Stiftung Nagelschneider

Wuppertal Institut für Klima, Umwelt, Energie GmbH

EWACC2012
BUILDING BRIDGES

The role of renewable energy for sustainable development

Presentation:
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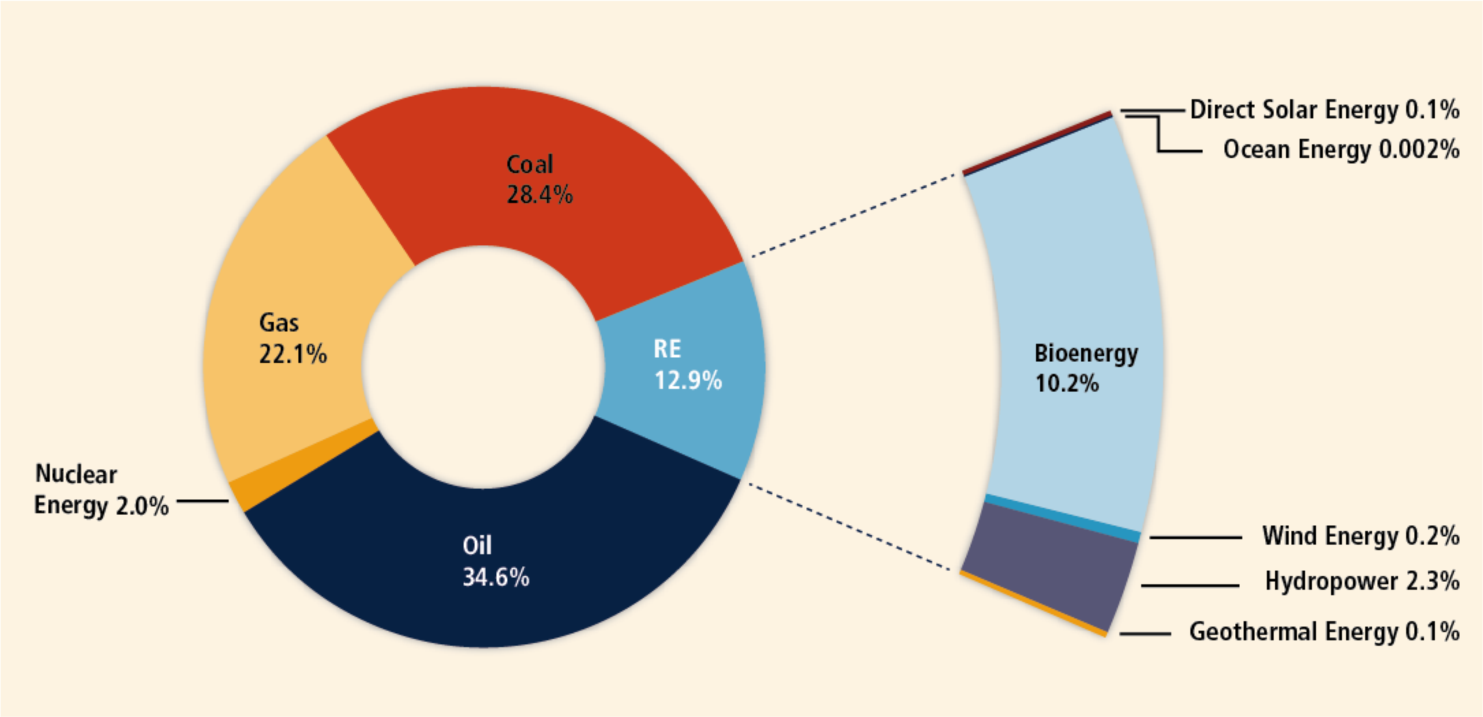
General need for sustainable energy system transition

Global energy system is still fossil fuel dominated and not sustainable

- The global energy system is still fossil fuel dominated and amongst others GHG emissions from the provision of energy services contribute significantly to the increase in atmospheric GHG concentration
- A general need for energy system transition exists to mitigate climate change and solve additional challenges



Future energy system faces various challenges

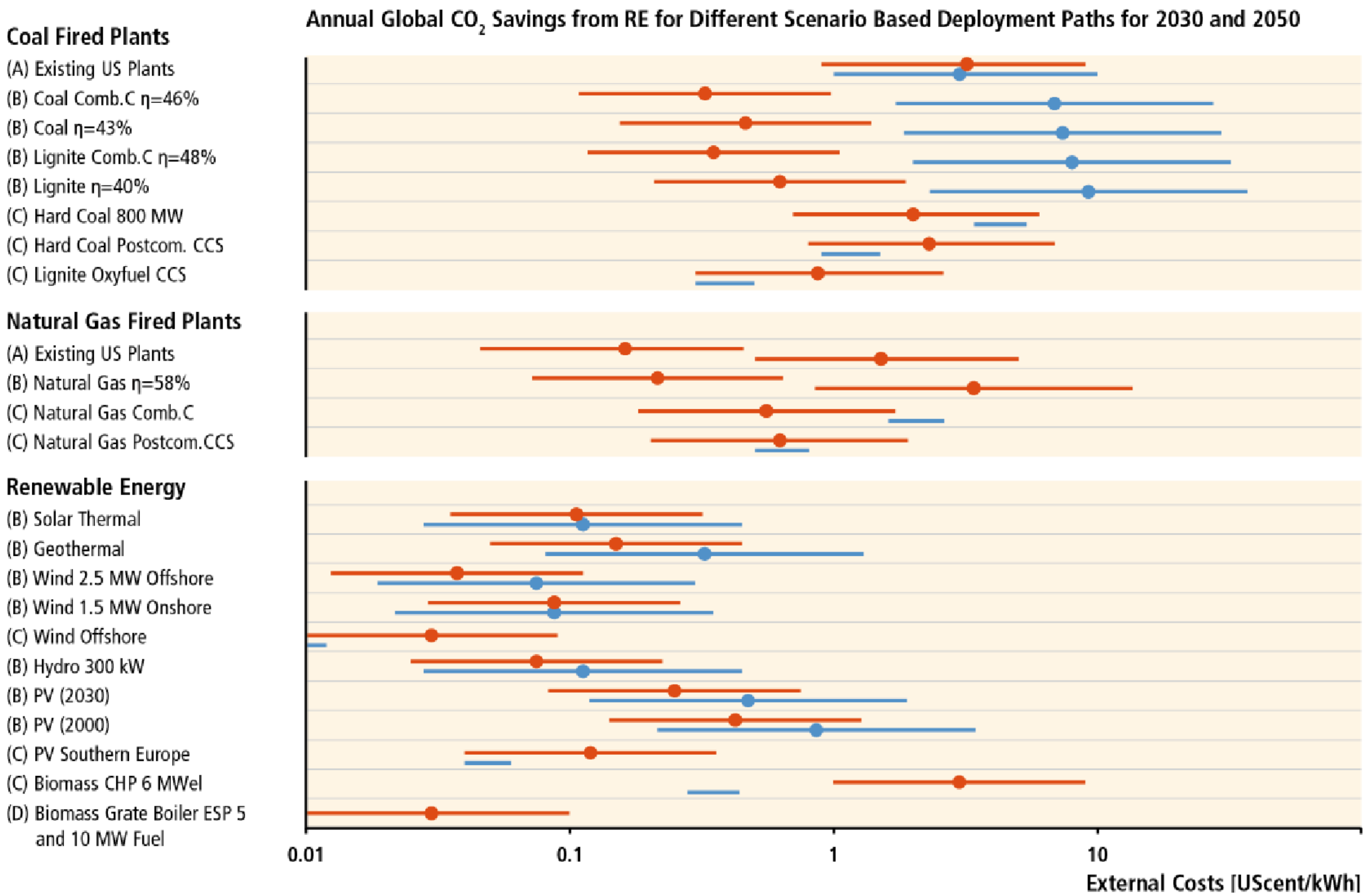
Sustainable energy system transition requires a multi-dimensional perspective - complex transition task

- Reliability (energy supply on demand)
- Broad access to energy (reduce energy poverty)
- Security of energy supply (reduce the dependency from conventional fuels)
- Compatibility with environment
- Economic efficiency (guarantee competitiveness of consumer)
- Compatibility with social concerns (affordable energy consumption)
- Risk minimisation
- Industrial impulses and employment effects
- Minimal system vulnerability
- Flexibility in terms of changing frame conditions (climate, demography, etc.)

For many sustainable energy transition challenges RE could provide solutions.

An illustrative example for system knowledge

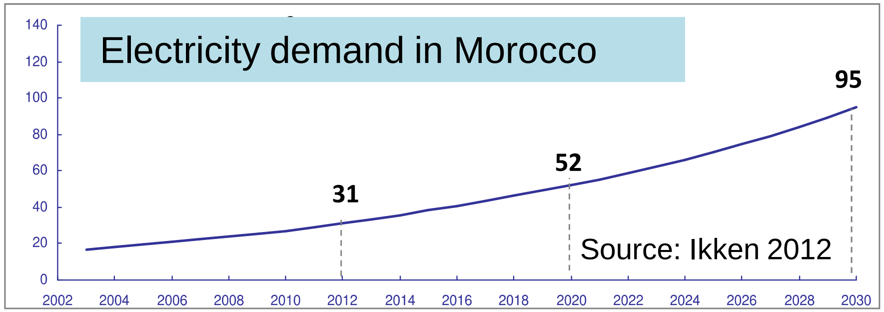
External costs of RE are considerable lower than those for fossil fuels – consideration of external costs increases competitiveness of RE



Sustainable energy system transition to an RE dominated system is necessary

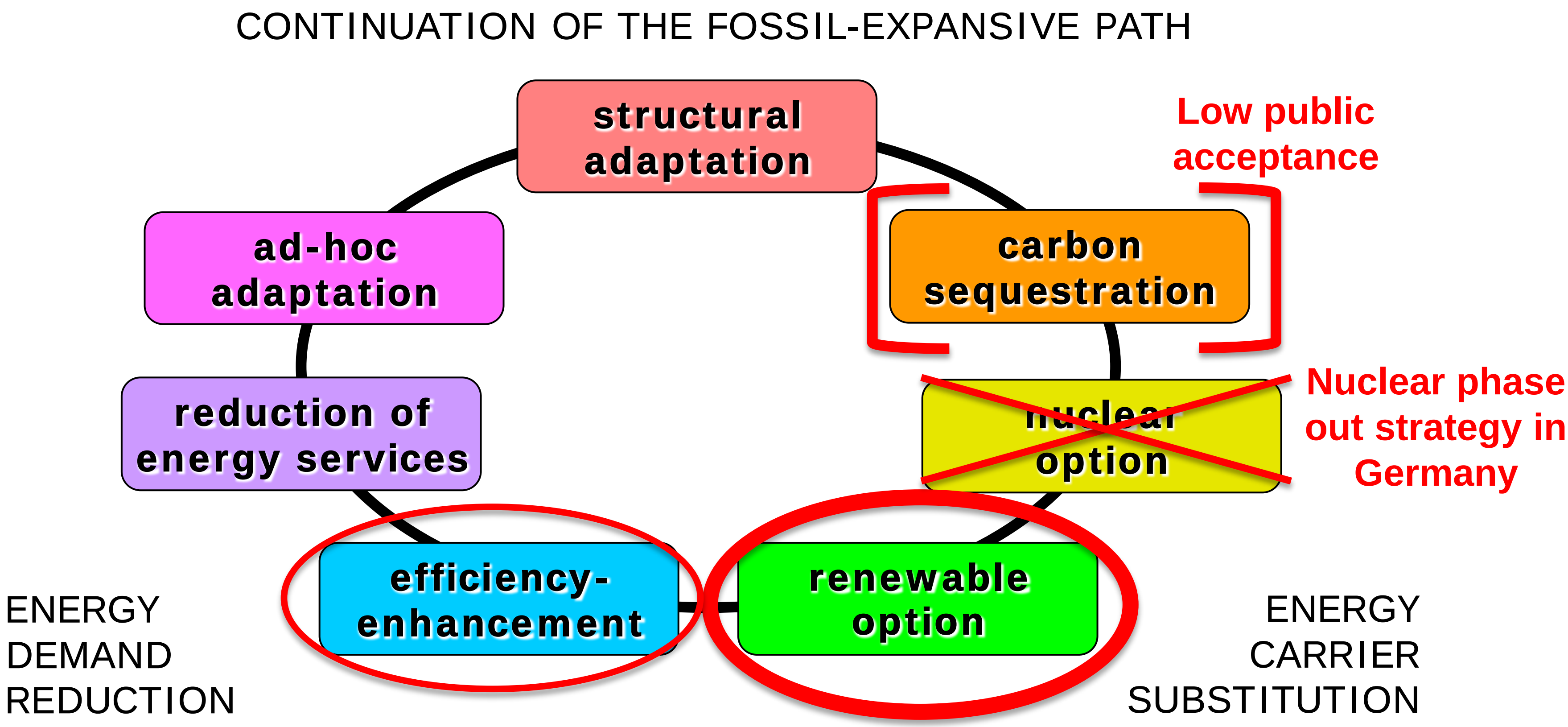
Corresponding transformation process and underlying conditions differ from region to region

- **Case Study „Germany"**
  - „Energiewende" in Germany covers nuclear phase out strategy (2011 -> 2022) as a consequence of nuclear power plant accidents in Fukushima
  - Further deployment of renewable energies and substantial increase of energy efficiency (demand and supply side) as central pillar
  - ……
- **Case study „MENA" region**
  - Energy system transformation combined with growing energy demand
  - Establishing of suitable energy infrastructures and powerful manufacturing industries as prerequisite
  - Energy security and reduction of dependencies of conventionel fuels (e.g. Tunisia, Morocco, Jordan)
  - …….



What are the Options for Climate Protection and Adaptation?

There is no silver bullet – a combination of technologies has to solve the problems – renewable energies are an important part of the story



Efficiency measures reduces the pressure on RE deployment

Renewable energies are supposed to be a major future contributor in the electricity sector in Germany

The sustainable transformation of an energy system is by far more than as a technological challenge

- **Technological challenge**
  - system integration of new technologies including associated infrastructure
- **Compatibility challenge**
  - cooperation between conventional and new technology options
- **Infrastructure challenge**
  - further development of appropriate infrastructures (e.g. smart and super smart grid)
- **Investment challenge**
  - adapt to different investment characteristics (high capital cost, low variable costs)
- **Resource challenge**
  - avoid negative resource impacts (e.g. critical resources) as potential future bottlenecks
- **Stakeholder challenge**
  - persistence forces of established stakeholder
- **Policy challenge**
  - integrated regional, national and international policy initiative (multi-level approach)
- **Social challenge**
  - public perception and societal acceptance (incl. socio-economic impacts)

Resulting challenges for each country are complex

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The Arab Spring strengthened the social dimension of existing political, economical and environmental problems which causes that people in the MENA region are demanding a more inclusive, democratic and sustainable development that must be ensured by investments in new energy infrastructures (sustainable and equitable growth as well as livelihood security)

Shaping the energy system requires holistic assessment of technology options

Definition of sustainability criteria

- **Technical viability**
  - technical know-how and appropriate local expertise are essential
- **Economic feasibility**
  - economic potential (after initial period of investments)
- **Local and global environmental benefits**
  - mitigation of fossil fuel energy consumption, GHG emissions and avoidance of negative environmental side effects, contribution to co-benefits (e.g. air quality improvement)
- **Replicability and marketability**
  - solid basis for potential benefits in other areas if applicated elsewhere
- **Poverty reduction, social equity and gender issues**
  - contribution to poverty reduction, respect social equity rules and gender issues
- **Local manufacturing involvement and employment potential**
  - support involvement of local population and local authorities: create regional employment potential - provide economic impetus (integrate ecological/economic objectives)
- **System compatibility**
  - Compatibility with comprehensive implementation strategies and concepts

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To be sustainable large-scale renewable deployment must ensure positive returns to local communities, bring social and economic opportunities as well as respect for land rights, livelihoods and the environment

Shaping the energy system requires holistic assessment of technology options

Definition of sustainability criteria

In the past ~*2005:*

„Understanding renewable technologies and their potential role in the MENA region“

→

Today*:*

„Understanding the framework, the processes and the impacts of large-scale renewable deployment in the MENA energy systems “

- Technology (feasibility, field application)
- Ressource assessment (wind, solar)
- Economic potential
- Large-scale RES supply schemes?

→

- Infrastructures
- Market integration
- Financial issues
- Legal framework and regulation
- Energy security
- Geopolitics
- Stakeholder framework
- Enviromental impacts
- Technology transfer
- Business opportunities
- Industrial development
- Employment effects
- Livelihood security

.....

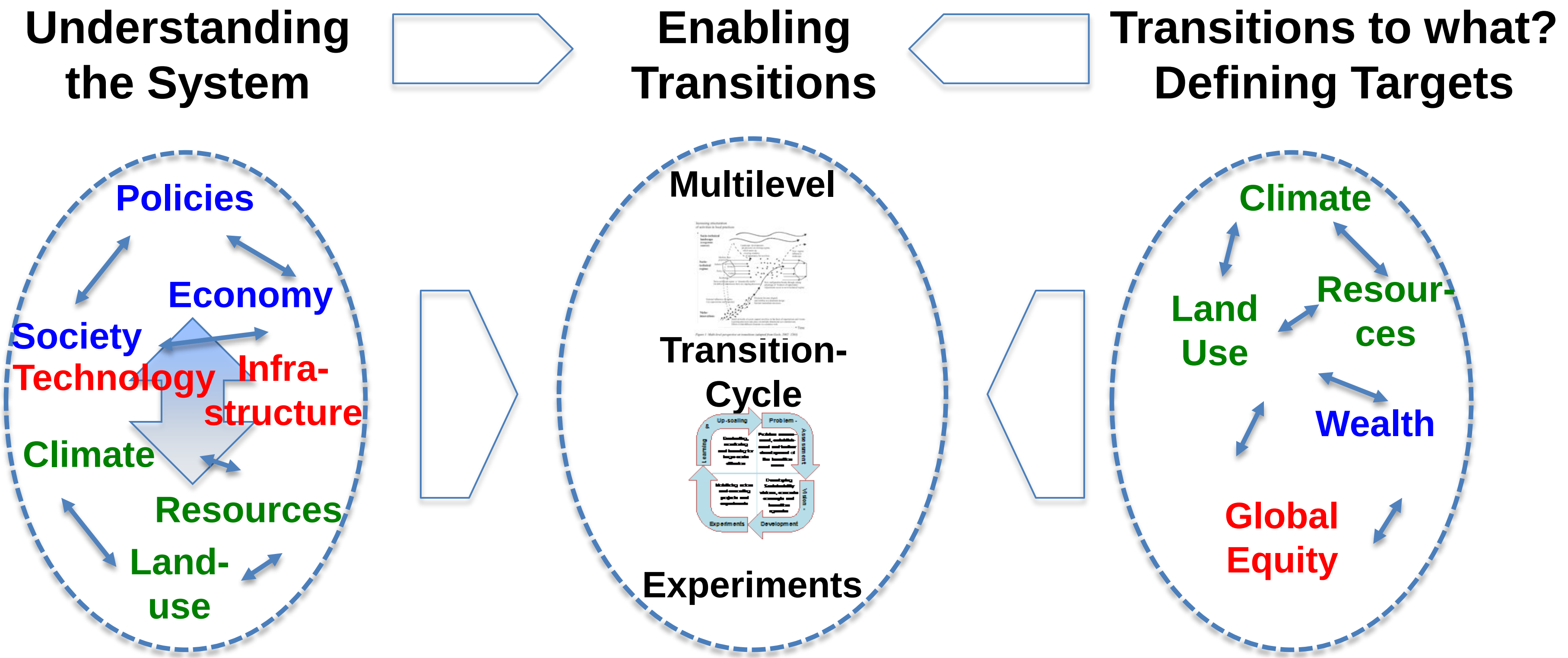
Engineering, economics.

→

Multitude of further disciplines: political science, finance, managment, sociology, law, environmental sciences, …

From transdisciplinary sustainability science to transition science

Science is requested to contribute to sustainable energy system transition - new self understanding of science: enabling transitions



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)

An illustrative example for transition knowledge

Niche applications play major role for the change of socio-technical regime and implementation of necessary transition pathways – the crucial role of experiments

Example:
Energy system transition

Demographic and Societal Developments (e.g. population growth, urbanization, individualization…)

Market structure and rules
Policy framework
Investment environment
Competence and experience
……

100% renewable regions,
Public wind and solar parks,
Local manufacturing structures,
System solutions combining RE and EE
(real term experiments necessary)

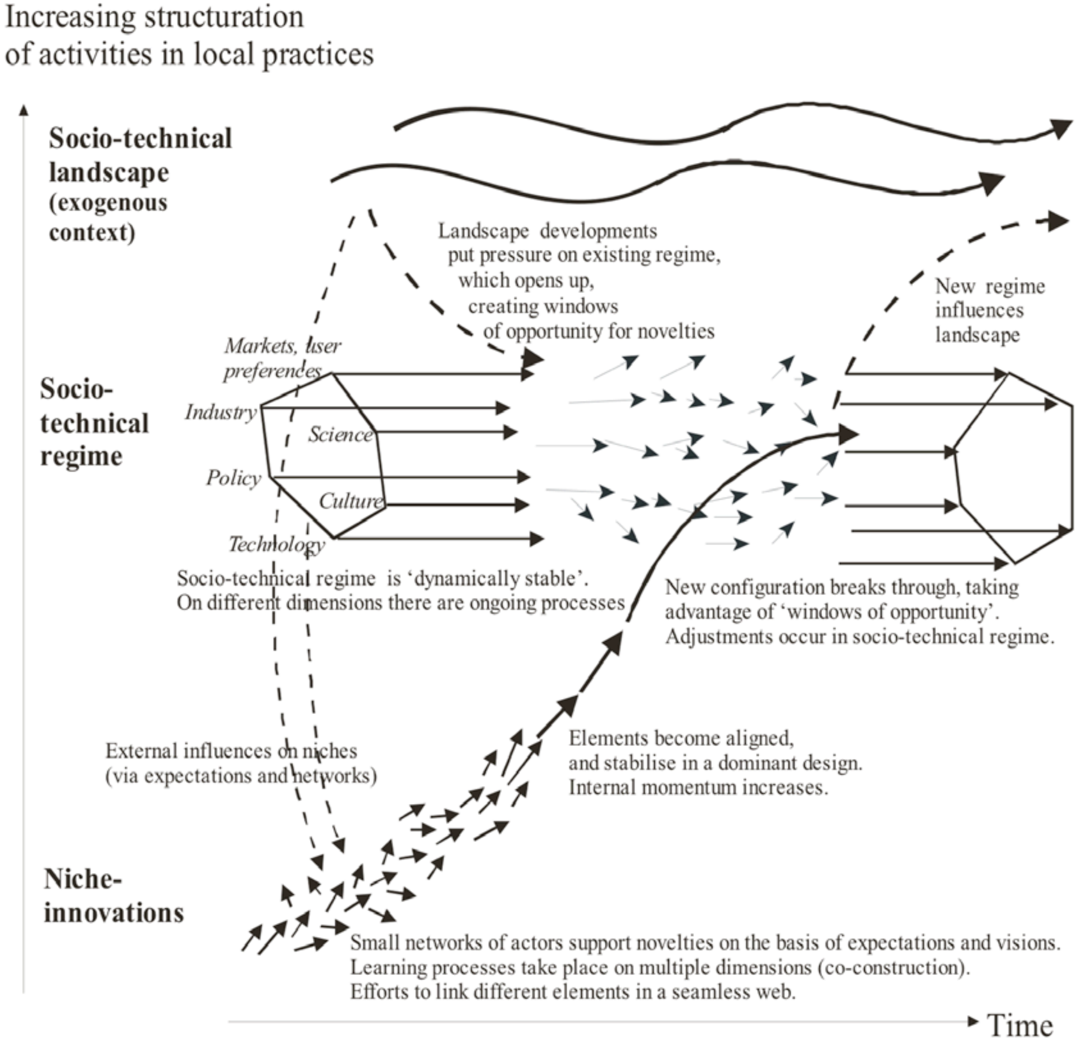


Figure 1: Multi-level perspective on transitions (adapted from Geels, 2002: 1263)

Illustrative examples for science as transition knowledge basis

Provision of neutral information for relevant stakeholder – science as enabling body and facilitator for transition

- **Neutral information about**
  - technologies
  - infrastructures
  - associated economic characteristics
  - environmental impacts
  - system behaviour

  must enable stakeholder in public authorities, parliaments, private sector and civil society to assess energy system develop opportunities based on their own knowledge

- **Information about socio-economic effects**
  - regional economic impulses
  - economic participation
  - entrepreneurial (business) opportunities and industrial cooperation
  - employment effects

  are crucial for social acceptance as well as public and policy makers involvement

Illustrative examples for science as transition knowledge basis

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The DESERTEC Institute for studies on socio-economic development and employment in MENA (DISEM) as regional initiative to provide independent information about relevant socio-economic questions for sustainable development in MENA

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Thank you very much for your attention!