What can science contribute to sustainability? Opportunities and limits of transdisciplinary research

What can science contribute to sustainable development?
Opportunities and limits of transdisciplinary research

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Three Global Transformations

- Globalization/Re-nationalization
- Digitalization
- Sustainabilization

Unitended Side Effects

- Global environmental changes (climate, biodiversity, pollution, environmental health)
- Increase of vulnerability with respect to the interactions between the technological, social and natural risks
- Urbanization, demographic changes, migration, land-use planning
- Governance deficits (corruption, re-nationalization, authoritative leaderships, neo-imperialism)
- Severe equity problems with respect to opportunities and income and vulnerability

What do these trends imply for sustainability?

Concept: Sustainability

- **Definition**
  - Orientation
  - To secure the environmental foundations and the humane living conditions
  - For the present and future generations worldwide
- **Dimensions of Sustainability**
  - Ecology
  - Economics
  - Social and cultural aspects

Dimensions and subdimensions

- **Ecology**
  - Decarbonization
  - Dematerialization
  - Renaturalization
- **Economy**
  - Circular economy
  - Lasting quality of life and work
  - Dynamic adaptation to changing environmental conditions (innovations)
- **Social and cultural dimensions**
  - Social justice (intra- und intergenerational)
  - Peaceful conflict resolution
  - Individual and social identity and cultural meaning

SDGs: Overview

Challenges for Sustainability Sciences

- Major increase in scientific studies and analyses without major impact on the success of sustainability, climate protection and resilient structural changes
- Plurality of knowledge claims: science is not the only knowledge provider that counts
- Missing bridges between knowledge and action
- Lack of convincing concepts for transformative and transdisciplinary research

Focus on the steps between knowledge and action

- *Knowledge (Investigating what is true and what works)*
- *Judgement (Balancing arguments)*
- *Decision Making (Setting priorities based on trade-offs)*
- *Implementation (Putting decision into action)*
- *Monitoring (Reviewing results)*

Transdisciplinary Concept of Science

- Classic Research (curiosity driven, methodological rigor, open questions)
- Goal Oriented Investigations (coherent strategies to reach a predefined objective or set of objectives, including assessment of unintended consequences
- Catalytic Expertise (analysing, designing and facilitating processes to initiate constructive and productive learning among and between different knowledge camps, interest groups and value orientations)

Four Functions of Scientific Evidence

- *Enlightenment* (informing policy makers about complex relationships)
- *Orientation* (providing assistance for foresight, vision and planning)
- *Instrumental and Strategic Planning* (predefined goals, strategy elicitation, strategy assessment, trade-off analysis and prioritization)
- *Co-creation* (developing new insights and orientation knowledge together with change agents)

Need for an Integrated Approach

- Policy makers need scientific support in all four substantive fields: enlightenment, orientation, strategy and co-creation.
- These different needs require special discourse formats that have their own normative rules and implementation criteria.
- Complex sustainability problems demand combinations of discourses: they may start as epistemic discourses, lead to orientation and strategy discourses and might end up as an exercise in co-creation.

Conclusions

- **New role for science:**
  Focus on three major scientific concepts
  - Curiosity driven, classic concept
  - Goal oriented, strategic and instrumental concept
  - Process-oriented, catalytic concept
- Need for an integrated governance approach providing understanding, orientation, strategies and co-production of knowledge and action
- Need for including scientific, political, economic and civil society actors as well as affected citizens