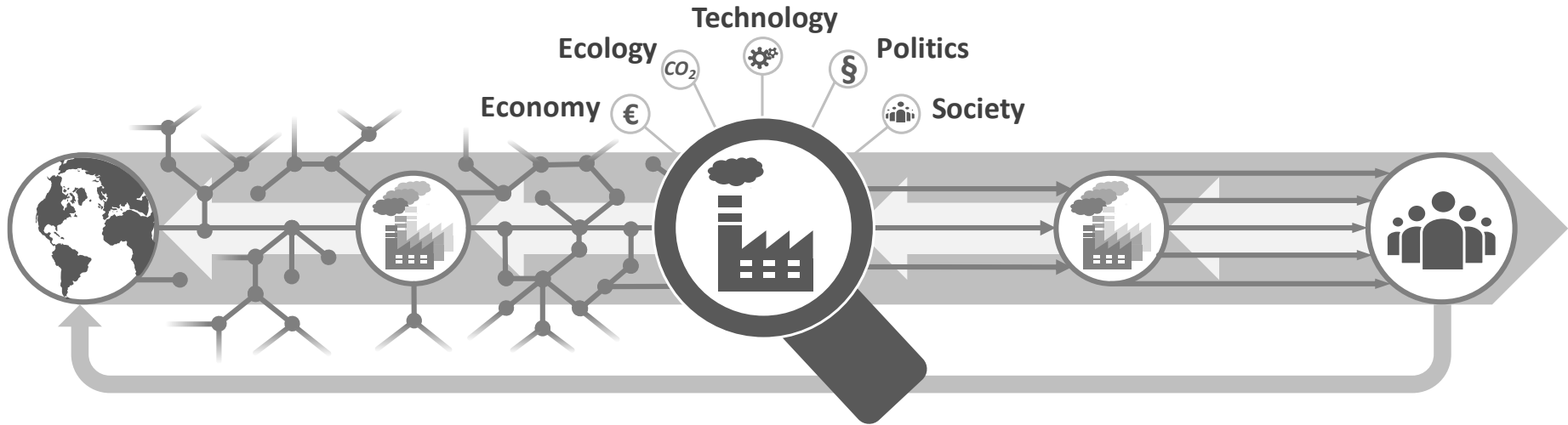
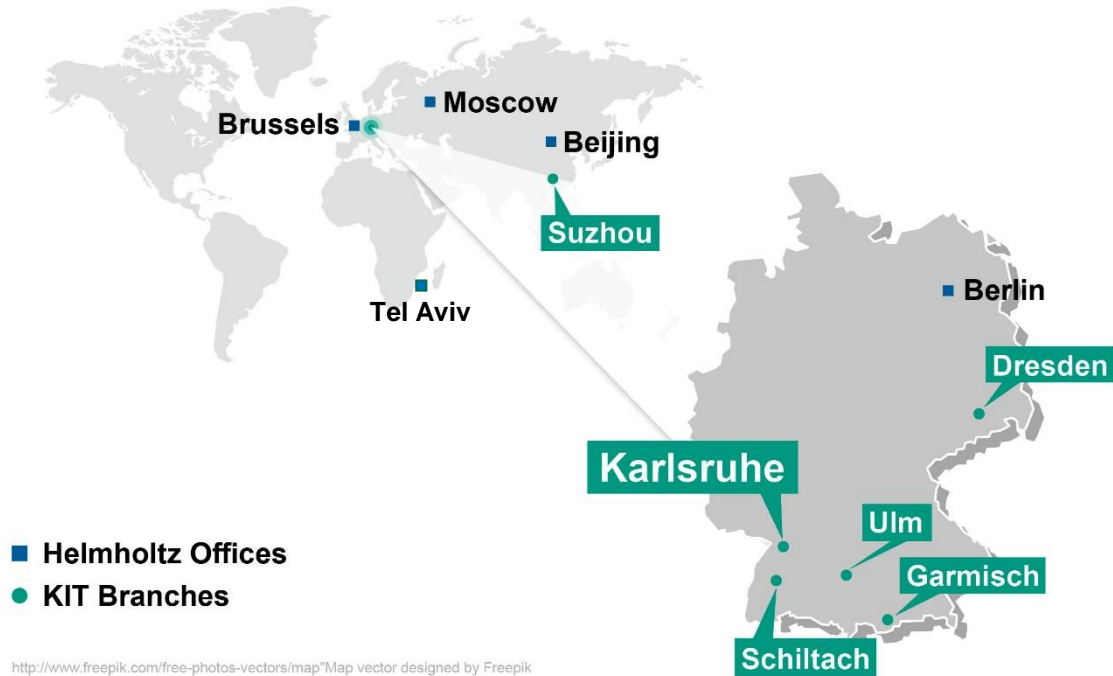


Research Group Sustainable Value Chains

JFS Matchmaking Event for the 2023 STI Joint Call

Dr. Andreas Rudi





Circular Economy Research Focus

Circular economy in a broader sense

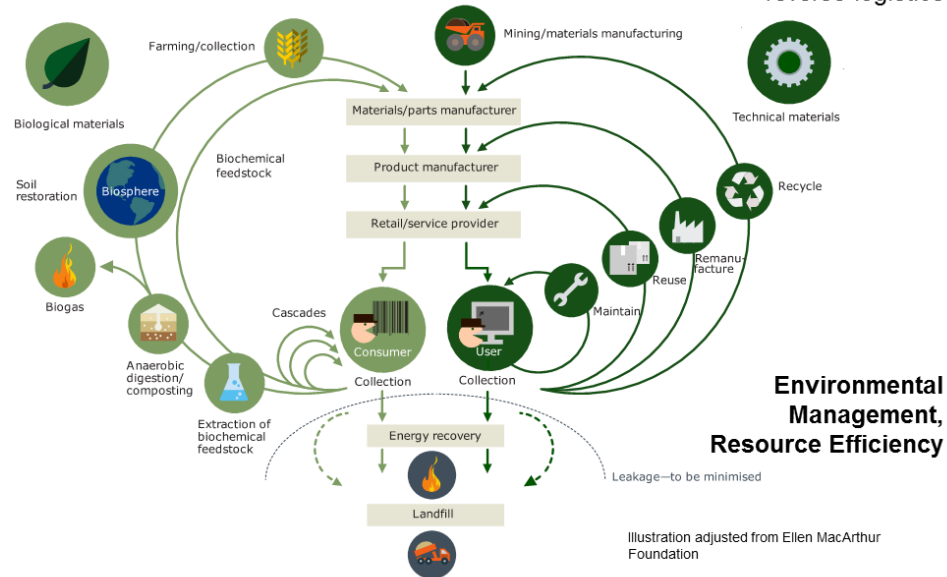
- 1) Material / energetic use of renewable resources
- 2) Closed-loop supply chains of essential raw materials (metals, minerals, plastics, composites, ...)

Related topics

- Environmental management (e.g. emission reduction measures)
- Corporate Social Responsibility (CSR)
- Resource efficiency
- Digitalization and Industry 4.0 in connection with increasing the sustainability of industrial operations

Bioeconomy

Use of renewable resources for production of platform chemicals and fuels



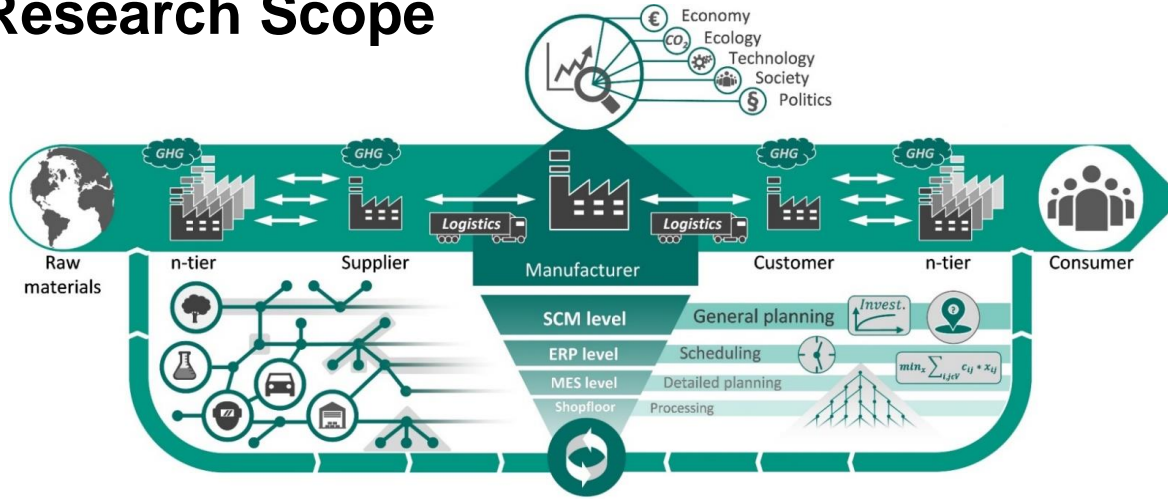
Circular Economy
Closed-loop supply chains,
reverse logistics

**Environmental
Management,
Resource Efficiency**

Illustration adjusted from Ellen MacArthur
Foundation

Sustainable Value Chains

Research Scope



Selected projects

- **REF4FU**: Renewable fuels from green refineries → Aspen^{Plus}, TEA, OR
- **InnoFuels**: Platform for the ramp-up of electricity-based fuels → TEA, LCA, OR
- **Care-O-Sene**: Catalyst research for sustainable kerosene → Aspen^{Plus}, TEA, OR
- **reFuels**: Rethinking fuels → TEA of eFuels production processes with Aspen^{Plus}
- **E-Akteur**: Stakeholder relationships in the value creation of electric car batteries → ABM
- **DeMoBat**: Industrial dismantling of traction batteries for electric cars → MFA, MFCA, OR
- **ReBioBW**: Potential analysis of agricultural residues for the bioeconomy in BW → GIS, ML

Research Partners



External Funding



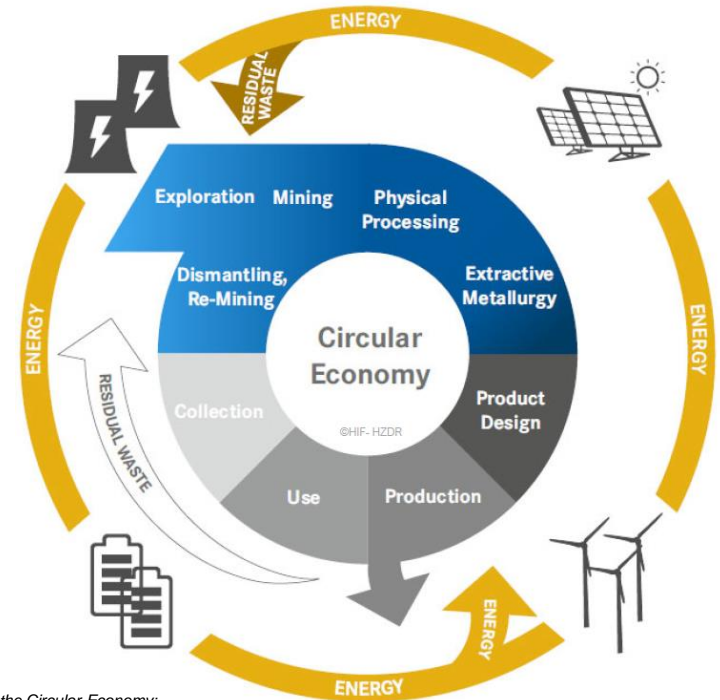
Energy Transition and Circular Economy

Material, Energy Nexus

- The energy transition affects raw material requirements in Southeast Asian and Europe.
- Renewable energy plants, storage systems and intelligent grids create an increased demand for elements such as steel, copper, cobalt, lithium, rare earths, the platinum group elements, indium or tellurium.
- Extraction of most raw materials is linked to negative social and environmental consequences

➔ **Project idea A:** Transition towards a more sustainable use of raw materials by evaluating innovating solutions.

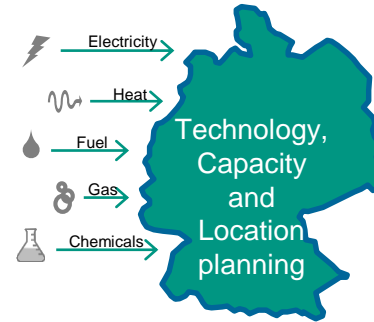
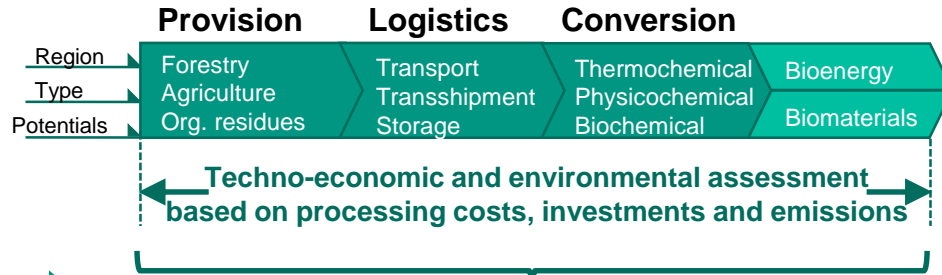
➔ **Project idea B:** Development of closed-loop concepts for material utilization pathways.



Graphik: Markus A. Reuter et al. (2018): Limits of the Circular Economy: Fairphone Modular Design Pushing the Limits, World of Metallurgy

Assessment of bio-based value chains

Techno-economic analyses, simulation, optimization

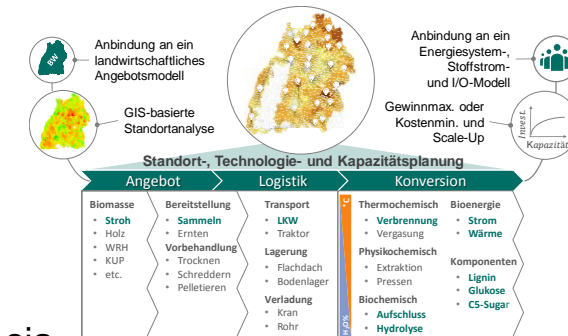


Exemplary projects in the context of modelling bioeconomy value chains in Baden-Württemberg

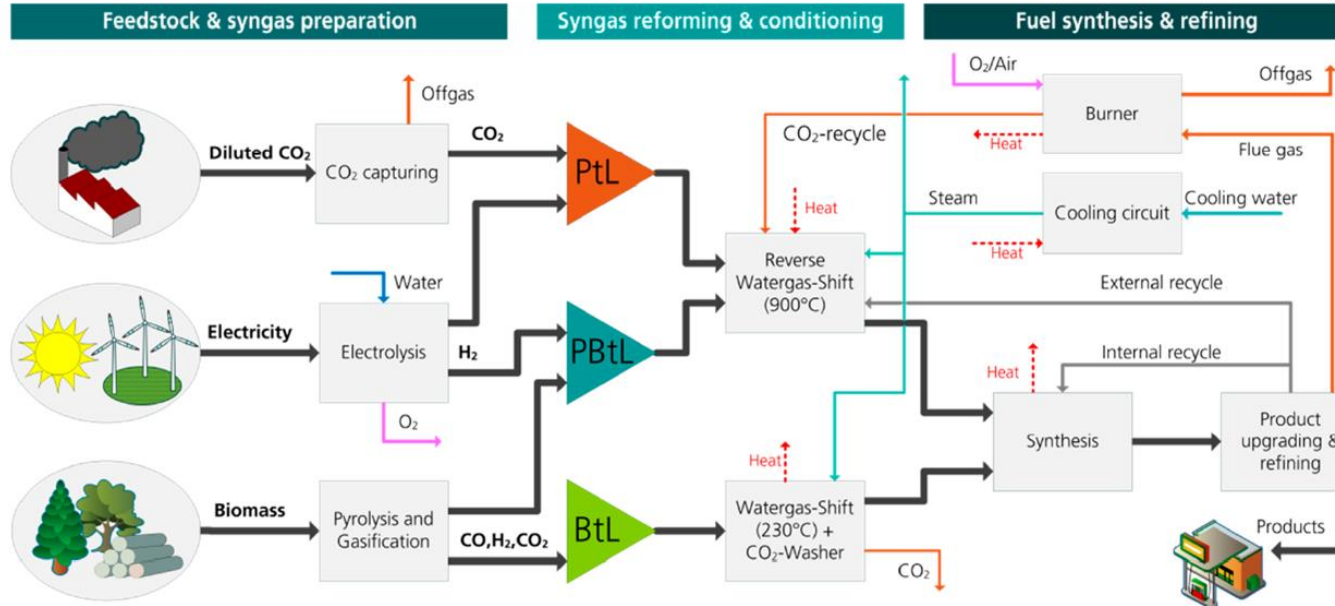
- ➔ Integration of:
 - ➔ Multiple biomass types, processes, technologies and products
 - ➔ Governmental regulations and socio-economic restrictions

- ➔ Identification of:
 - ➔ Potential biomass utilization pathways
 - ➔ Key indicators influencing the value chain
 - ➔ Bio-economic impact factors

➔ **Project idea C:** Assessment of bioeconomy concepts in Southeast Asia.



PBtL & PtX: Renewable Carbon & Green H₂



Project idea D: Analysis of renewable carbon & green hydrogen potentials in Southeast Asia.

Source: Pregger, T., Schiller, G., Cebulla, F., Dietrich, R.U., Maier, S., Thess, A., Lischke, A., Monnerie, N., Sattler, C., Clercq, P.L. and Rauch, B., 2020. Future Fuels—Analyses of the Future Prospects of Renewable Synthetic Fuels. *Energies*, 13(1), p.138.

We are looking for...

Project consortia in the context of Circular Economy & Sustainable Energy Supply that need an interdisciplinary partner for...

- material and energy flow orientated planning and control of industrial operations,
- analysis and assessment of process chains and networks under economic and ecological sustainability aspects as well as political frameworks with
- quantitative planning and optimization approaches are developed using methods from business administration, operations research, engineering, natural and environmental sciences
- in various fields of application like circular economy, bioeconomy, green hydrogen and general resource efficiency and sustainability in industrial context

Thank you for your attention.

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