HITEC DAY

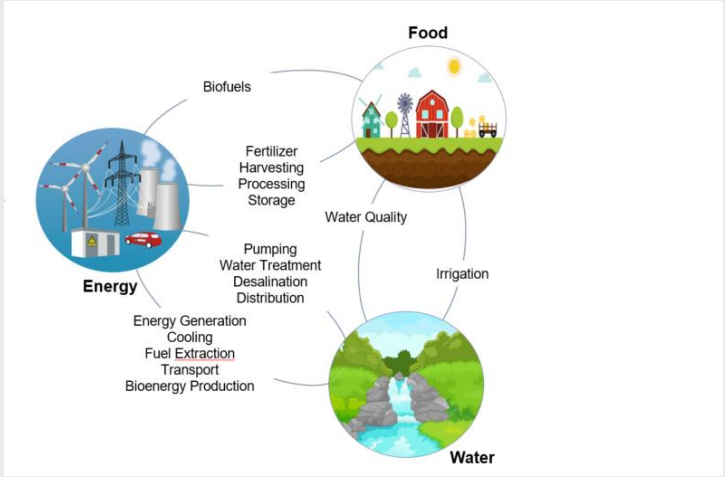
THE THREE DIMENSIONS OF SUSTAINABILITY IN REGIONAL TRANSFORMATION PROCESSES

JUNE 9, 2022 I MIRKO DALLENDÖRFER, SOPHIA DIEKEN
(SANDRA VENGHAUS, FLORIAN SIEKMANN)

BACKGROUND

Systems Analysis and Technology Evaluation (IEK-STE)

Prof. Sandra Venghaus



IEK-STE, FZJ and School of Business and Economics, RWTH Aachen University

Integrated Transformation Processes and their Regional Implementations: Structural Change from Fossil Economy to Bioeconomy (*Transform2Bio*)

Funded by the Ministry of Culture and Science of the State of North Rhine-Westphalia, Germany.

https://www.biosc.de/transform2bio_en

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CONTENTS

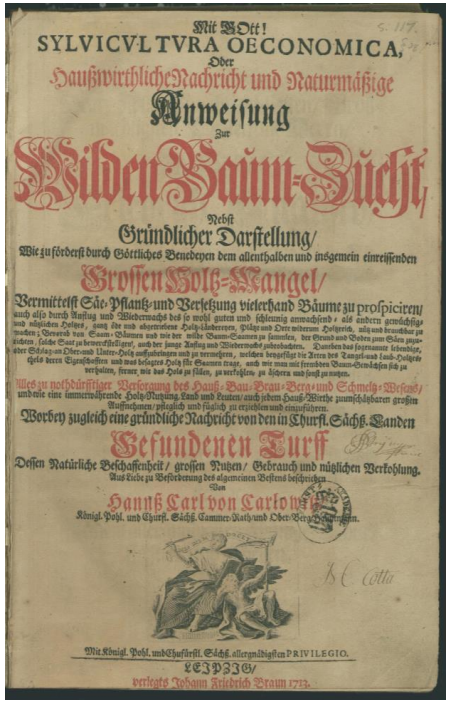
From sustainability to empirical transformation research

WHAT IS SUSTAINABILITY?

Origins in the forestry sector

Wird derhalben die gröste Kunst/Wissenschaft/ Fleiß/ und Einrichtung hiesiger Lande darinnen beruhen/ wie eine sothane ***Conservation*** *und Anbau des Holtzes anzustellen/ daß es eine* ***continuirliche beständige*** *und* ***nachhaltende*** *Nutzung gebe/ weiln es eine unentberliche Sache ist/ ohne welche das Land in seinem Esse* [Existenz] *nicht bleiben mag.*

Hannß Carl von Carlowitz, *Sylvicultura oeconomica, 1713, (S. 105)*


Mit GOtt!
SYLVICVLTVRA OECONOMICA,
Oder
Haußwirthliche Nachricht und Naturmäßige
Anweisung
Zur
Wilden Baum-Zucht
Nebst
Gründlicher Darstellung/
Wie zu förderst durch Göttliches Beydeyen dem allenthalben und insgemein einreissenden
Grossen Holtz-Mangel/
Vermittelst Säe- Pflantz- und Versetzung vielerhand Bäume zu prospiciren/
Alles zu nothdürfftiger Verforgung des Hauß- Bau- Brau- Berg- und Schmelz-Wesens/
Worbey zugleich eine gründliche Nachricht von den in Churfl. Sächß. Landen
Gefundenen Turff
Dessen Natürliche Beschaffenheit/ grossen Nutzen/ Gebrauch und nützlichen Verkohlung.
Hannß Carl von Carlowitz
Mit Königl. Pohl. und Churfürstl. Sächß. allergnädigsten PRIVILEGIO.
LEIPZIG/
verlegts Johann Friedrich Braun 1713.

- Central aspect: use of renewable resources to the extent that they can be re-grown
- An encompassing universal definition is not agreed upon until today

WHAT IS SUSTAINABILITY?

Sustainable development

1

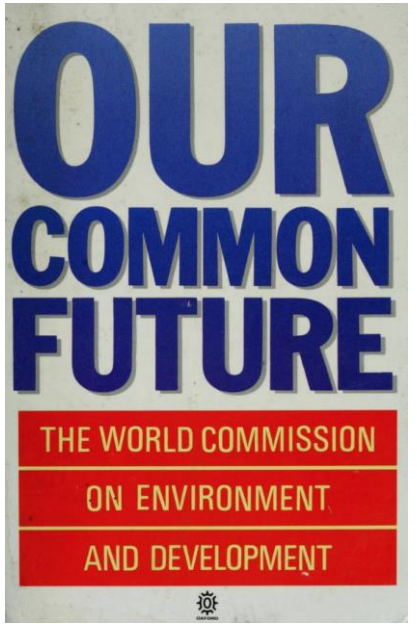
Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Report of the World Commission on Environment and Development:
Our common future, 1987, p. 41

2

In essence, sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development; and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations.

Report of the World Commission on Environment and Development:
Our common future, 1987, p. 43



Report of the World Commission on Environment and Development, 1987

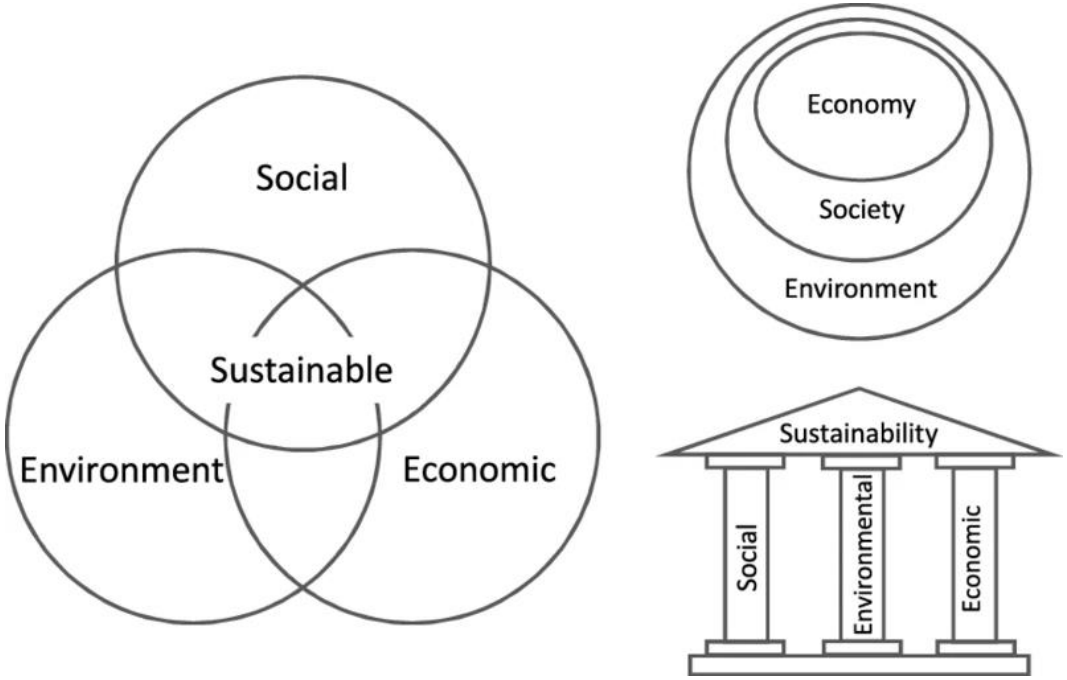
WHAT IS SUSTAINABILITY?

Environmental economics perspective

- Sustainability ➡ Capital stock should not diminish
  - Natural capital
  - Manmade and human capital

➢ Three dimensions of sustainability
  - Environmental: healthy natural environment
  - Social: healthy institutions, social relations, social justice
  - Economic: maintaining economic productivity

- What about trade-offs?

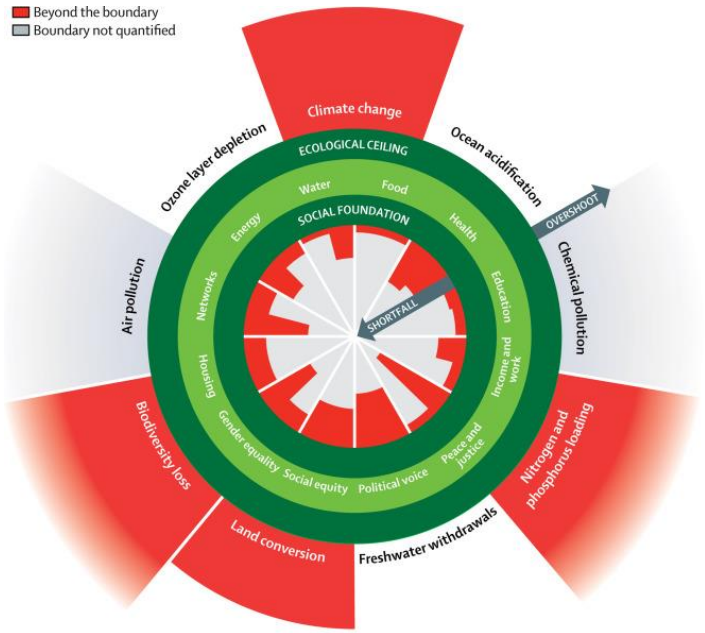


Different representations of the sustainability dimensions (Purvis et al. 2019)

WHAT IS SUSTAINABILITY?

Weak sustainability

- Manmade capital can substitute for natural capital (to an extent)
- Natural resources can be depleted, as long as they are “invested” productively for future generations



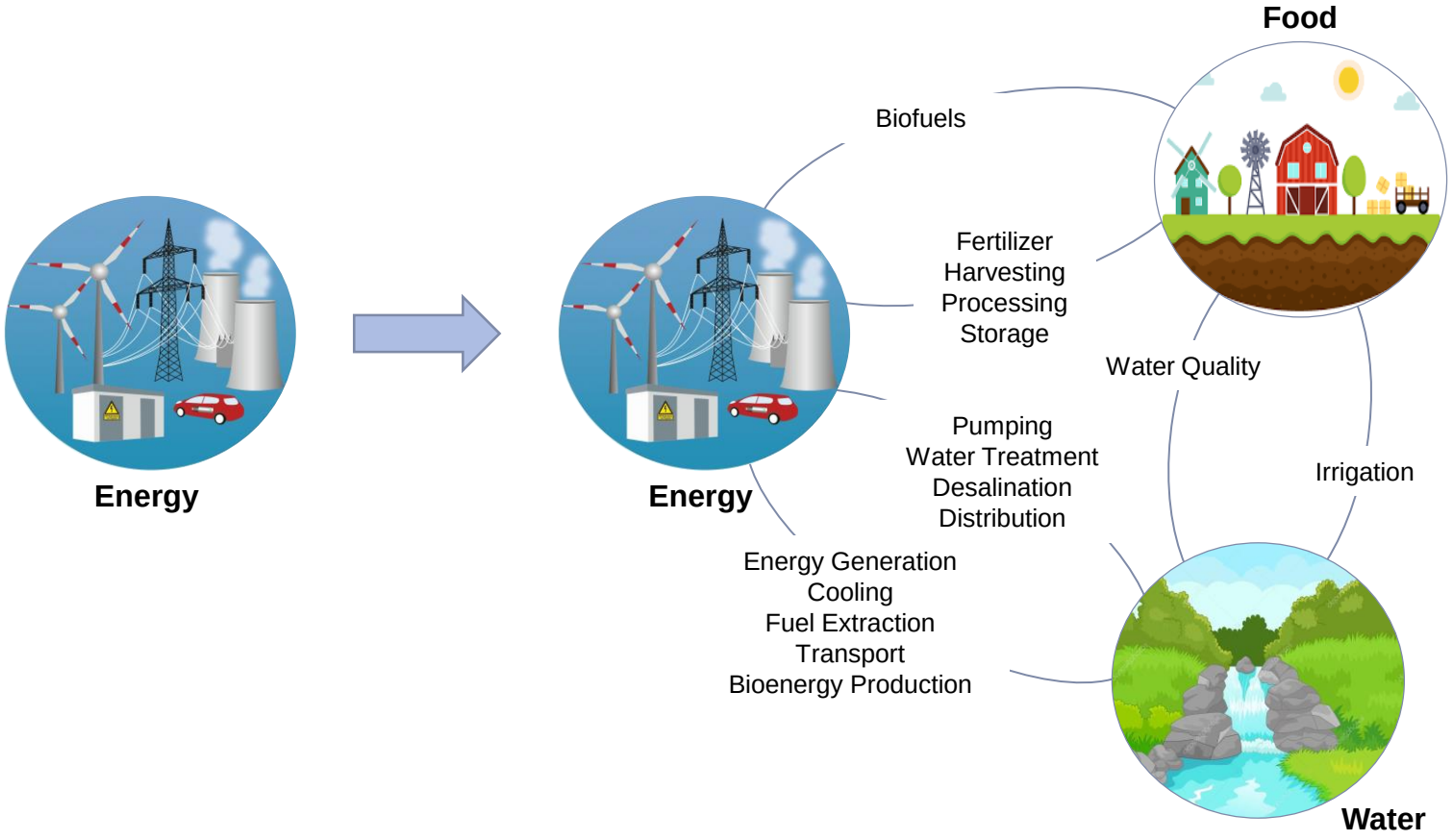
The doughnut model of sustainable development (Raworth, 2017)

Strong sustainability

- Natural capital is not (fully) substitutable but complementary with manmade and social capital, (some) natural resources need to be preserved
- Ecological ceiling: absolute limits to environmental damage, global boundaries as a safe space for human development (Steffen et al. 2015)
- Social foundation: minimum standards of human wellbeing as the basis of sustainable development

COMPLEXITIES OF SUSTAINABILITY

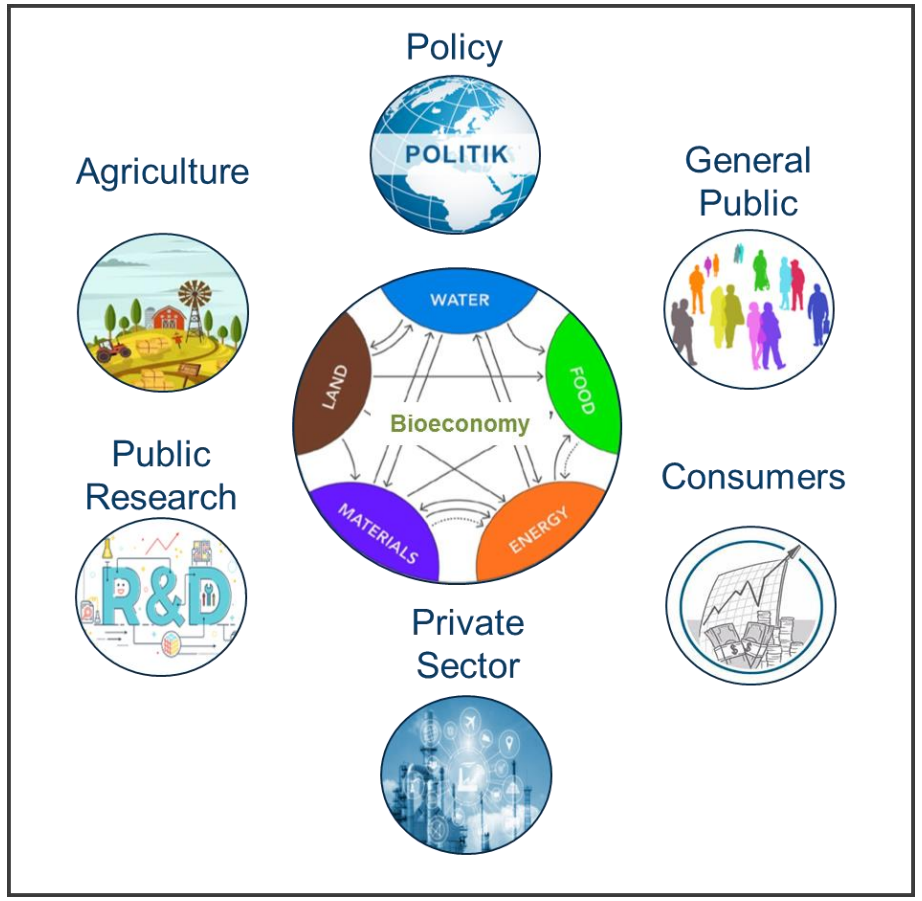
Interrelation between sectors



Source: based on UNC, 2017

COMPLEXITIES OF SUSTAINABILITY

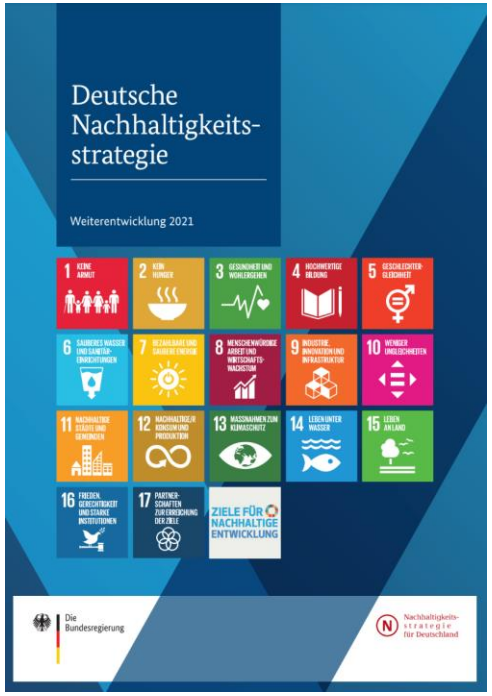
Various stakeholders with diverging understandings, needs, interests and values



COMPLEXITIES OF SUSTAINABILITY

Multiple governance levels

ZIELE FÜR NACHHALTIGE ENTWICKLUNG



COMPLEXITIES OF SUSTAINABILITY

Sustainability transformation as a “wicked problem”

- Solutions to “wicked problems” are not true-or-false, but good-or-bad
- Solutions to “wicked problems” cannot be directly or definitively tested
- Solutions to “wicked problems” are a “one-shot operation” – learning by “trial-and-error” is not possible

There is no optimal solution!

Rittel, H.W.J.; Webber, M.M. Dilemmas in a general theory of planning. *Policy Sciences* 1973, *4*, 155-169, doi:10.1007/BF01405730.

TRANSFORM2BIO

Project Outline

Integrated Transformation Processes and their Regional Implementations: Structural Change from Fossil Economy to Bioeconomy (Transform2Bio)

Systematic identification of transformation pathways for the implementation of a bioeconomy in the Rheinische Revier, Germany that are

(a) **desirable** (from a sustainability perspective)

(b) **feasible** (from a techno-economic perspective), and

(c) **acceptable** (from a stakeholder consensus perspective)

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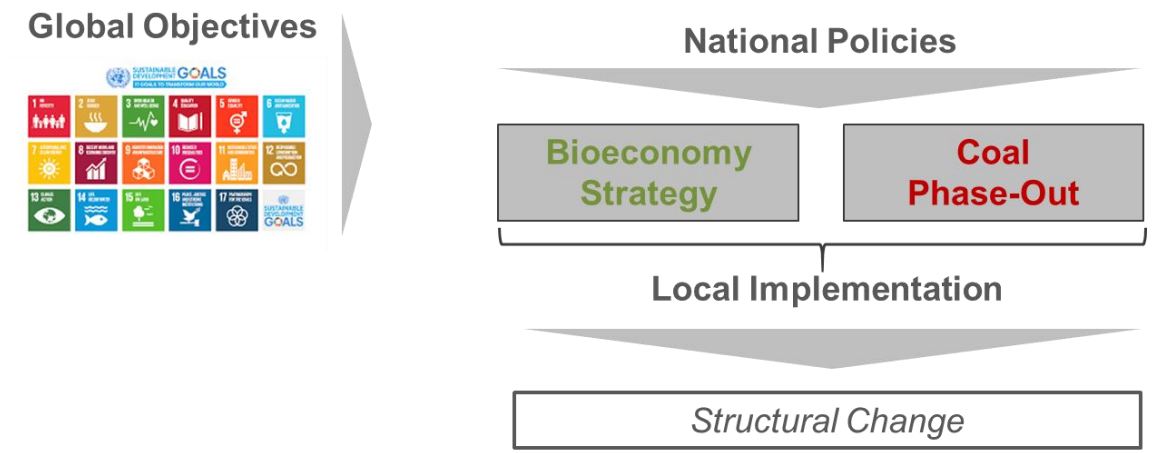
Case Study: Rheinisches Revier



- 2016: the Climate Action Plan of the German Government proposed the implementation of a “Commission for Growth, Structural Change, and Regional Development” (the “coal commission”)
  - to prepare the phase-out of coal power in Germany
  - developing policy instruments to guide the structural change
- 2019: publication of the final report
- An unprecedented transformation process has been set-off driven by funding of 40 billion Euros
- For the Rheinische Revier a focus is set on establishing a ‘sustainable bioeconomy’

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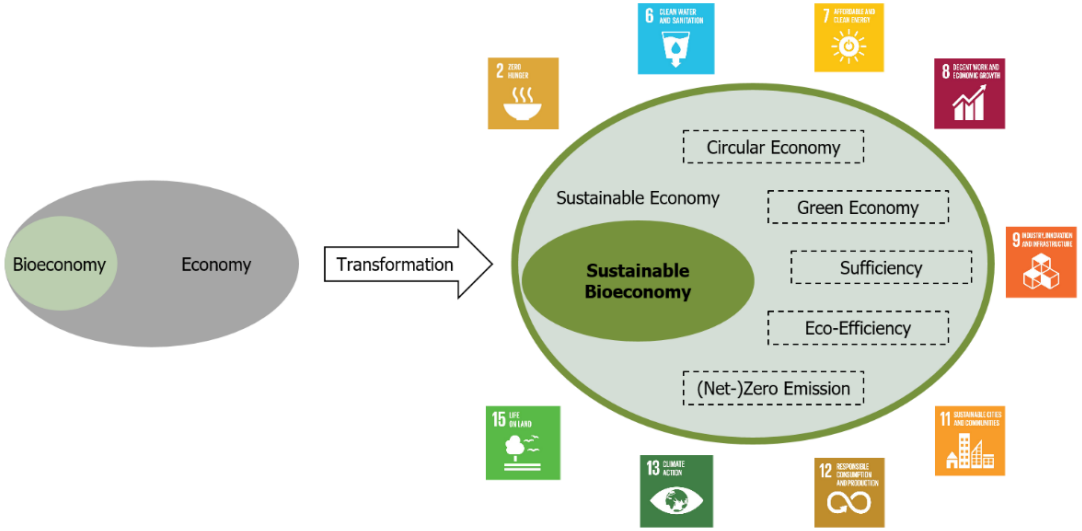
Bioeconomy transformation

The German Bioeconomy Council defines “bioeconomy” as …

- „the knowledge-based production and utilization of biological resources to provide products, processes and services in all sectors of trade and industry within the framework of a sustainable economic system.“



The OECD defines “bioeconomy” as …

- “the set of economic activities in which biotechnology contributes centrally to primary production and industry”.

German Bioeconomy Council. Bioeconomy Policy Synopsis and Analysis of Strategies in the G7, 2013. / OECD. Meeting Policy Challenges for a Sustainable Bioeconomy; 2018; doi: 10.1787/9789264292345-en

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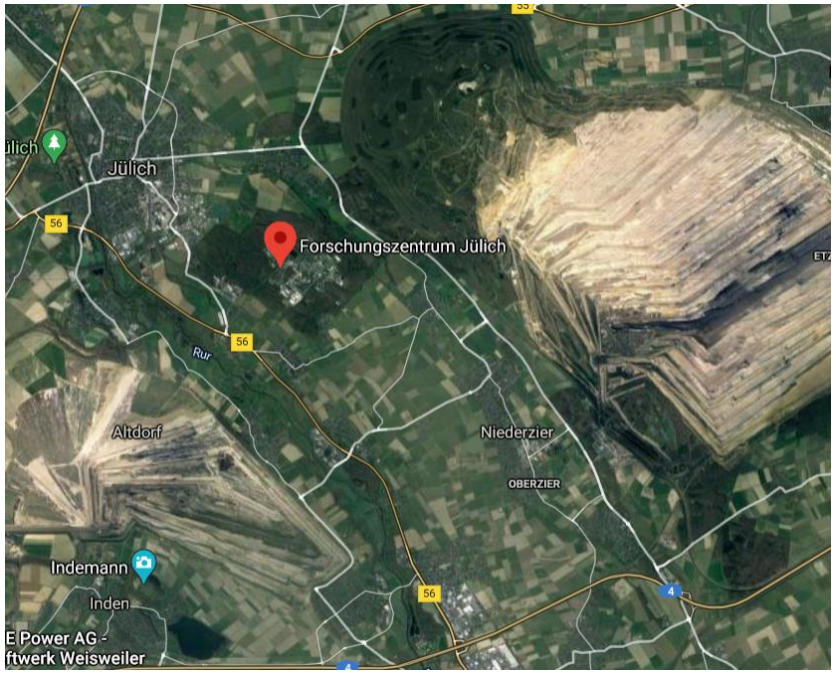
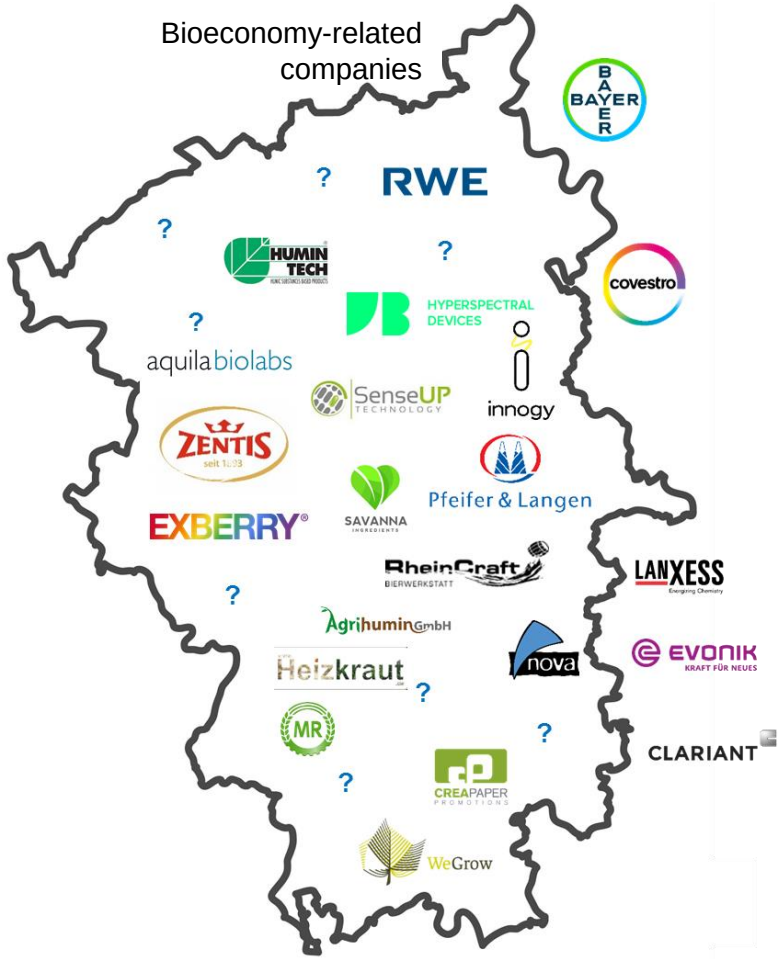
Case Study: Rheinisches Revier



Google 2020: Google maps. (https://www.google.de/maps/place/Forschungszentrum+J%C3%BClich/@50.8877197,6.378711,16834m/data=!3m1!1e3!4m5!3m4!1s0x47bf5c630c1cf66b:0x996c4b391c31866a!8m2!3d50.9052562!4d6.4048035)

- favorable conditions for agriculture (soil, climate, etc.)
- strong food industry and access to local and regional markets (e.g., chemical & pharmaceutical industry, energy, …)
- bioeconomy science and education region
- ‘social movement‘ (strong public opinions / public engagement, dynamic funding environment, dynamic local initiatives and government activities)



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Bioeconomy governance

Bioeconomy policy is spread across different policy domains and levels

Actors, institutions and norms and their interactions impact on the design and implementation of a transformation

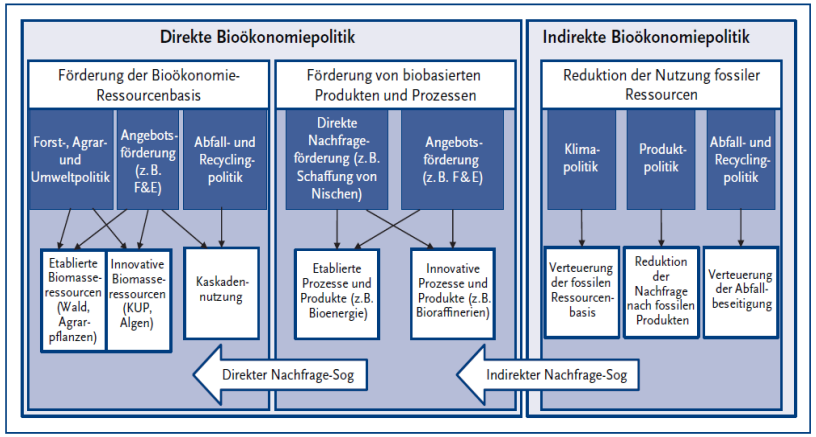
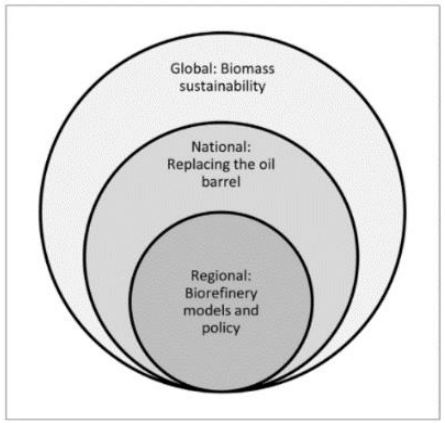


Abbildung 1: Drei Säulen einer Bioökonomiepolitik (Quelle: nach Pannicke et al. 2015)



- Lack of knowledge & shared understanding
- Lack of acceptance & behavioral change
- Sectoral fragmentation
- Conflicts of use
- Lack of participation & legitimation

Gawel, E./A. Purkus/N. Pannicke/N. Hagemann (2018): "Herausforderungen einer nachhaltigen Bioökonomiepolitik„. Ökologisches Wirtschaften-Fachzeitschrift 33(1), pp. 19-20; Philp, J. (2018): "The bioeconomy, the challenge of the century for policy makers“. New Biotechnology 40, pp. 11-19.

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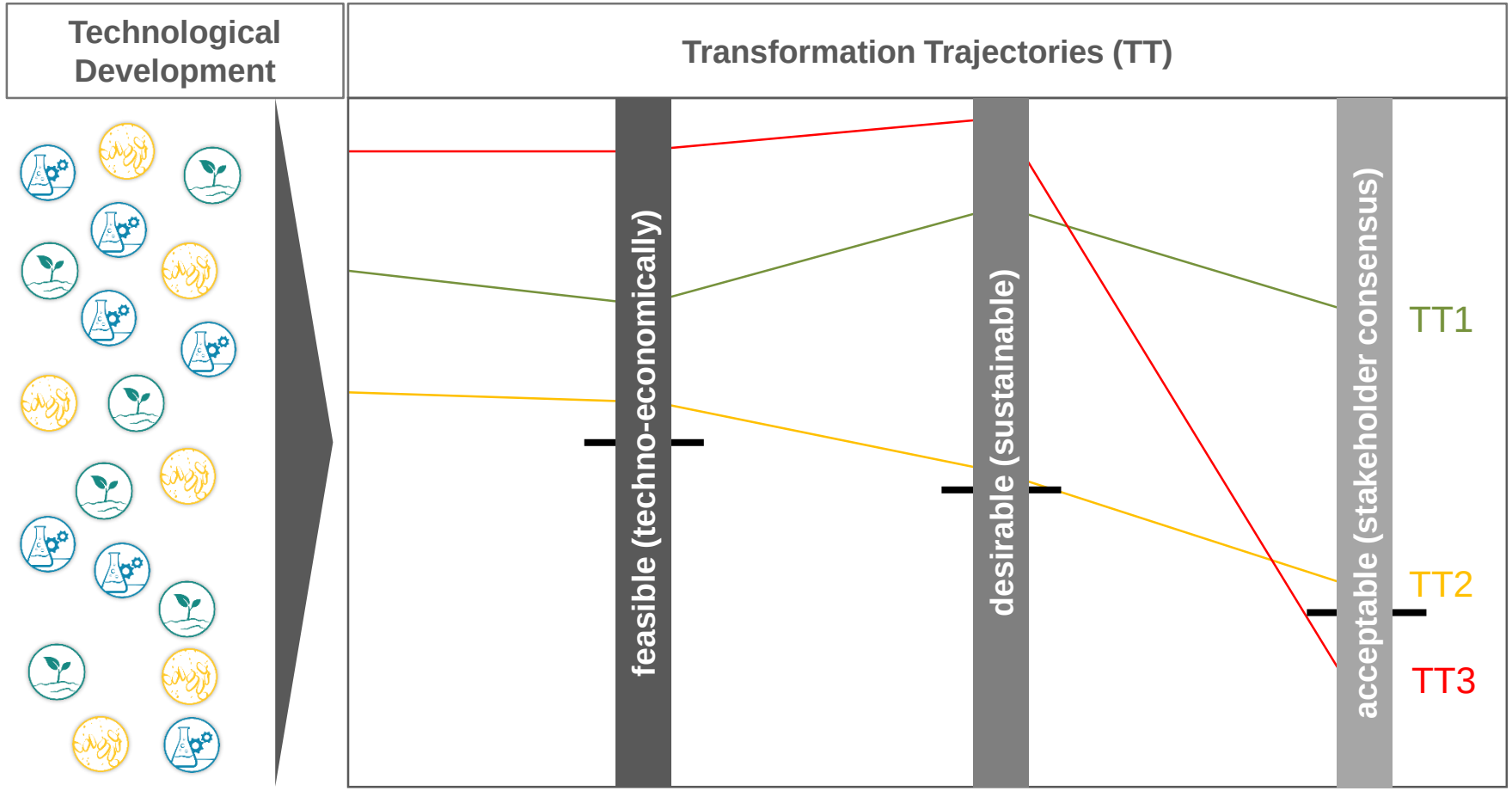

Option: Benchmarking

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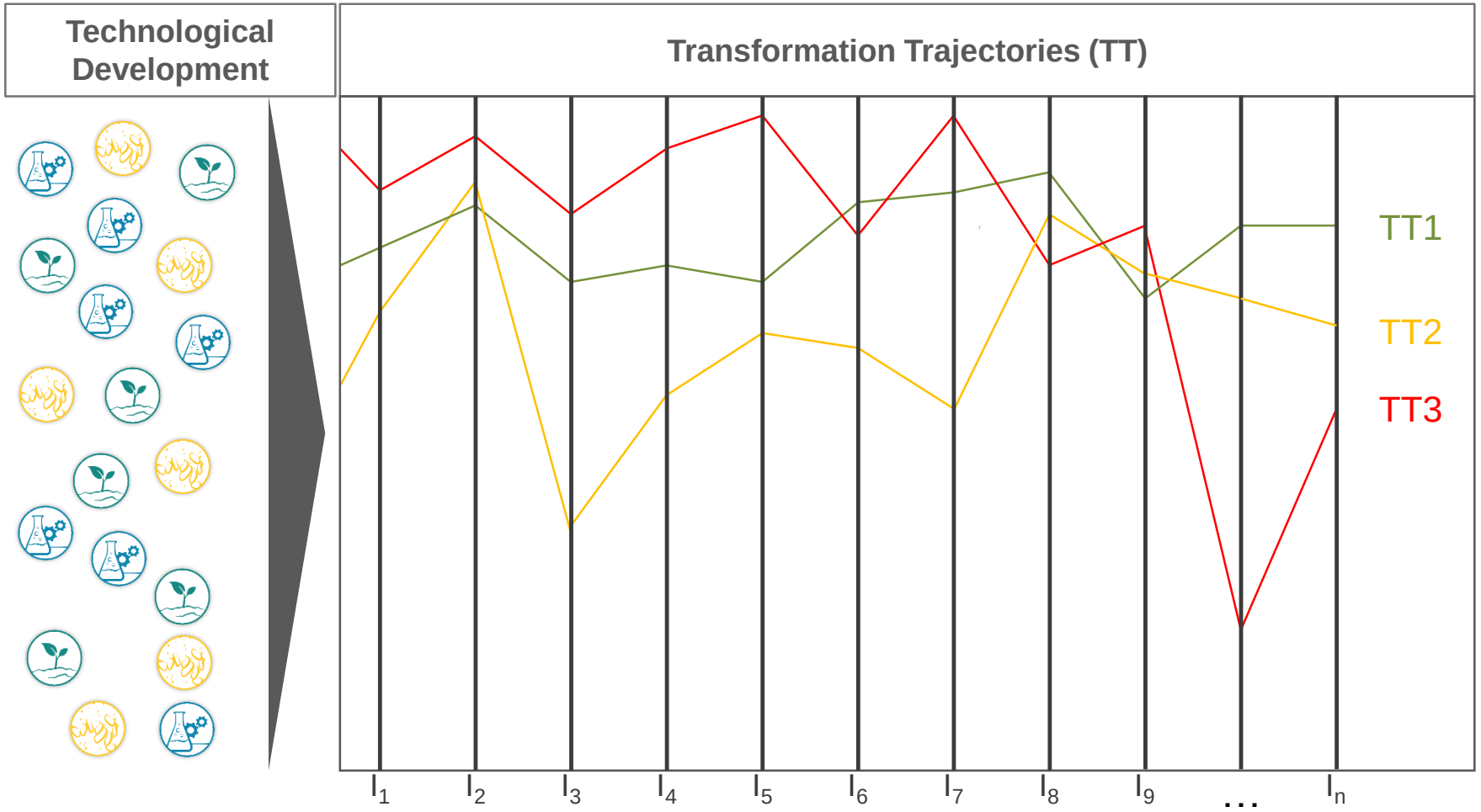

Option: Multi-Criteria Analysis

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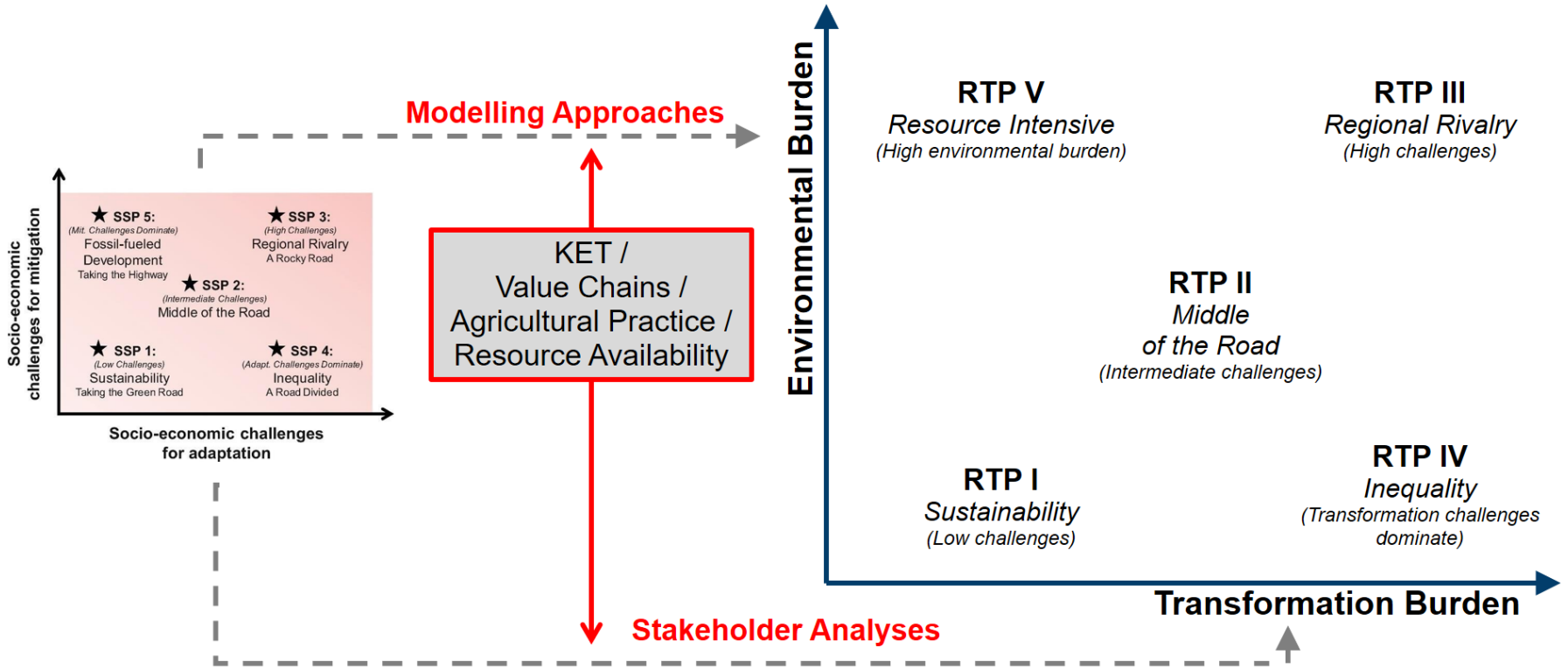

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Indictors for regional transformation pathways

Objective to identify determinants for a successful transformation towards bioeconomy in the Rheinische Revier and qualitative descriptions for possible regional transformation pathways

Approach based on the Shared Socioeconomic Pathways (SSPs) (O‘Neill et al. 2014 & 2017), and localization of indicators to develop categories for Regional Transformation Pathways (RTPs)

SSPs	RTPs
Demographics	Demographic development in the region
Human development	Lifestyle and society
Economy and lifestyle	Economy and industry
Policies and institutions	Policies and institutions
Technology	Technology and science
Environment and natural resources	Resource Availability and environment

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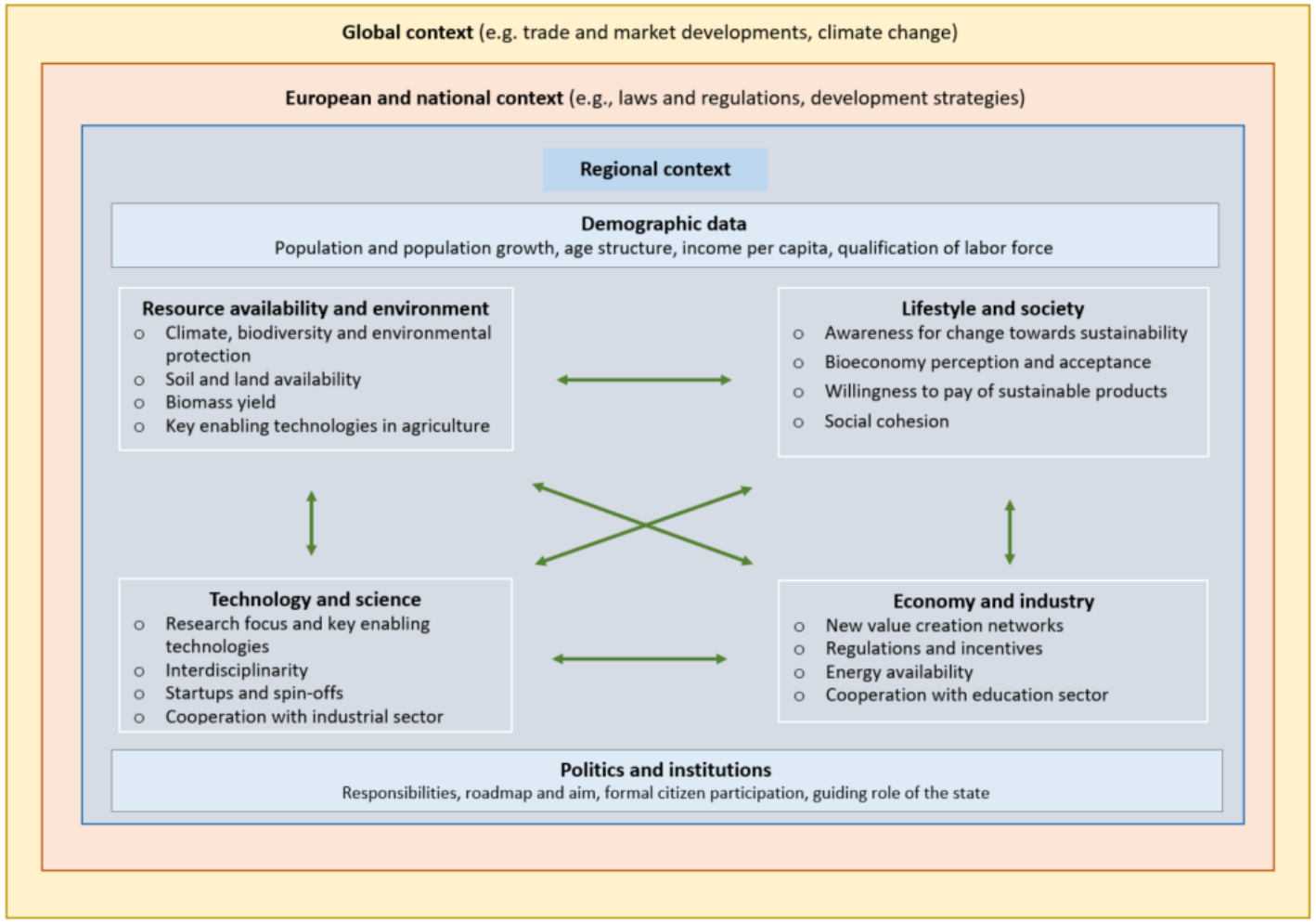
Indictors for regional transformation pathways



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Thank you for your attention!