
INNOVATION SYSTEMS - DIFFERENT PERSPECTIVES

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Prof. Dr. Knut Koschatzky



Source: Munich Business School

Prof. Dr. Knut Koschatzky

Phone +49 721 6809-184

knut.koschatzky@isi.fraunhofer.de

Competence Center "Policy and Regions"

Fraunhofer Institute for Systems and

Innovation Research ISI

Breslauer Str. 48

76139 Karlsruhe

Distributed innovation processes

- The recent understanding of innovation as an interactive and systemic process can also be interpreted as a **distributed knowledge sourcing and combining process between different agents**.
- Knowledge generation and implementation processes are supposed to result from **social interaction** between economic actors.
- Distributedness of innovation depends on different influential factors: the **modes** of interrelationships between agents (knowledge base and specialization), the **dynamics** in the distribution patterns of the agents (changes in the distribution patterns), and the **scales** which address the levels of innovation (incremental steps <--> fundamental changes) (Coombs et al. 2003, p. 1126).
- The advantages of distributedness depend on the **absorptive capacity** of firms (Cohen/Levinthal 1990) and on a proper **gatekeeper function** in the firm (Tushman/Katz 1980).

Development of the (national) innovation system concept

- **Friedrich List** (1789-1846) is considered as "father" of the NSI approach. He was economist and politician and developed the concept of "**national systems of production**":
 - Optimization of production,
 - National infrastructure and institutions.
- **Christopher Freeman**: British economist (Brighton), formed the term "**national system of innovation**" (1987) and developed List's idea further. He considers it necessary that the state promotes the technological infrastructure and indicates that short-term strategies (such as wage and currency changes) are of limited effectiveness in order to strengthen the international competitiveness of an economy.
- **Bengt-Åke Lundvall**, Professor at the Faculty of Economics of the University of Aalborg, Denmark; he links the NSI concept with economic aspects of learning (National Systems of Innovation: Towards a theory of innovation and interactive learning ", 1992)
 - innovation as an inherent part of the normal economic activities
 - Interactive learning as core of his approach

Elements of an innovation system

A system consists of **components** in the expression of:

- Institutions (norms, rules, laws, routines) that govern the interactions between individuals, groups and organizations
- Organizations defined by consciously created structures with explicit tasks

and their **relationships** in the form of interactions in the expression of:

- Competition
- Transactions
- Networks (cooperation, cooperation)

The system has a **function** (e.g. the generation of innovations)

The system must be **coherent** and therefore in itself be **distinguishable**, i.e. delimitable

supplemented according to Edquist (2005, p. 187)

Definition and activities

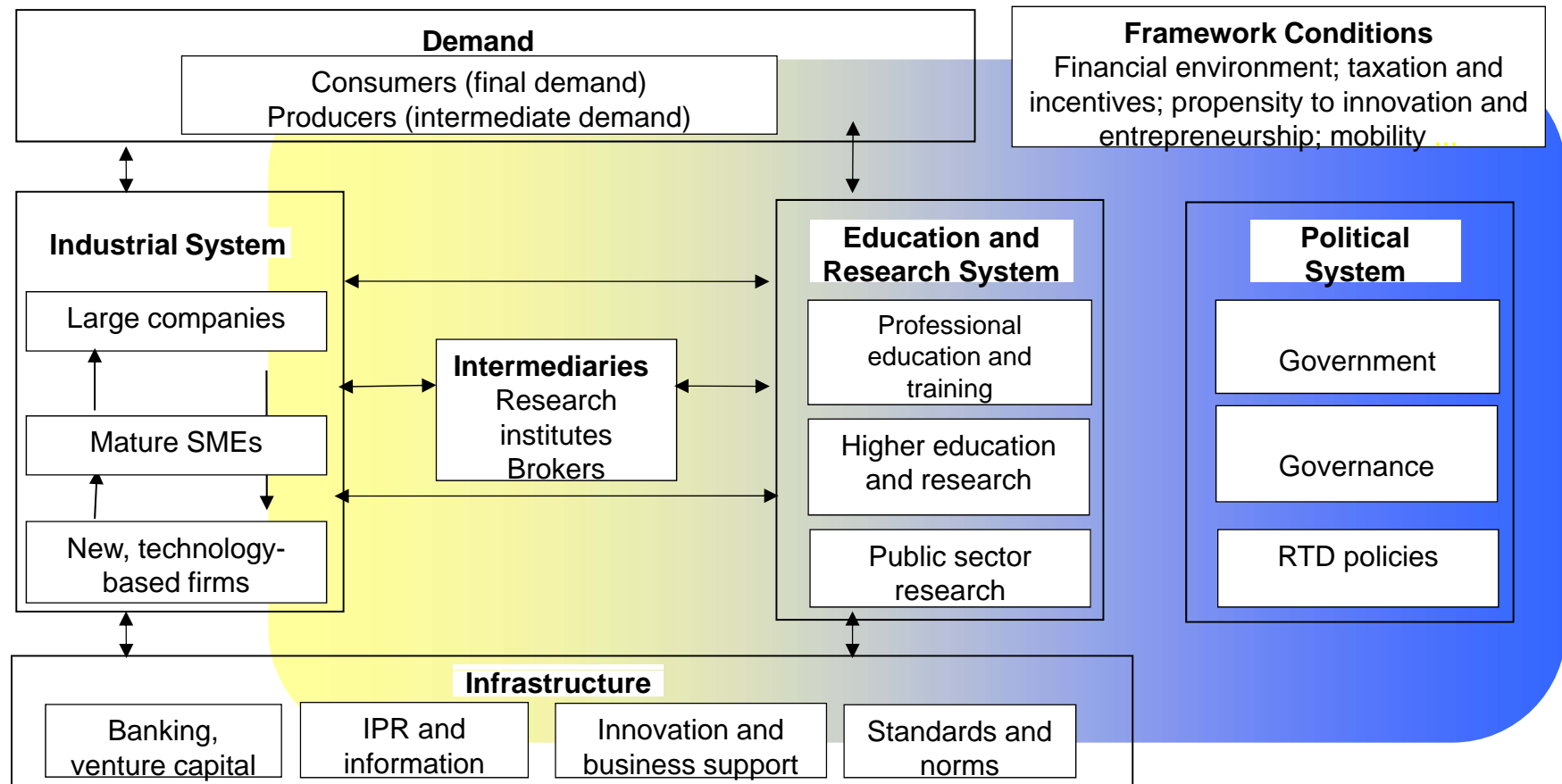
Systems of innovation are defined by "...all important economic, social, political, organizational, institutional, and other factors that influence the development, diffusion, and use of innovation" (Edquist, 2005, p. 182).

Activities of an innovation system are

- Provision of research and development
- Competence building (e.g. education, training, learning...)
- Formation of new product markets
- Demand side induced product development
- Creation of new and change of existing organizations
- Internal and external networks for learning and innovation
- Creation of new and change of existing institutions (tax regulations, environmental regulations, IPRs...)
- Incubation and firm formation activities
- Innovation financing
- Consultancy and transfer offers

based on Edquist (2005, p. 190/191)

The innovation system model



Source: Kuhlmann/Arnold (2001)

Different forms of innovation systems

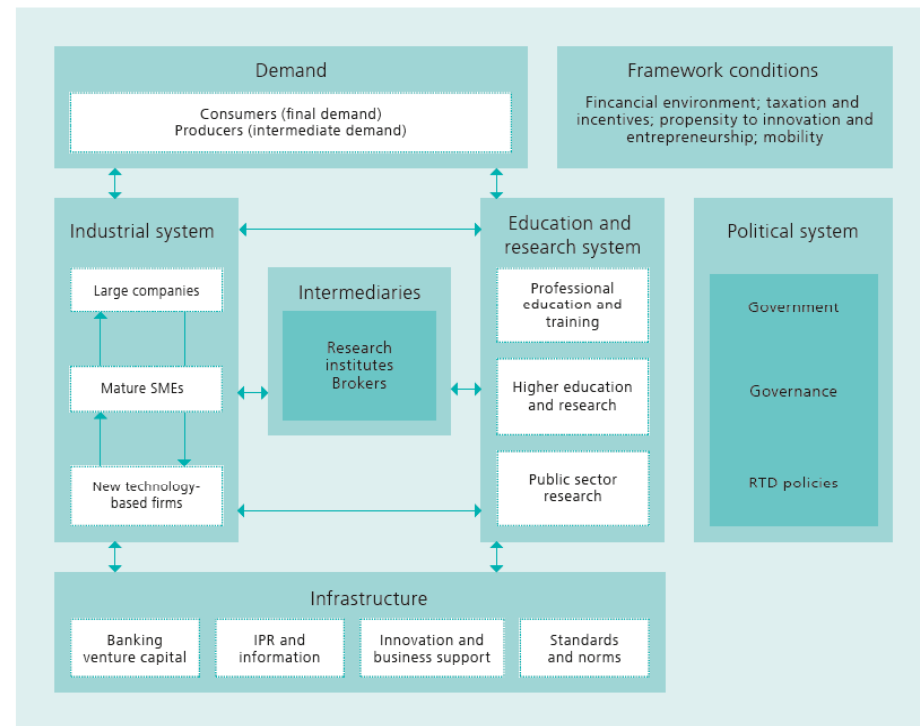
- **Regional innovation system:** a set of interacting private and public interests, formal institutions, and other organizations that function according to organizational and institutional arrangements and relationships in specific regions conducive to the generation, use, and dissemination of knowledge (according to Doloreux/Parto 2005).
- **Sectoral innovation system:** a set of new and established products for specific uses and the set of agents carrying out market and non-market interactions for the creation, production and sale of these products (according to Malerba 2002).
- **Technological innovation system:** It consists of dynamic knowledge and competence networks. In the presence of an entrepreneur and sufficient critical mass, such networks can be transformed into development blocks, i.e. synergistic clusters of firms and technologies within an industry or a group of industries (according to Carlsson/Stankiewicz 1991).

Changes in innovation systems

- Due to the dynamic character of innovation processes, also **innovation systems have to continuously adapt** to new challenges and competitive change.
- Although path dependency results in quite stable organizational structures over a certain period of time, **organizations itself and interfaces between them change** more frequently.
- Changes induced by the increasing globalization since the early 1990s and the increasing complexity and interrelatedness in innovation processes had also impacts on the German innovation system.
- **New organizations** emerge, **new forms of governance** are introduced (e.g. in the higher education system), **new policies, instruments and programmes** are implemented.
- Also **interfaces and transfer bridges** change: Collaborations between **heterogeneous partners** (i.e. belonging to different sub-parts of an innovation system) develop and the modes of collaboration between them change.

A too simplistic view on actor groups, user demands and socio-cultural aspects?

- **Macro perspective:** industrial system, education and research system, system of intermediaries, political system, "demand"
- **Meso perspective:** small and large firms, manufacturing and services, sectors/technologies, HEIs, non-university research institutes, TTOs, chambers of industry and commerce, parliament, government, ministries
- **Micro perspective:** Who are the relevant organizations and people? Who has specific bargaining powers? What are specific user demands? How do socio-cultural aspects shape and influence innovation processes?

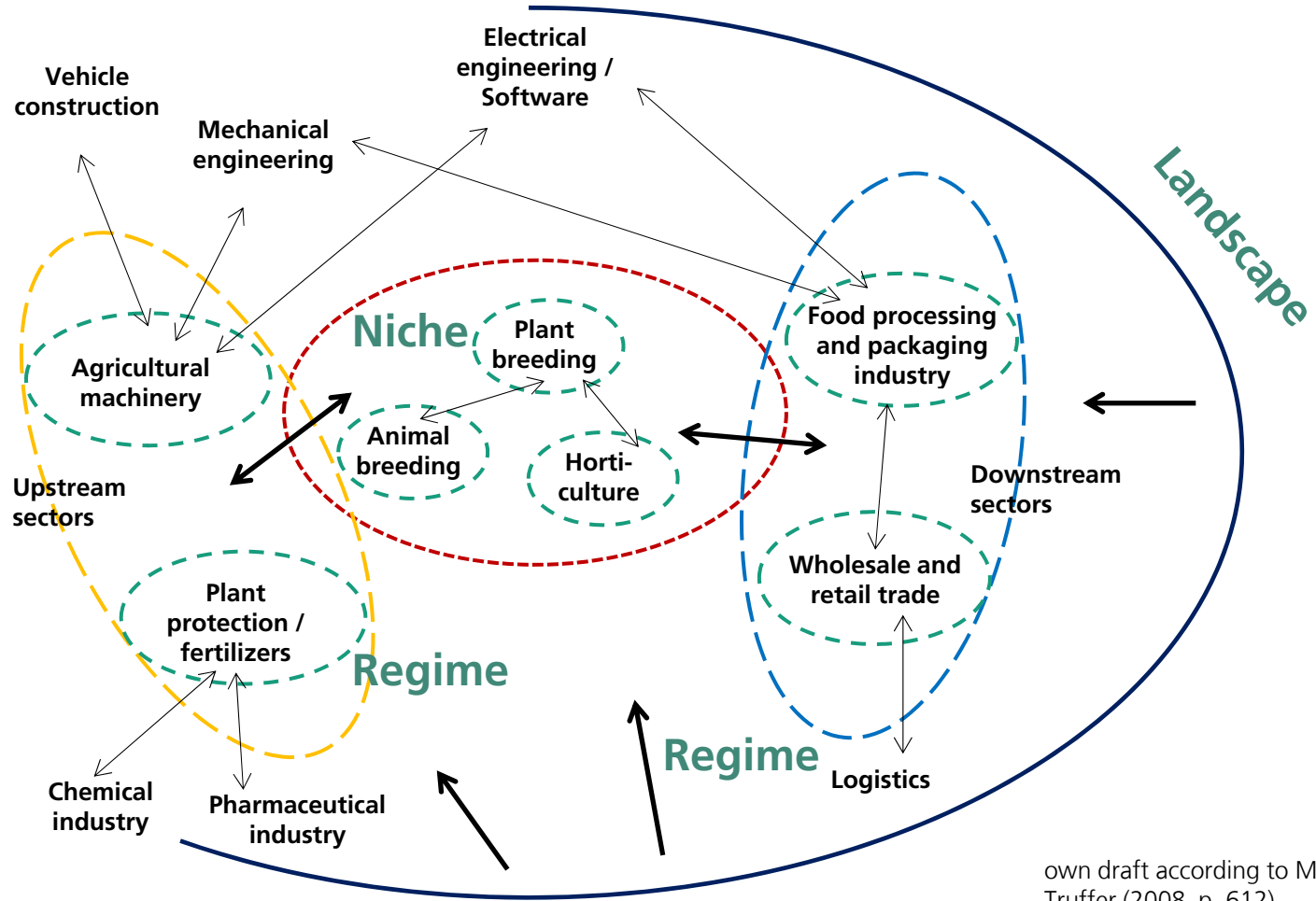


Source: Koschatzky (2012) according to Kuhlmann and Arnold (2001, p. 2)

New approaches

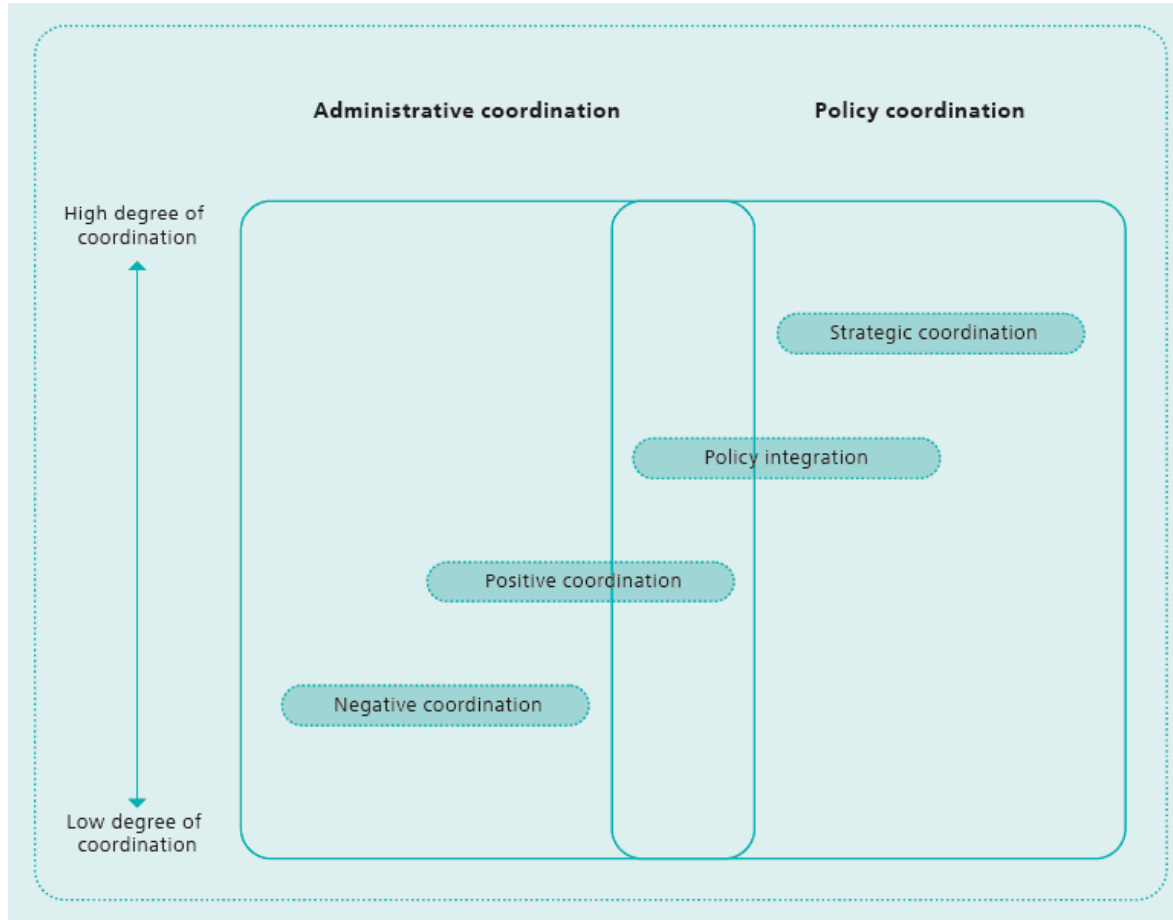
- Attempts to develop **multi-level conceptual frameworks** for the comprehensive analysis of sectoral and technological innovation and for bridging the different territorial scales in innovation policies.
- **New elements:** multi-level perspective (MLP) defined by landscape, regimes and niches, the extension of sectoral innovation system approaches by the integration of a socio-technical systems, mission- and demand-oriented perspective (Geels 2004), and the functional perspective (Hekkert et al. 2007, Hekkert/ Negro 2009).
- **Landscape** as macro level: set of factors that influence innovation or transition processes but are hardly (or only in the long run) affected by themselves (Markard/Truffer 2008).
- **Socio-technical regime:** coherent, highly interrelated and stable structure at the meso-level characterized by established products and technologies, stocks of knowledge, user practices, expectations, norms, regulations, etc. It represents the selection environment for technological development in a certain field or sector (Markard/Truffer 2008).
- **Niche:** local level of innovation processes. Protected space or incubation room, in which new technologies or socio-technical practices emerge and develop isolated from the selection pressures of 'normal' markets or regimes (Markard/Truffer 2008).

Multi-level framework innovation system in agriculture



own draft according to Markard/ Truffer (2008, p. 612)

Types of policy coordination



Source: Lindner (2012) based on Braun (2008, p. 231)

- **Negative coordination:** highly formalized hierarchical procedures
- **Positive coordination:** shared perspectives, coordination in interdepartmental committees
- **Policy integration:** Coordination of policy goals between different actors
- **Strategic coordination:** Development of far reaching visions and future-oriented strategies

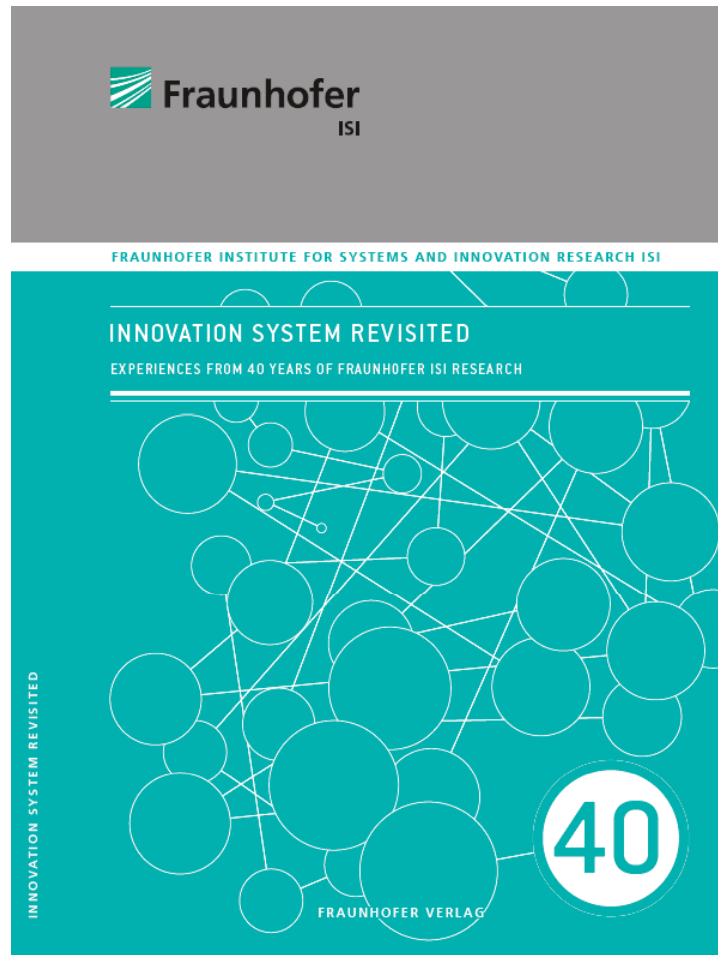
Requirements and modes of policy coordination

- Understanding that **advantages of coordination and collaboration** are larger than possible disadvantages (*culture of exchange*)
- Implementation of **New Public Management principles** (mainly for improvement of vertical coordination)
- **Discursive and participatory processes** (reflexive governance, transition management) and use of strategic intelligence through foresight, technology assessment, evaluation, benchmarking
- Establishment of **bridging organizations** to improve coordination capacities
- **Organizational mergers** (within ministries or public organizations)
- **Political leadership** (support from high levels of politics)

Different sources from Fraunhofer ISI (2012)

Conclusions

- The innovation system concept is a **necessary and helpful tool** for understanding the systemic aspect of innovation processes and for the formulation of appropriate policies.
 - In its classical form, it is a **static concept** and does not take the dynamic aspect of economic and technological developments and changes in political approaches into account.
 - **User demands, mission-oriented policies** and increasing needs for **policy coordination** have to be incorporated in the IS approach.
 - The **multi-level perspective** (MLP) is one way to overcome these weaknesses.
 - It highlights the **role of protected spaces** (niches) in which new user-oriented solutions can be generated and opens the floor for the integration of **socio-cultural factors** in an innovation system model.
 - Its **weakness** is the exclusion of organisational and institutional structures. "Landscape" as such is too broad. More research is necessary.
 - **Policy** can both use the old and new concepts, but has to deal with appropriate approaches and their implementation by its own.
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**Thank you for your
attention!**

Contact:

knut.koschatzky@isi.fraunhofer.de

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