



Lecture 11: Recommendations for Research and Education

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Episode 1: Recommendations for Research and Education

Episode 2: Interview



You will learn

1. that the social contract suggested by the WBGU needs strong cooperation between science and society;
2. that inter- and transdisciplinarity, as well as participation are important structural requirements for research and education supporting transformation;
3. that problem analysis and communication is a major issue for the transformation;
4. that research and education for the transformation are strongly interconnected;
5. that new ways for education and research would demand new curricula, courses and institutions.



- Knowledge-based transformation
- Requirements
- The four transformative pillars of the knowledge society
- Transformative Research
- Transformation Research and Education
- Suggestions for Education



Top-Down: States, UN, G20,
multinational alliances



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multinational alliances

Bottom-up: NGOs, protest movements, master minds

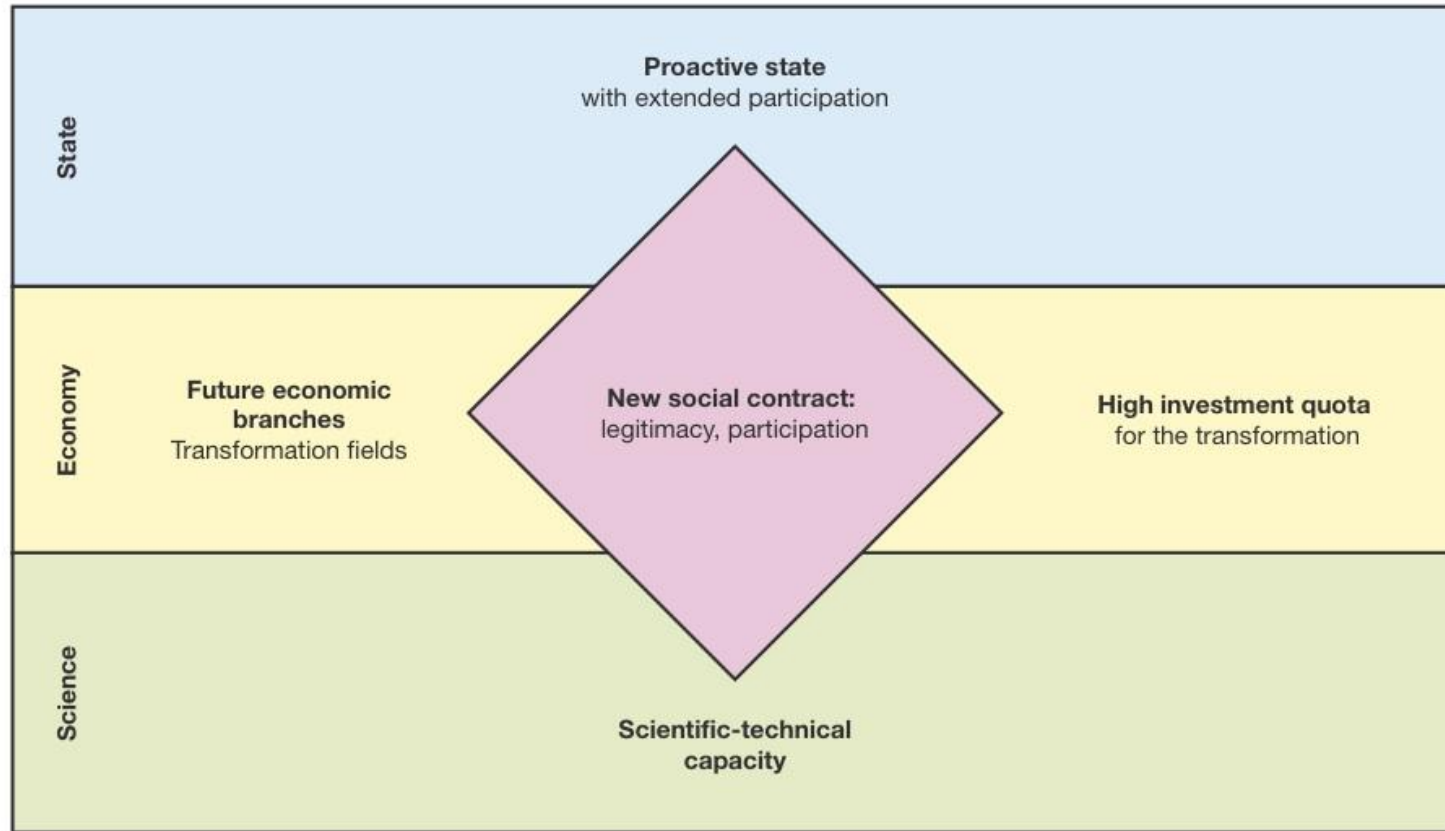


Top-Down: States, UN, G20,
multinational alliances

„**Side-by-side**“: e.g. **Cooperation of science/research/technology and civil society, education for transformation**, dialogue, discourse, new forms of political participation, best practice examples, fore runner companies, dedicated public offices, successful change agents etc.

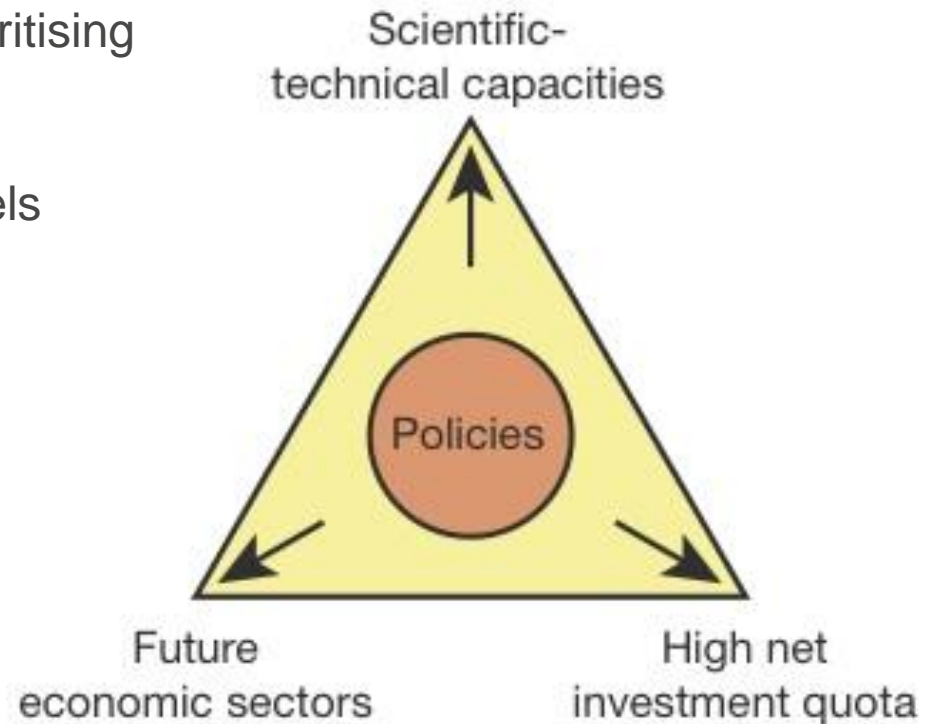
Bottom-up: NGOs, protest movements, master minds

The Social Contract of the WBGU



Source: WBGU, 2011

- **Financial**
 - upscaling / focusing / prioritising
 - long term
 - public, industry, private
 - innovative business models
- Structural
- Content



Source: WBGU, 2011



- Financial
- **Structural**
- **Content**

Goal

Global transformation towards a low-carbon society by 2050

Global sustainability context

Structure

Systemic
Interdisciplinary
Cross-disciplinary

International cooperation
Reflexive
Long-term

Result components

Low-carbon innovations
Conditions for diffusion

Political strategies



Need for Restructuring Research for Transformation

Interdisciplinarity, cross-disciplinarity, systemic research

- Shared research issues
- Combining ecological, technological and socio-economic aspects

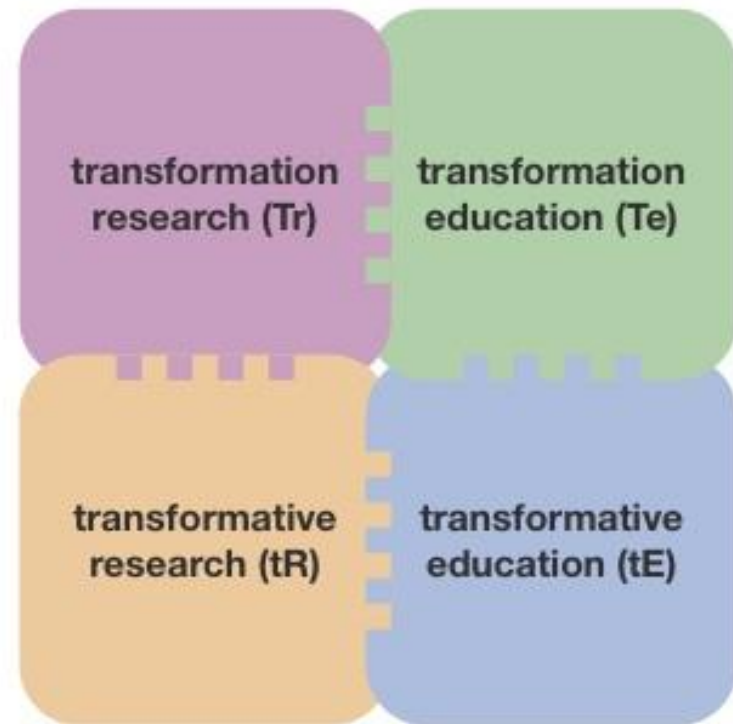
Transdisciplinarity

- Stakeholder involvement, combining scientific and practical knowledge
- Create legitimation by participation
- Foster investment by cooperation of research and development with business
- Combined search and reflexion process for future knowledge



Requirements

- Financial
- **Structural**
- **Content**



Source: WBGU, 2011

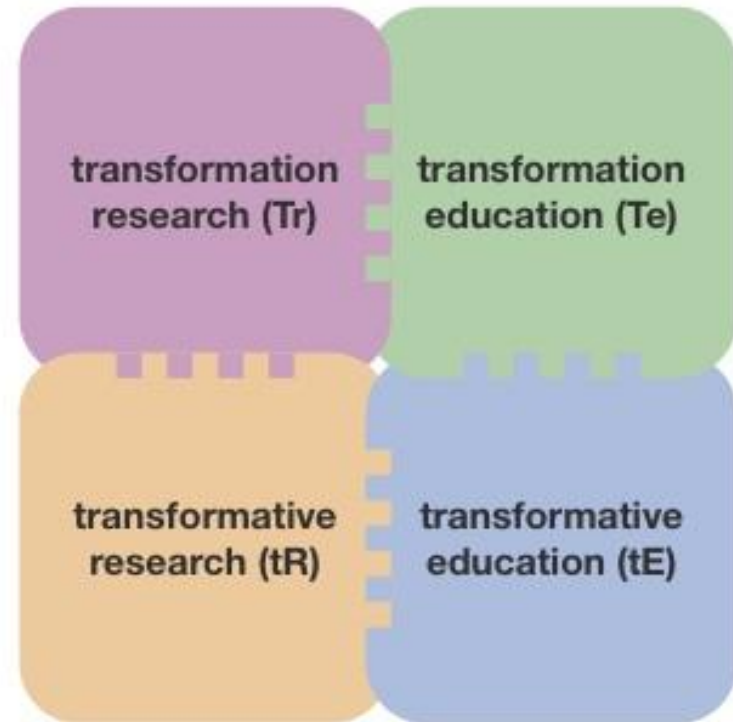


Subject: Transformation as such, conditions needed for realising it

(factors and causal relation for **transformation processes**; **learning from history**; **interaction** between society, earth system and technological development; **human preconditions for change**)

Supports active transformation process with specific innovations

(e.g. consumer research for **new business models**, **efficiency technologies**, **dissemination**, **often sectoral**, but in a **systemic context**)



Source: WBGU, 2011



Transformation of the Energy System

- Provision of renewable and other zero-carbon energies
- Efficient energy use in all sectors
- Low-carbon mobility solutions
- Future European power grid and storage technologies
- Impediments and barriers for a supranational energy policy
- Impact of consumer behaviour
- Risk assessment of new technologies (e.g. CCS)
- Etc.



Transformation in the Field of Urbanisation

- Data on urbanisation trends
- Urban culture and lifestyle
- Participation in regional and urban planning
- Low-carbon regional and urban solutions
- Etc.



Transformation of Land Use

- Global land use: Monitoring, models and scenarios
- Indirect land-use changes
- Agriculture and a climate-friendly diet
- Bioenergy use
- Etc.



Research Issues for the **Social Contract**

- Key factors of the Transformation
- Political organisations and legitimacy
- Legal framework conditions

Sustainability Science and **Global Change Research**

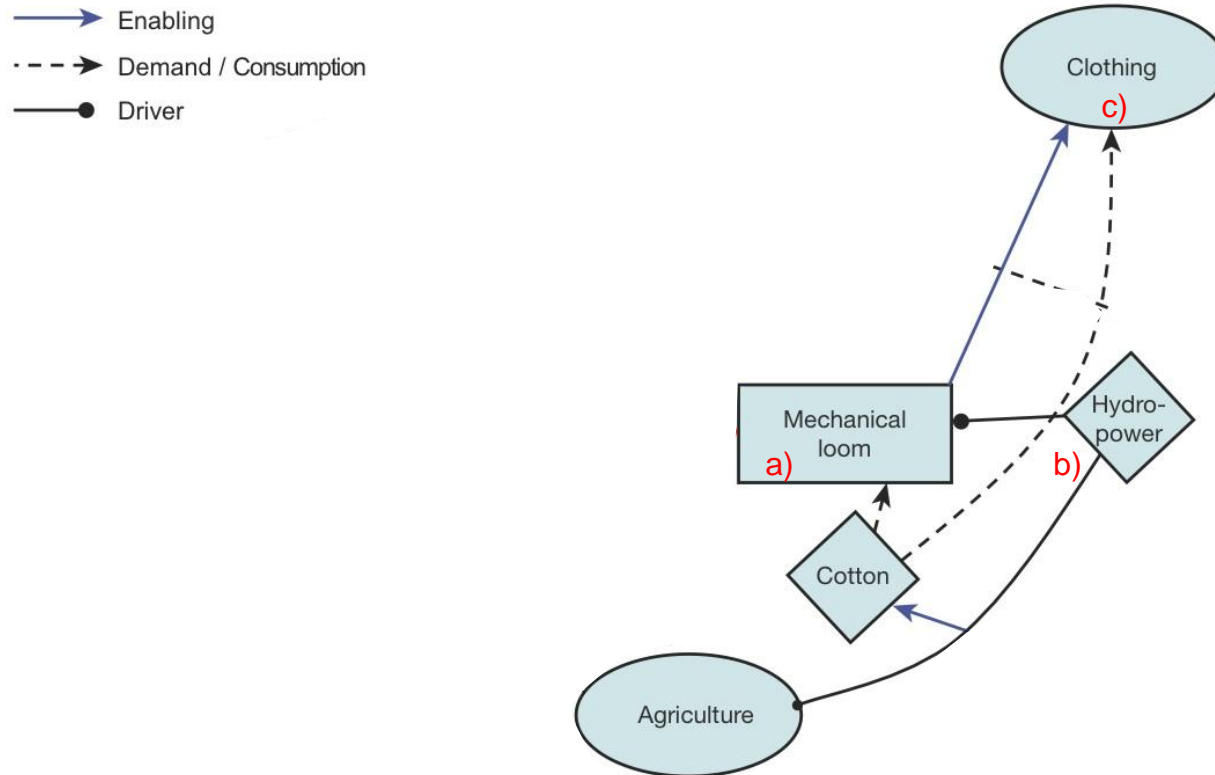
Transformation Research *sensu strictu*:

- Social transformation processes and transformation ability
- Transformation paths
- Scope for acceleration
- Global cooperation and global transformations
- Problem analysis, problem solving, problem communication



Learning from Historical Transformation Processes

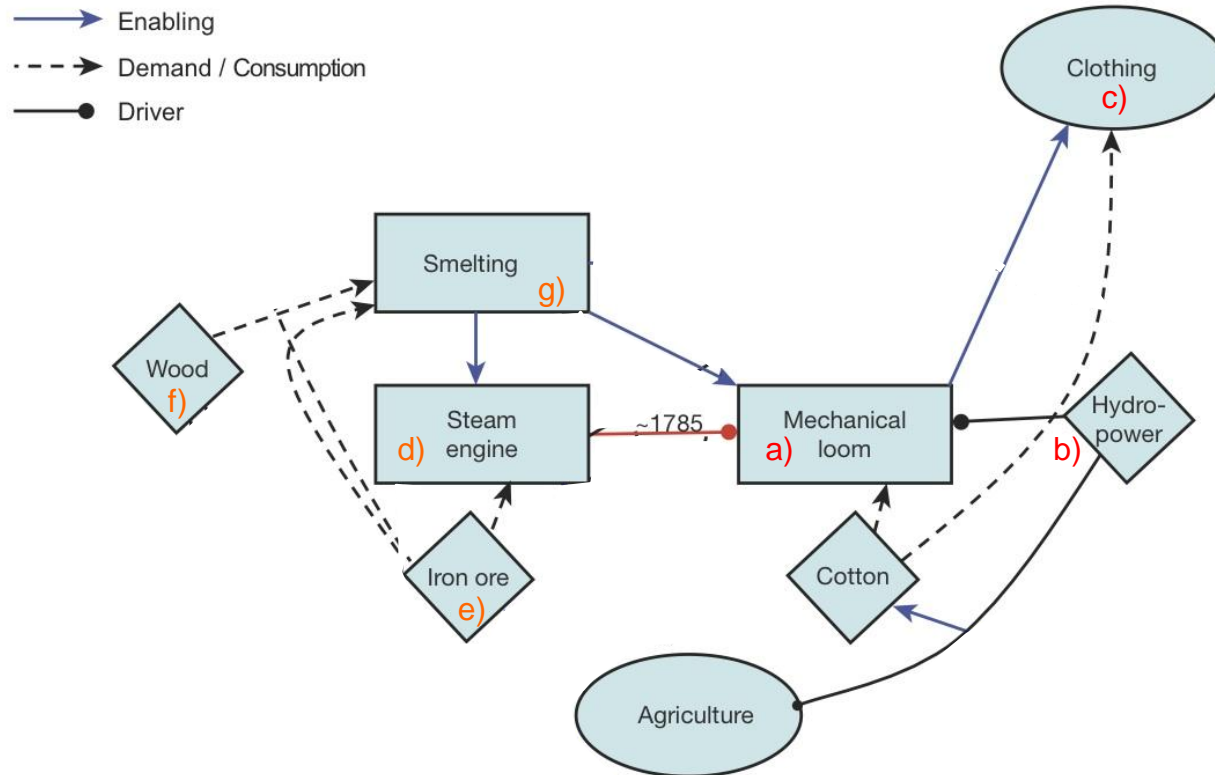
Example: Complex relationships in the Industrial Revolution



Source: WBGU, 2011

Learning from Historical Transformation Processes

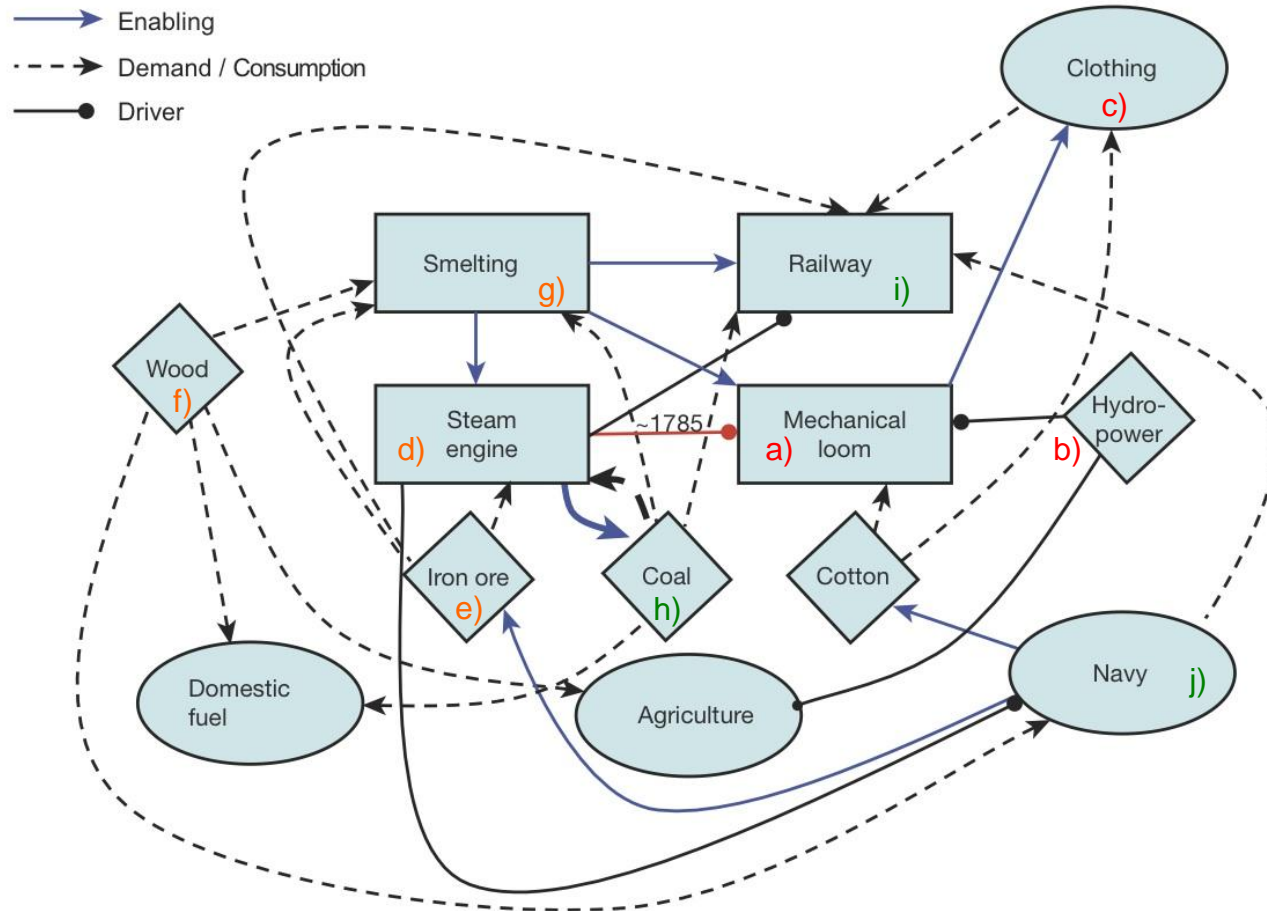
Example: Complex relationships in the Industrial Revolution



Source: WBGU, 2011

Learning from Historical Transformation Processes

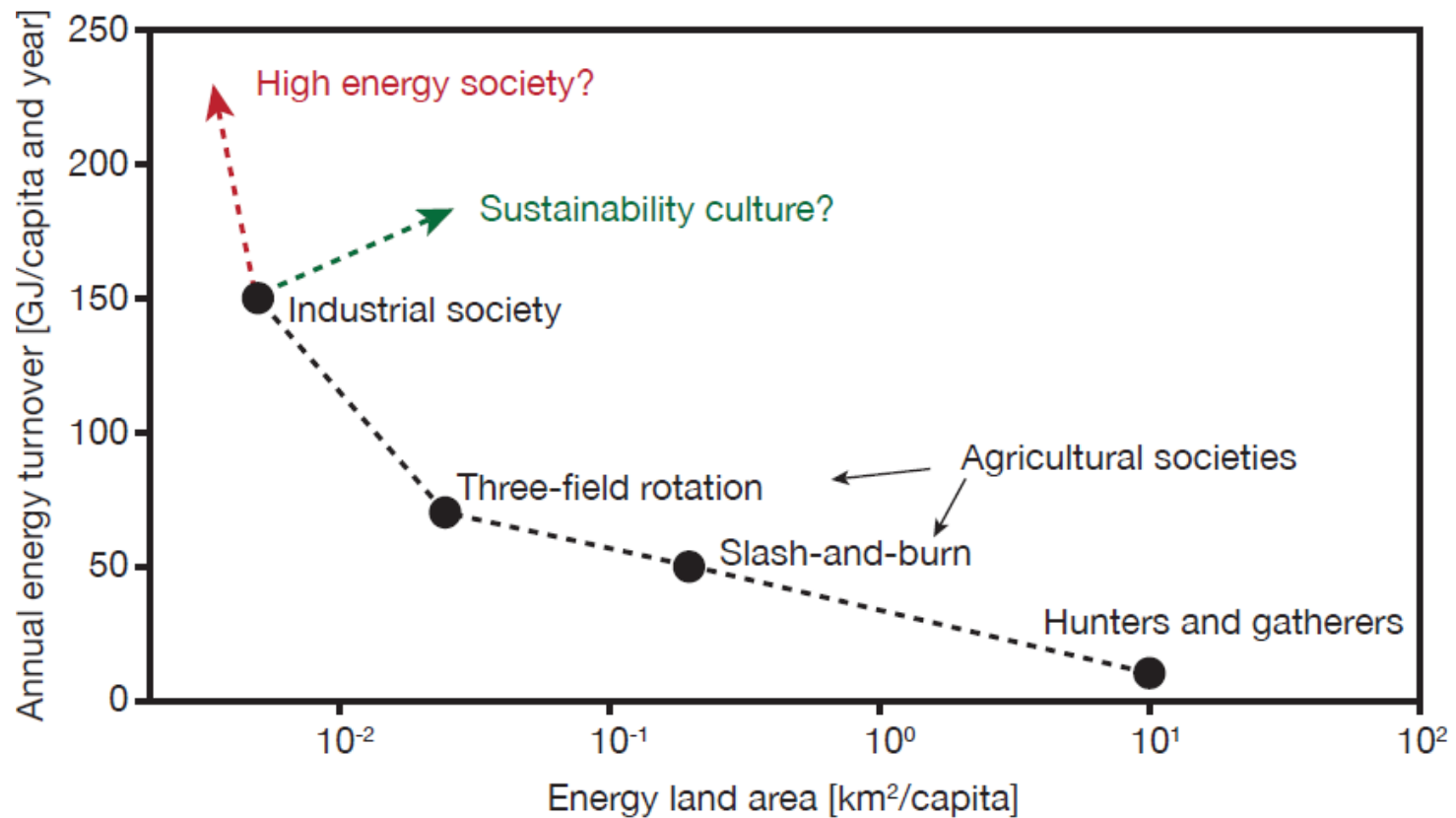
Example: Complex relationships in the Industrial Revolution



Source: WBGU, 2011

Learning from Historical Transformation Processes

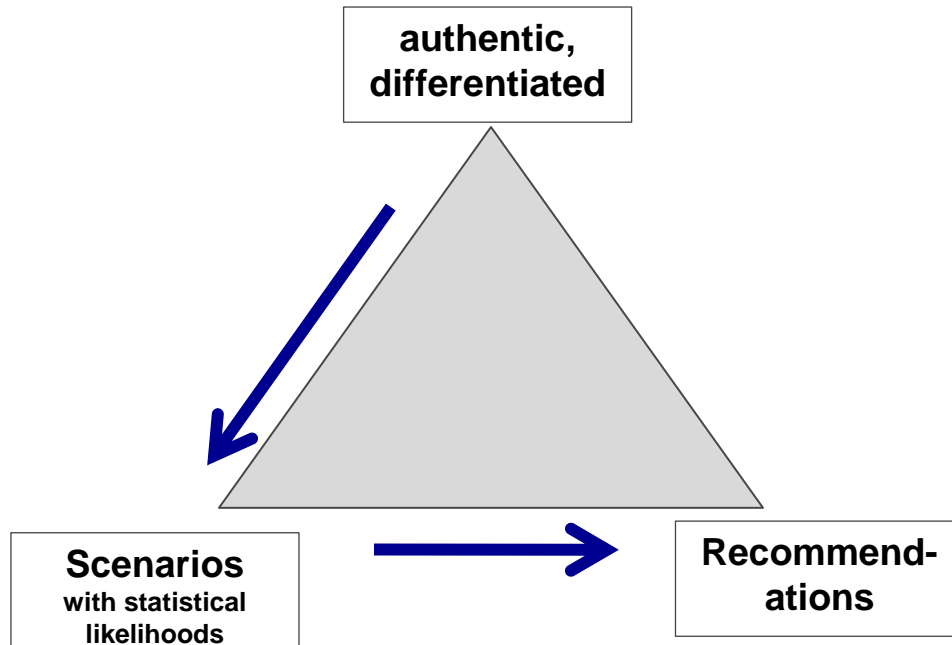
Development of Land Area Productivity



Source: WBGU, 2011

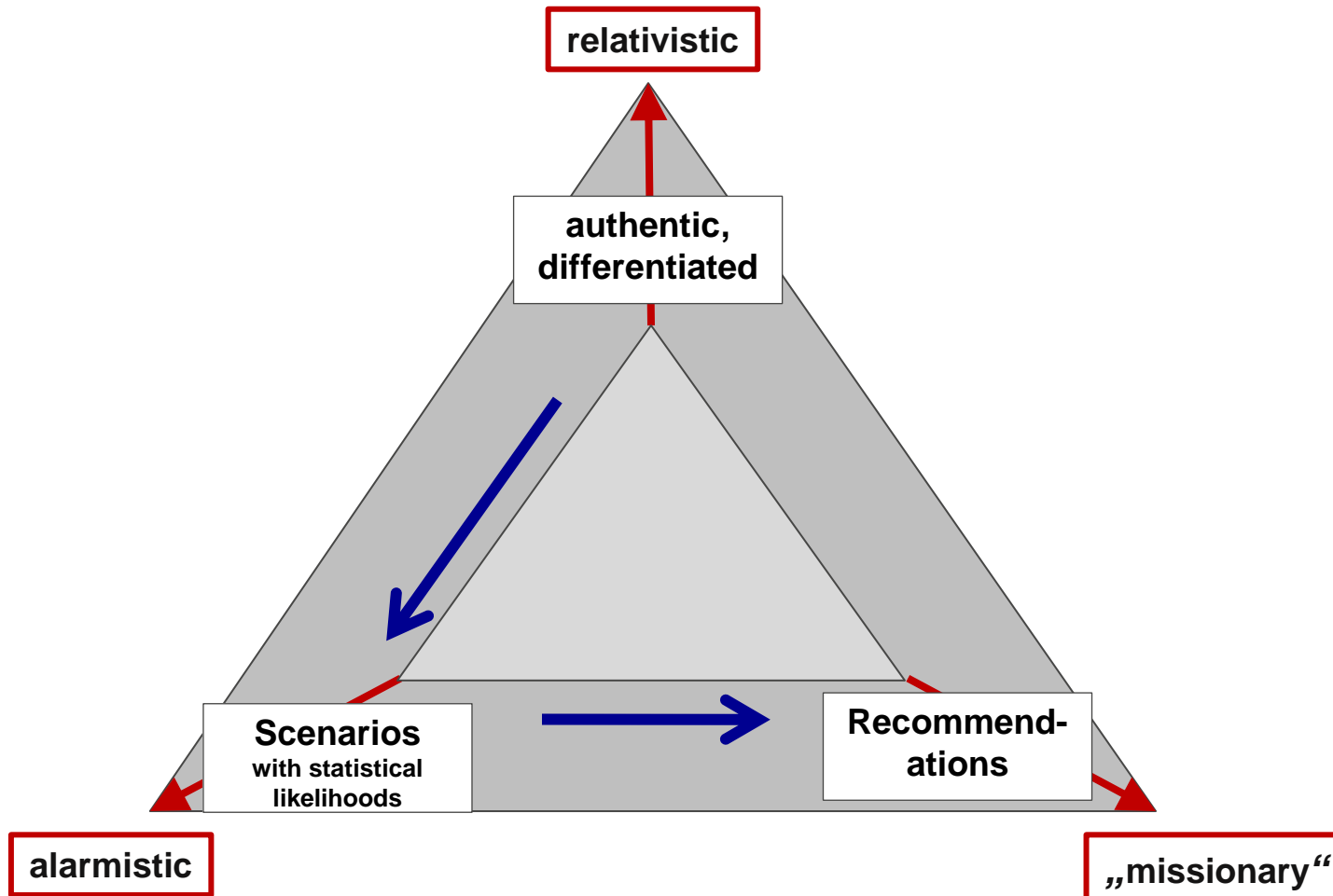


Problem Analysis and Communication



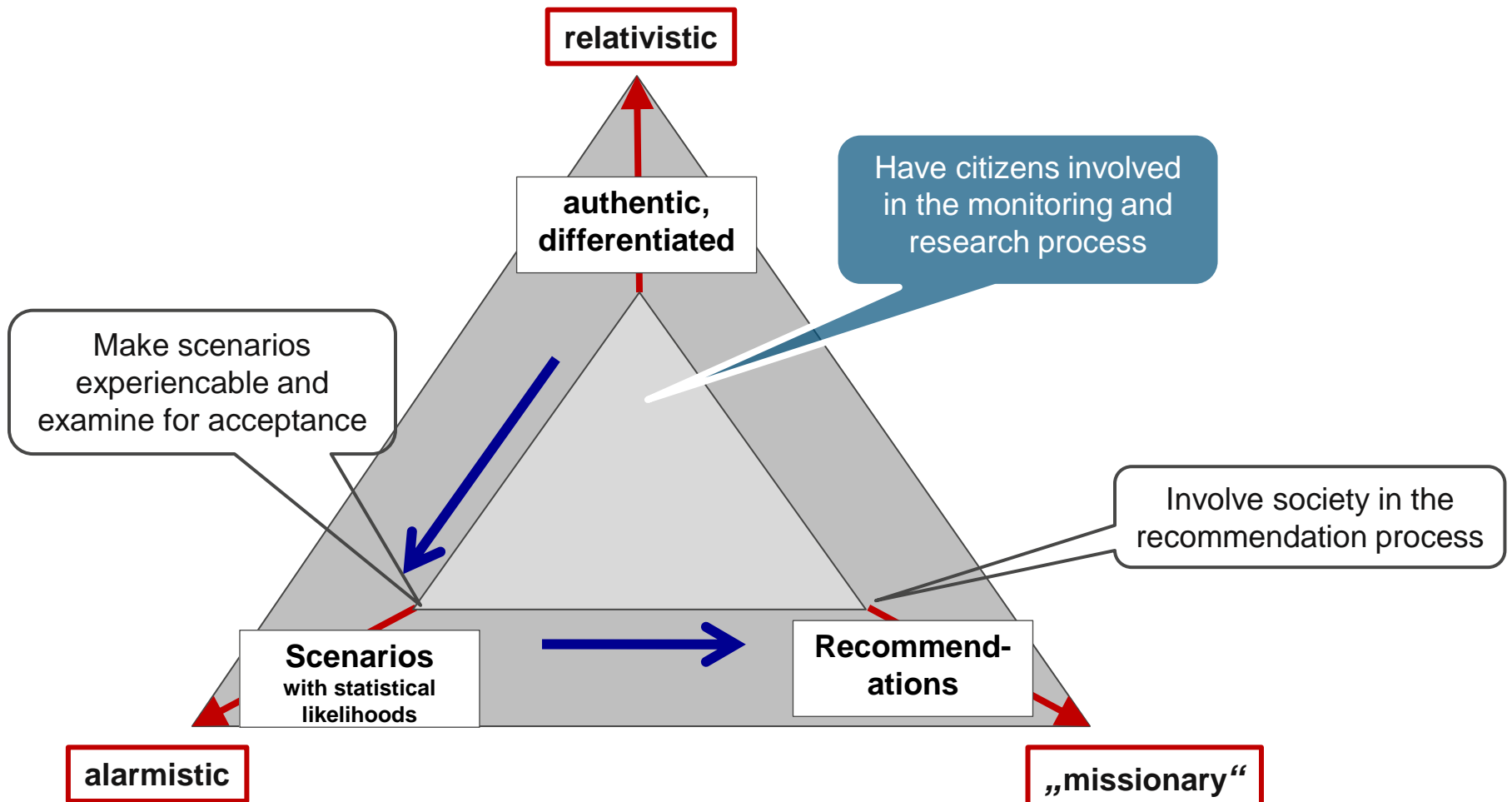
Source: Leinfelder 2009, 2011

Problem Analysis and Communication



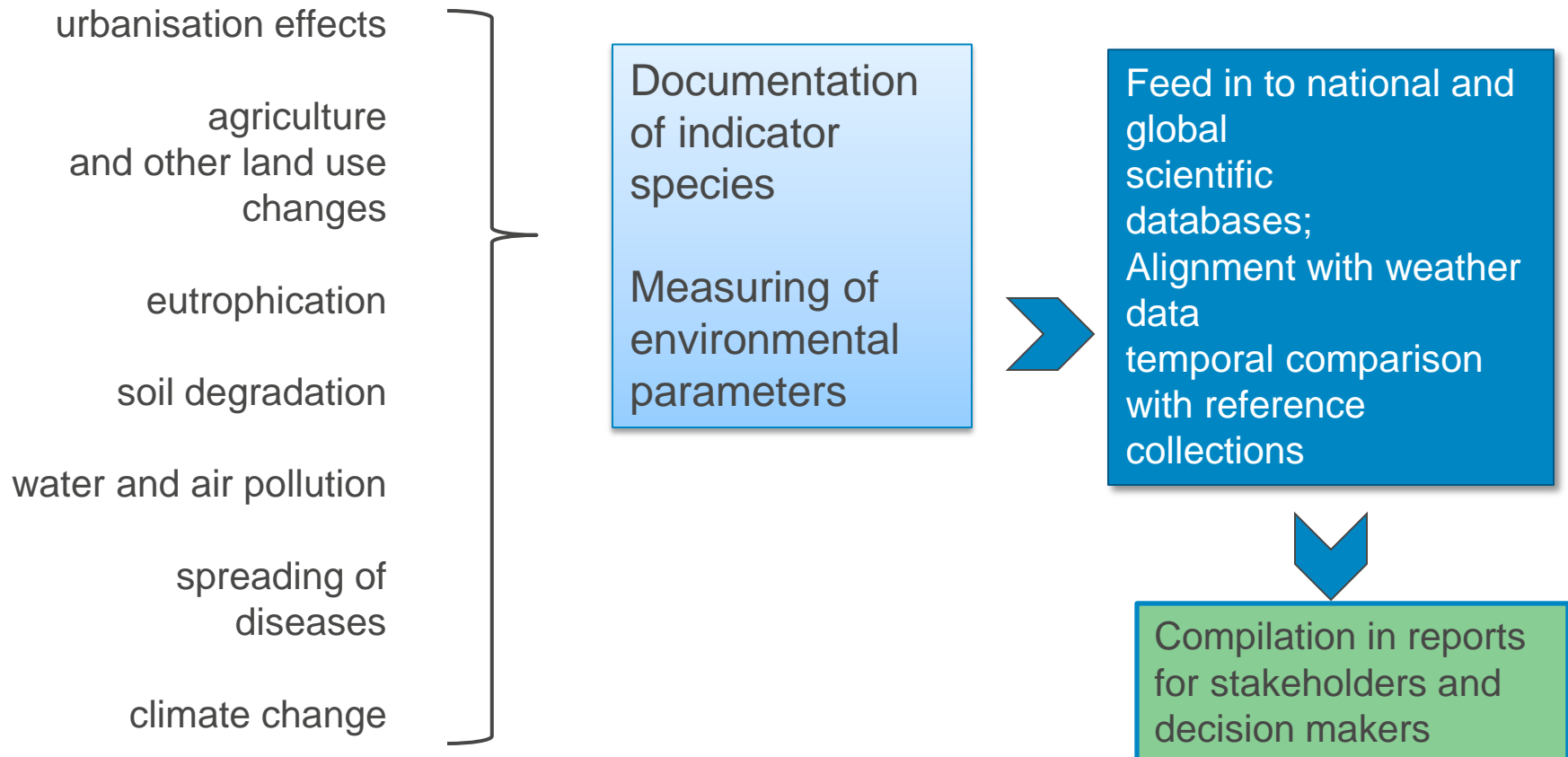
Source: Leinfelder 2009, 2011

Problem Analysis and Communication



Source: Leinfelder 2009, 2011

Participative environmental monitoring stations in land anthromes



- Integrate transformation topics into school and university curricula, vocational qualification and life long learning.
- Produce teacher training modules for systemic education.
- Use Bologna process for combining transformation-relevant modules and exchange programs.
- Establish transformation science degree courses.
- Establish low-carbon business schools and interdisciplinary faculties.
- Establish national universities for transformation-relevant science and education.
- Establish an extensive programme „Participation in Transformation Research“ („citizen science meets institutional science“).
- Participation for monitoring, surveys, reflections, visions and realisations.
- Develop institutional mechanisms on a national and international scale.



1. Identify the state of research for the transformation towards sustainability in Germany and the EU by using the WBGU flagship report 2011.
2. Find out the cost estimates of European industry initiatives for the energy transformation.
3. Identify the argumentation lines of climate and transformation scepticism.
4. Judge the efficiency of the UN Decade ‚Education for Sustainable Development‘ and the German Science Year 2012 ‚Future Earth‘. To which extent do they help transformation towards sustainability?
5. Try to identify working opportunities for a potential new academic profession „transformateur“ (e.g. in analogy to the new profession of an engineer, as it arose during the Industrial Revolution). Outline major course elements for such a curriculum.



Basic reading:

- WBGU – German Advisory Council on Global Change (2011): World in Transition– A Social Contract for Sustainability. Flagship Report 2011, chapter 8. Berlin. www.wbgu.de

Further reading:

- Leinfelder, R. (2011): Biologische und kulturelle Evolution: Missverständnisse und Chancen.- In: Bayrhuber, H., Faber, A. & Leinfelder, R. (eds), Darwin und kein Ende? Kontroversen zu Evolution und Schöpfung.- S. 22-35, Seelze (Kallmeier in Verb. mit Klett u. Friedrich Verlag)
- Leinfelder, R. (2010): Vom Handeln zum Wissen – das Museum zum Mitmachen.- In: Damaschun, F., Hackethal, S., Landsberg, H. & Leinfelder, R. (eds.)(2010): Klasse, Ordnung, Art. 200 Jahre Museum für Naturkunde, S. 62-67, Rangsorf (Basilisken-Press)
- Leinfelder R., Schwägerl, C., Möllers, N., Trischler, H. (2012): Die menschengemachte Erde, in: Kultur & Technik, 2/2012, S. 12-16



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