Wuppertal Institute
for Climate, Environment
and Energy

Transition research: The role of science in transitions towards sustainable energy systems

Willington Ortiz, Magdolna Prantner

Outline

- The Wuppertal Institute
- Motivations. Why are Energy Transitions needed?
- Transition Research (applied to energy systems)
  - Type of knowledge
  - Iterative nature of transformation processes
  - System innovations
- Key messages & Advertisements

Mission of the Wuppertal Institute

Inter- and transdisciplinary Sustainability Research

- The WI explores and develops models, strategies and instruments to support a sustainable development at local, national and international levels.
- Sustainability research at the WI focuses on ecology and its relation to economy and society.
- Our research analyses and initiates technological and social innovations that decouple economic growth from nature use.

Scientific policy consulting (think tank): no university

Independent connecting point between basic science (universities) and policy/business

Science Company Wuppertal Institute
Locations

Where we are?

Wuppertal headquarter

Berlin Office

Integrated perspective requires interdisciplinary staff

The Team in 2014

ca. 200 Staff members

President Prof. Dr. Uwe Schneidewind

Scientific Disciplines

- Natural sciences
- Environmental sciences
- Geography
- Systems sciences
- Engineering sciences
- Planning sciences
- Economics
- Political science and law
- Social sciences

Further team members

- Scientific Services
- Administrative Services
- Ph.D. students
- Research students and trainees

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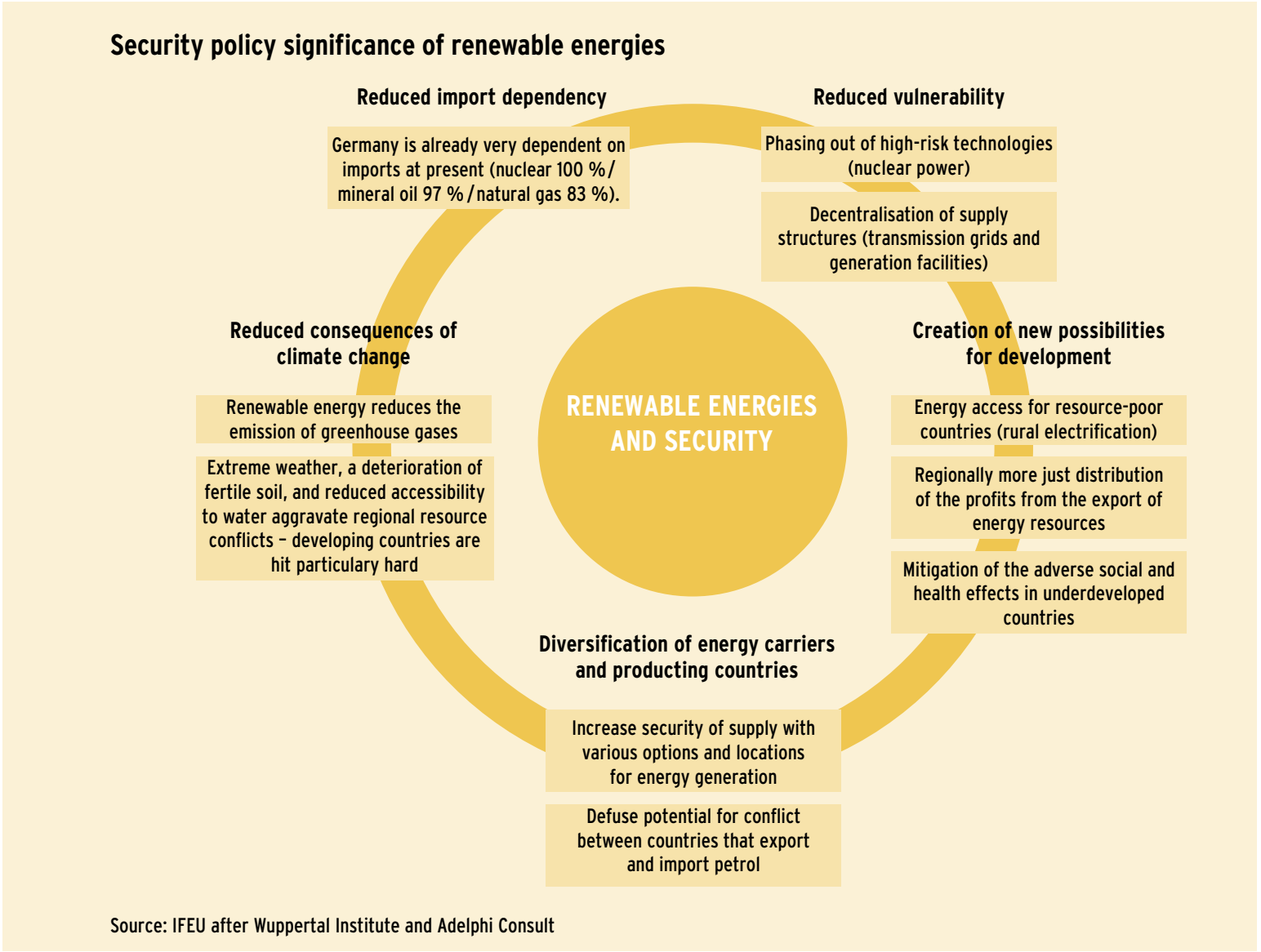
Motivations to Energy Transitions [towards low-carbon energy systems] – Globally

- Climate change
  - Energy sector responsible for ca. 30% of total global GHG emissions by 2010 [IPCC report 2014]

- Energy poverty
  - 0.9 billion people lack access to reliable electricity
  - 2.4 billion people relies on non-solid fuels as main source of energy [SE4All tracking framework 2013]

- Geopolitical stability
  - A significant part of the global supply of fossil energy carriers is coming from political instable regions

Co-benefits from increasing share of renewable energy in the system



Source: IFEU after Wuppertal Institute and Adelphi Consult

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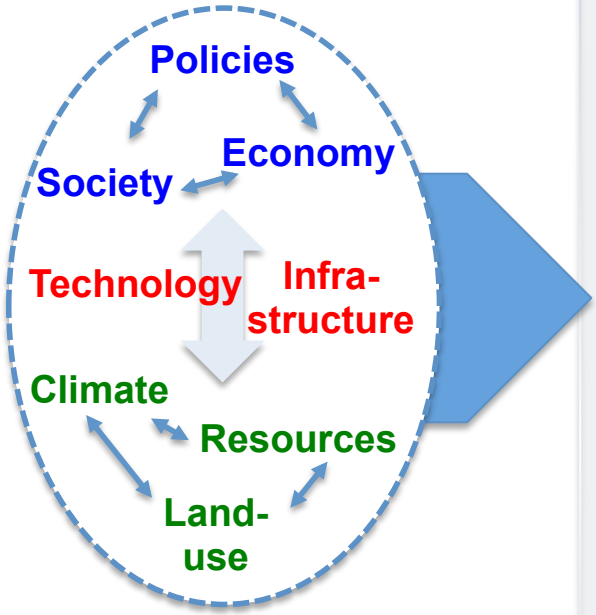
Transition research: knowledge that enables system transformation

Understanding the System

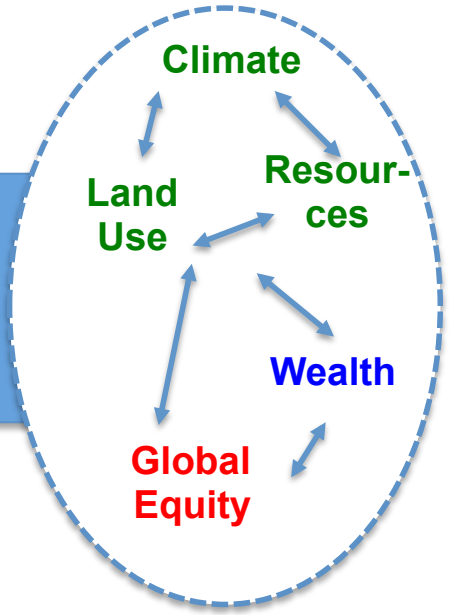


Enabling Transitions

Multilevel

Experiments

Transitions to what? Defining Targets



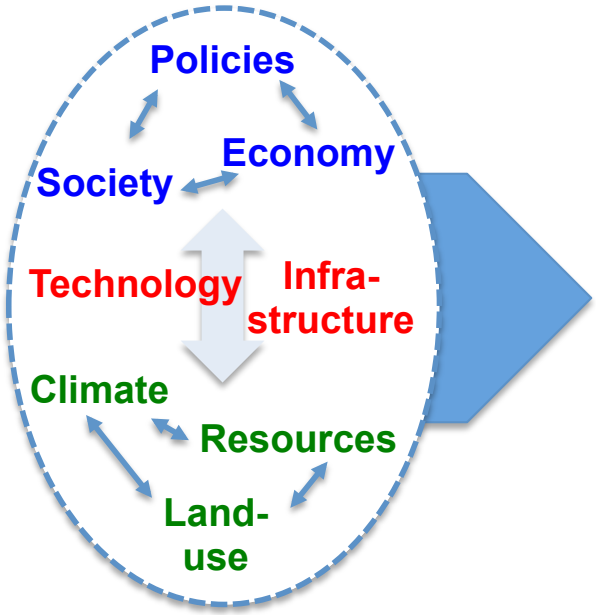
System-Knowledge
(Understanding socio-technical systems in their natural environment)

Transformation-Knowledge
(Enabling complex societal transitions)

Target-Knowledge
(Defining socio-ecological targets for a sustainable world: identification of trade off's and synergies)

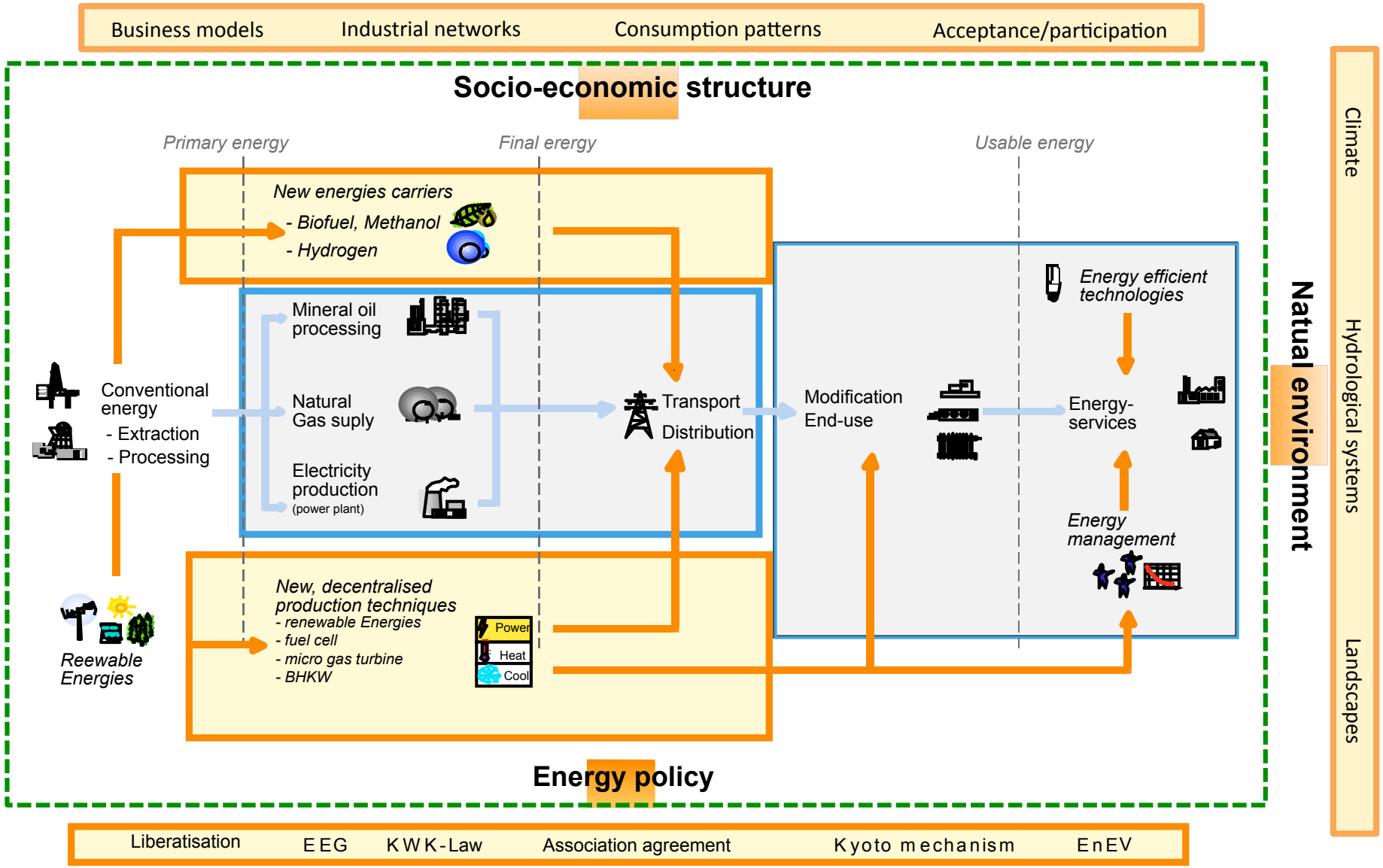
System Knowledge

Understanding the System

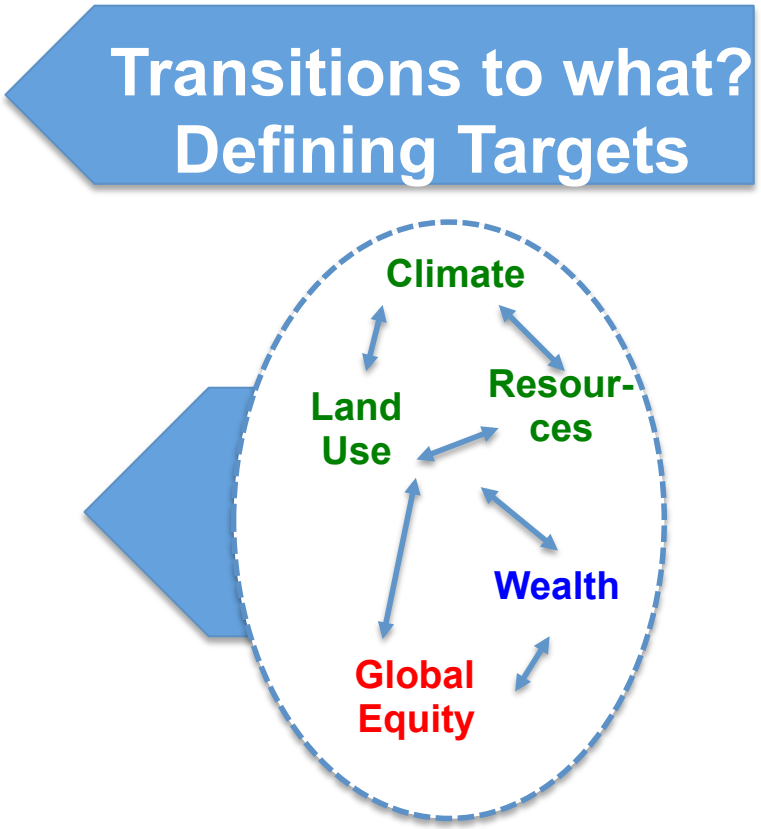


System-Knowledge
(Understanding socio-technical systems in their natural environment)

Schematic view of a generalized energy system



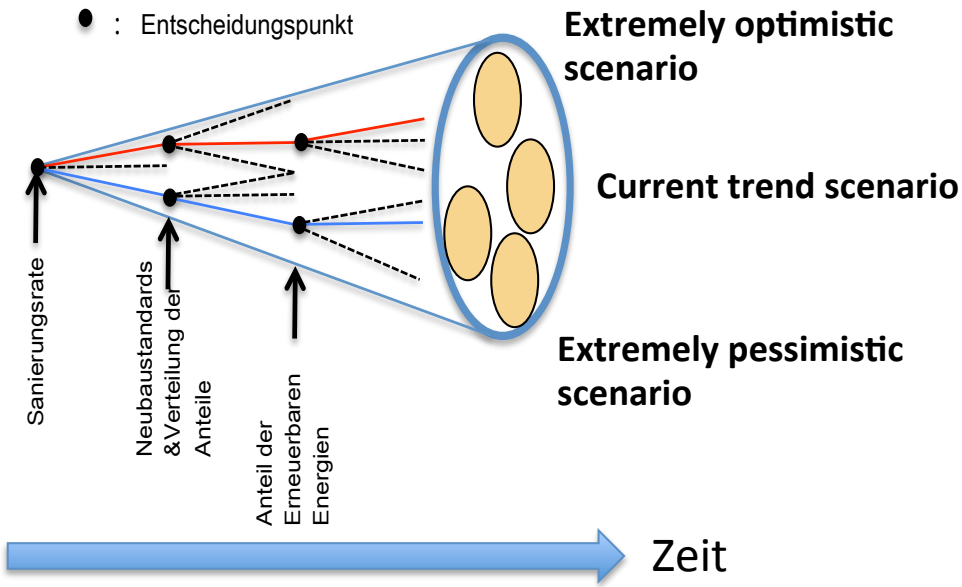
Target Knowledge



Target-Knowledge

(Defining socio-ecological targets for a sustainable world: identification of trade off's and synergies)

Scenario techniques as tool for long-term visioning and planning

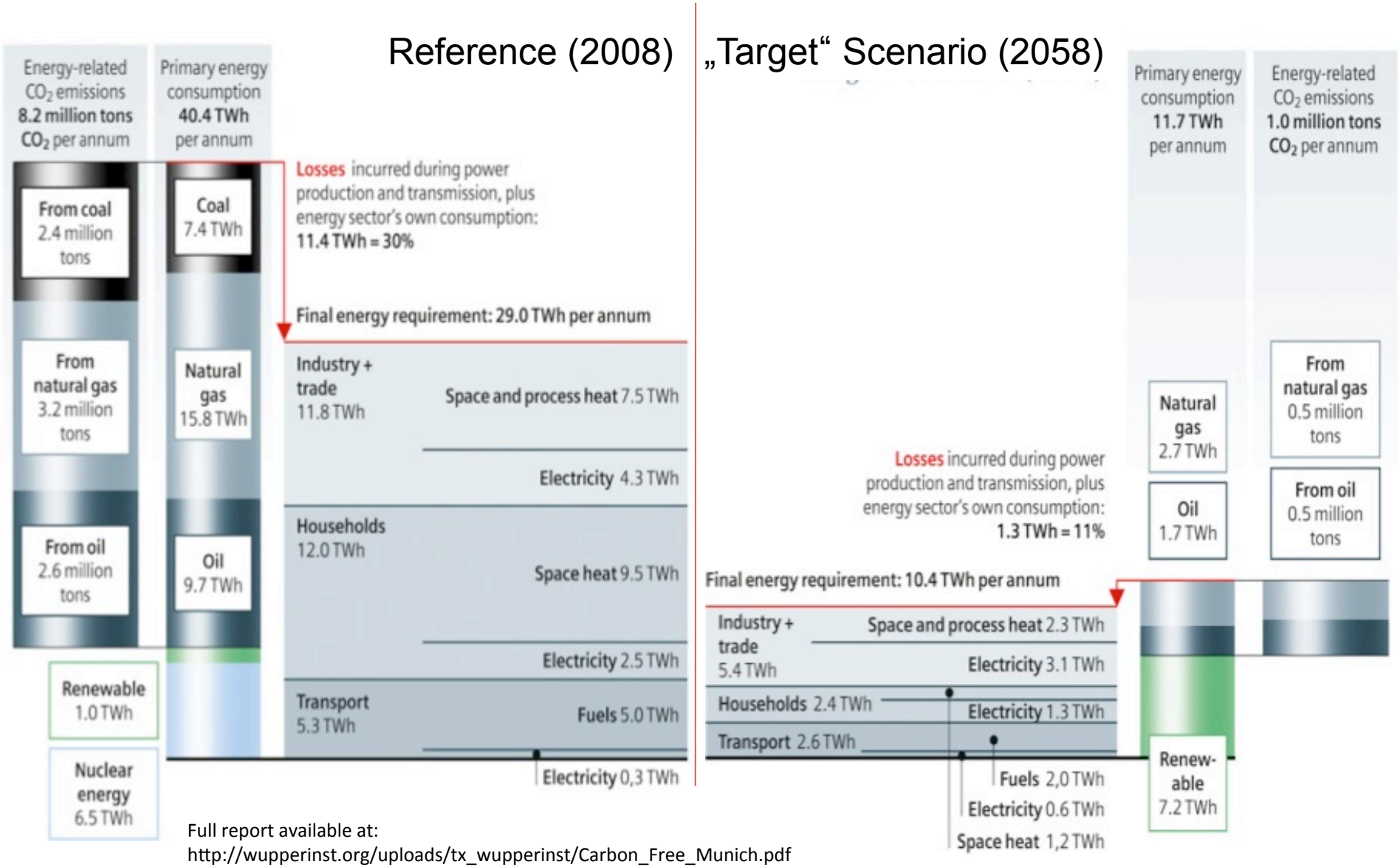


- Thinkable/expected Events and Developments operates on single elements of system model
- These events/developments can have different characteristics.
- A cone of **thinkable and plausible futures** emerges

Scenarios are images of the future, they illustrate development possibilities of an specific system in a roughly way.
They are not predictions!
Scenarios are asking "**what happens if …?**"

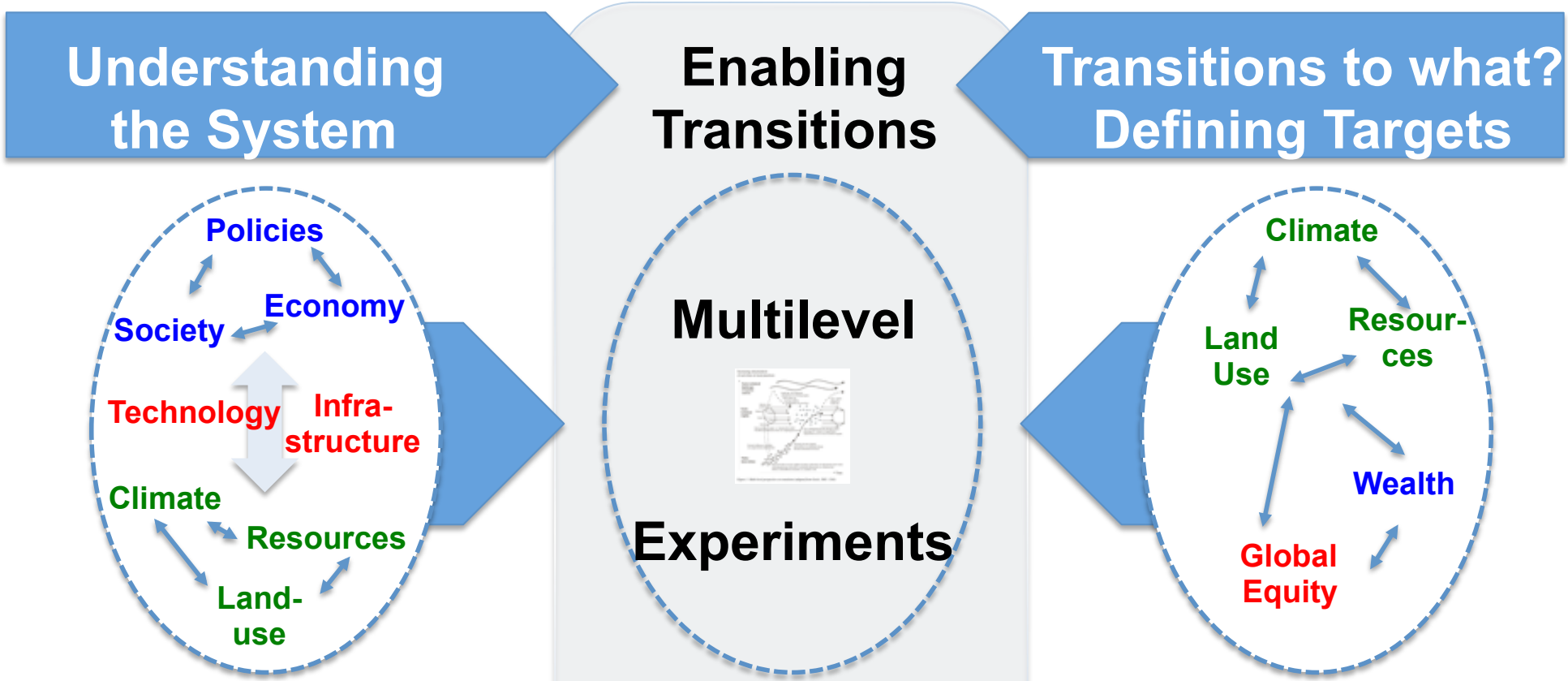
Example: Paths towards a carbon-free future for Munich in 2058

Energy demand and related CO_2 emissions in "target scenario"



Full report available at:
http://wupperinst.org/uploads/tx_wupperinst/Carbon_Free_Munich.pdf

Transformation knowledge



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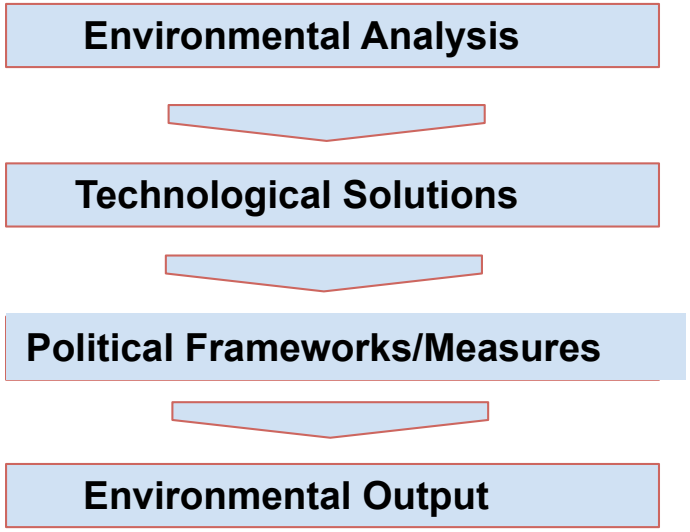
Understanding (socio-technical) Transitions

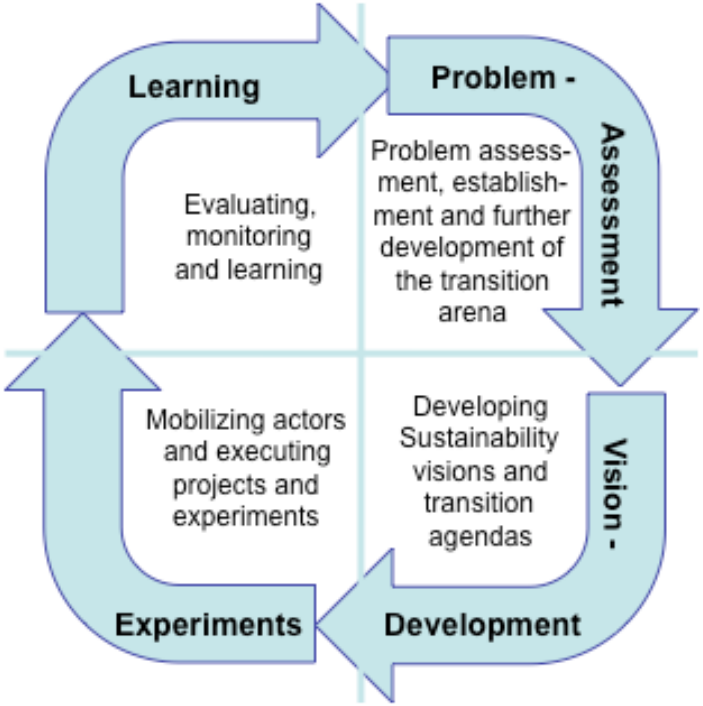
From a linear to a cyclical Transition Model

„Reality is made of circles. But we see straight lines“ Peter Senge, The 5th disciplince

The linear technological model



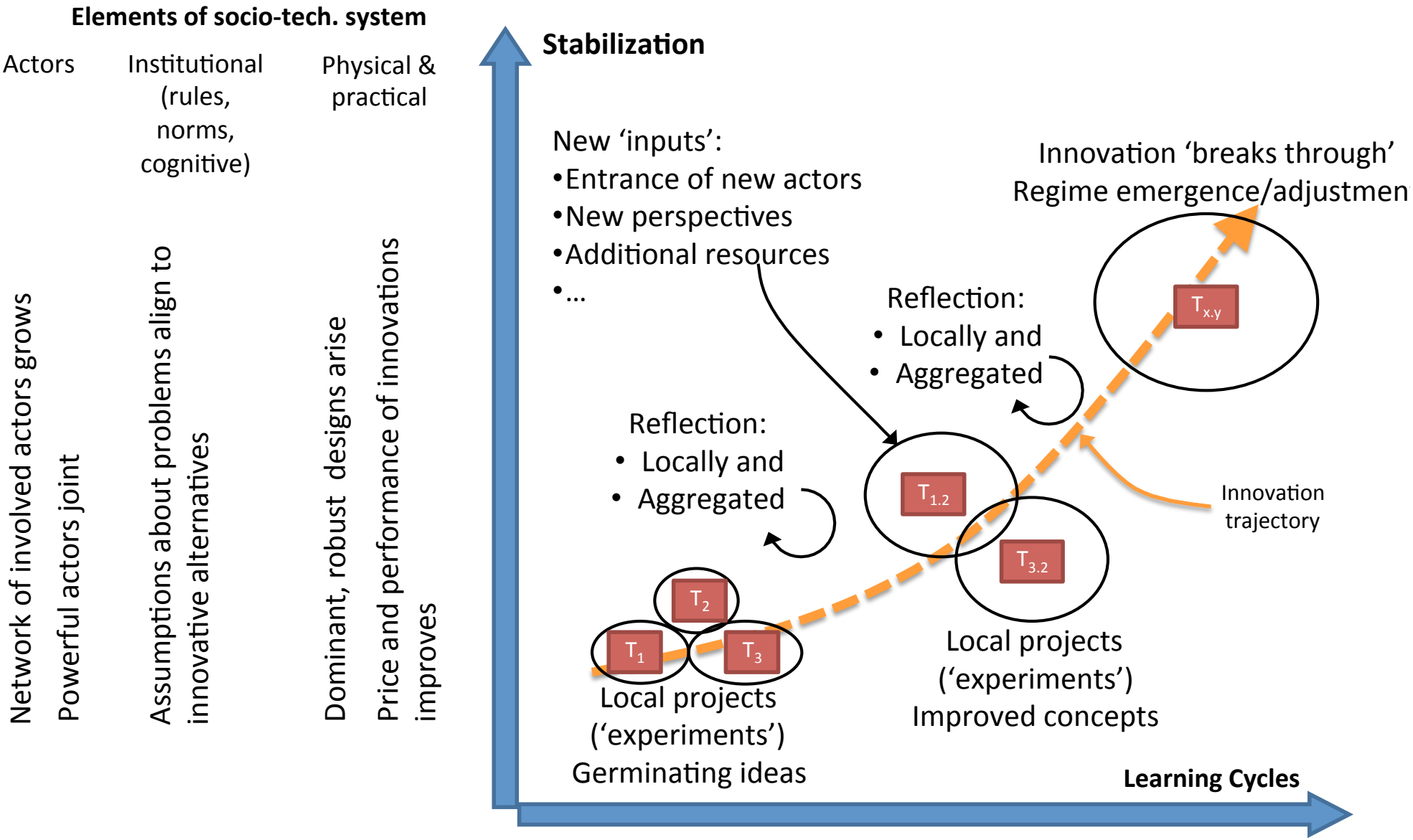
The cyclical transition model



Natural and technical science driven
(focus on market and state-transformation-modes)

Social Science driven
(embedded technologies, variety of societal transformation modes)

Trajectory of innovations emerging from iterative 'learning' cycles



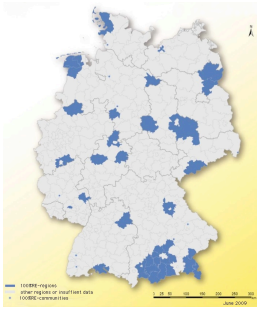
The central role of ‘real experiments’ in the transformation process: e.g. from communal to state-level

Climate Protection Plan NRW

Initiativkreis Ruhr®

"Low Carbon Ruhr – Innovation City"

100% RE communities



Large scale implementation

Problem - Assessment

Problem assess-ment, establish-ment and further development of the transition arena

Local climate protection and air quality assessments

Vision - Development

Developing Sustainability visions and transition agendas

Experiments

Mobilizing actors and executing projects and experiments

Learning

Evaluating, monitoring and learning

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Messages

- Transition research comprise the generation of three types of knowledge:
  - System
  - Target
  - Transformation
- Transformation process can be better understood as iterative learning process (rather than straightforward induced reactions to science and technology innovation)
- Transformation knowledge can be better (only!) be obtained by reflecting on ‘real experiments’.

Mapping RES Initiatives in the Danube Region

Are there ‘real experiments’ out there in the Danube Region?

… we are sure there are a lot of them!

Help us by mapping interesting examples you know (e.g. projects, programs, etc.) how to tap renewable energy sources in the Danube Region

Interactive Workshop:

Identifying research gaps for the energy transition in the Danube Region

- Think on research topics that you consider the most relevant in order to advance towards broader application of RES in your national/professional context...

- ... We need your ideas and skills

- … Today from 16:30 to 18:00

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Thanks for your attention!