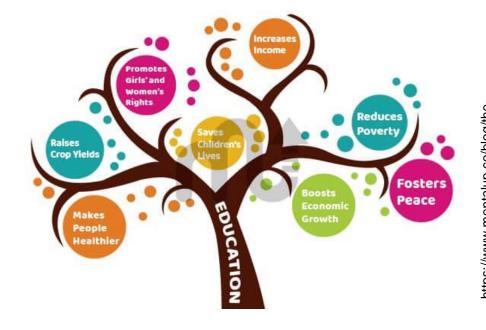


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# Education for innovation and sustainable energy consumption

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https://www.mentalup.co/blog/theimportance-of-education

#### **Motivation**



- How to foster a sustainability innovation strategy for institutions that rises to the challenge of sustainable energy consumption?
- Need for sustainability innovation strategy is obvious
  - Energy-induced greenhouse gas emissions are still too high
  - Extraction of metals are in many cases environmental disastrous and often inhuman
  - Conflicts are emerging (rapidly?)
- Education is a keystone to foster appropriate strategies



#### **Education**



- Process of (getting/receiving) systematic instruction
- Acquiring knowledge and developing the powers of reasoning and judgement
- Traditionally at schools and universities; nowadays also companies, communities, etc.
- Two challenges
  - Subject of learning, e.g. sustainability energy consumption
  - Conditions to achieve the desired education targets, defined by the respective discipline



## **Sustainability**



"Sustainable development is [a] development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

(Report of the World Commission on Environment and Development: Our Common Future, 1987, p. 41)

- Need for a "better" definition is obvious, but could be insufficient
- Achieving sustainability is a search for ways to improve the capacity
  - to "guide" interactions between nature, technology, economy and society toward a more sustainable future
  - to understand how sustainable futures could look like



# Sustainability – Education requirements



- Systematic instruction should address the dimensions of knowing
  - how to deal with the complexity of sustainability
  - how to act together across professional, social, and cultural content



# **Sustainability – Education requirements**



- Dimensions of complexity
  - Comprehensive (i.e. socioeconomic-environmentaltechnological) perspective of the respective system
  - Process of
    - identifying factors relevant for describing a possible sustainable future,
    - defining sustainability future(s), and
    - achieving a selected sustainable future

in a dynamic world

- Necessity for acting together
  - Sustainability
    - is the outcome of societal mediation
    - considering the findings of indicatorbased assessments
  - Selecting ways and means of achieving sustainability should be the outcome of societal mediation



# Sustainability energy consumption



- Conceptually no clear answer possible
  - Relevant (socio-economic-technological) system?
  - Relevant region? (Burden shifting!)
  - Relevant stakeholder?
- In practise
  - climate-neutral technologies plus
  - techno-economic efficiency/competitiveness (of these technologies)
    (often ignoring up-stream impacts)



## Educate sustainability energy consumption

#### - at Universities



- Relevant for "all" faculties
- Curriculum should address
  - an comprehensive approach,
    i.e. socio-economic-environmentaltechnological perspective
     on energy consumption
    - Socio is more than acceptance; also participation, culture
    - Economic is more than costs; also behavior, attitudes
    - Environment is more than greenhouse gas emissions; also e.g. eutrophication, nutrient balances

- interdisciplinarity to learn the complexity
  - Faculty overlapping exercises: "real world projects"
- transdisciplinarity to learn how to identify / define / implement sustainability energy demand
- innovation strategy to understand sustainability as a strategic element regarding innovation planning of organizations
  - diversity of teams
  - comprehensiveness of possible targets and target groups



### Educate sustainability energy consumption

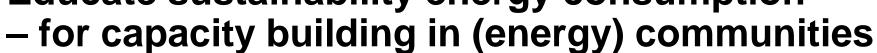




- Sustainability as a strategic component of companies' innovation strategy
  - Appropriate professional, social, and cultural diversity of innovation teams for improving quality of outcome
  - Comprehensive perspectives for reducing risks of failure
- Inter- and Transdisciplinarity
  - Check of feasibility of novel ideas
  - In particular required in case of innovations with direct impacts on social life, e.g. smart meters, digitalization
- Learning to deal with the Collingridge dilemma



## Educate sustainability energy consumption





- Increasing need or wish to control energy supply by itself
- Knowledge needed regarding
  - precise aim of the (energy) community, e.g. to increase reliability of energy supply for economic activities
  - technological opportunities
  - economic and legal constraints
- Transdisciplinarity!
  - Training needed in
    - self-organizing
    - self-confidence



#### Résumé



- Education in Sustainability Energy Consumption seems to be like "generating" Supermen or -women (for those knowing German: eierlegende Wollmilchsau)
  - Knowledge in content of different disciplines
  - Knowledge in sustainability science
- Rather impossible from an individual perspective
- Maybe overarching aim of education: creating empathy for other perspectives







https://www.unicef.org/reports/transforming-education-equitable-financing

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## Innovation strategies in the context of sustainability



- Innovation strategies: long-term planning
  - setting the ways and means to develop and implement novel technologies, products, organization, etc. and implement them
  - setting the target group of the innovation
- Innovation and sustainability
  - broadening the scope of thinking by increasing (professional, social, and cultural) diversity of teams and including environmental and societal impacts
    reducing risk of failure and improving contribution to societal (and organizational welfare)

## Innovation strategies in the context of sustainability



- Traditional (technological) innovation hubs
  - Companies (in cooperation with Universities)
- "New" innovation hubs
  - NGOs
  - Communities / public organizations

