INSTITUT FÜR INDUSTRIELLE ÖKOLOGIE

TECH4GREEN

DISRUPTIVE TECHNOLOGIES FOR A SUSTAINABLE TRANSFORMATION IN THE AUSTRIAN MATERIAL GOODS PRODUCTION

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INTRODUCTION

- Austrian industry and energy sector → 1/3 of GHG emissions
- EU emission reduction targets → sustainability transformation necessary
- Better technology → key driver for sustainability
- → providing a catalogue of technologies with the potential to facilitate this transformation

Method: Technology Selection

- literature review
- meta-analysis of patent searches
- two online surveys among technology and industry experts
- Selection criteria:
  - *Type of innovation*
  - *Technology readiness level*
  - *Disruptive character of the technology*
  - *How often the technology was mentioned in the expert surveys*
- → list of 27 technologies

METHOD: SUSTAINABILITY ASSESSMENT

- Social, economic and ecological sustainability
- Ecological sustainability potential
  - *Efficient use of resources and energy*
  - *Reduction of GHG emissions*
- Potential range of application in the industry
- Online survey results
- Literature review
- Project workshop with experts

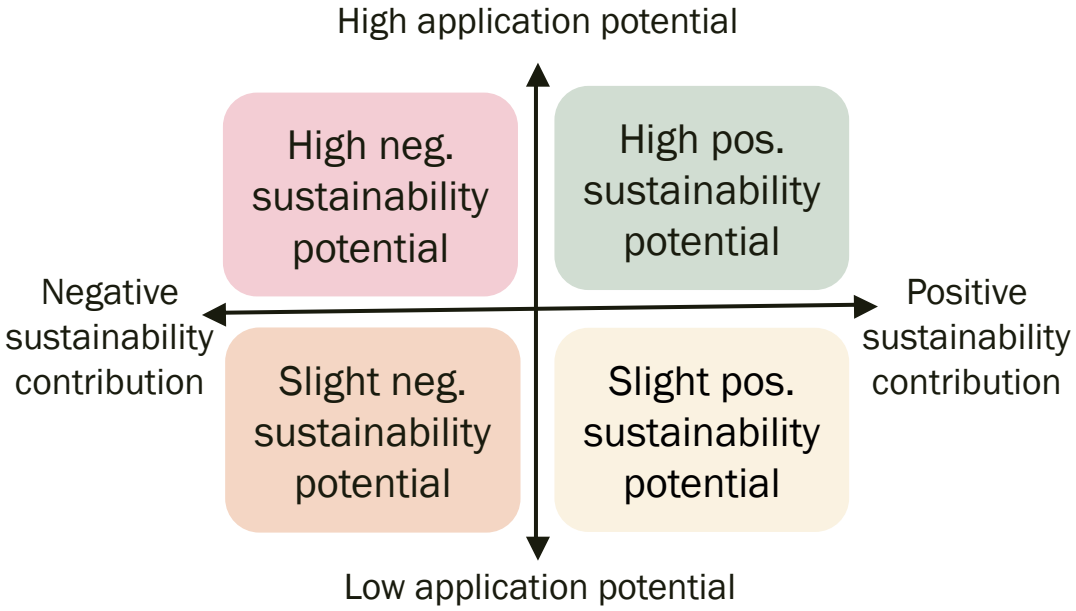

Fig. 1: System for classifying technologies according to their sustainability potential

SELECTED DISRUPTIVE TECHNOLOGIES

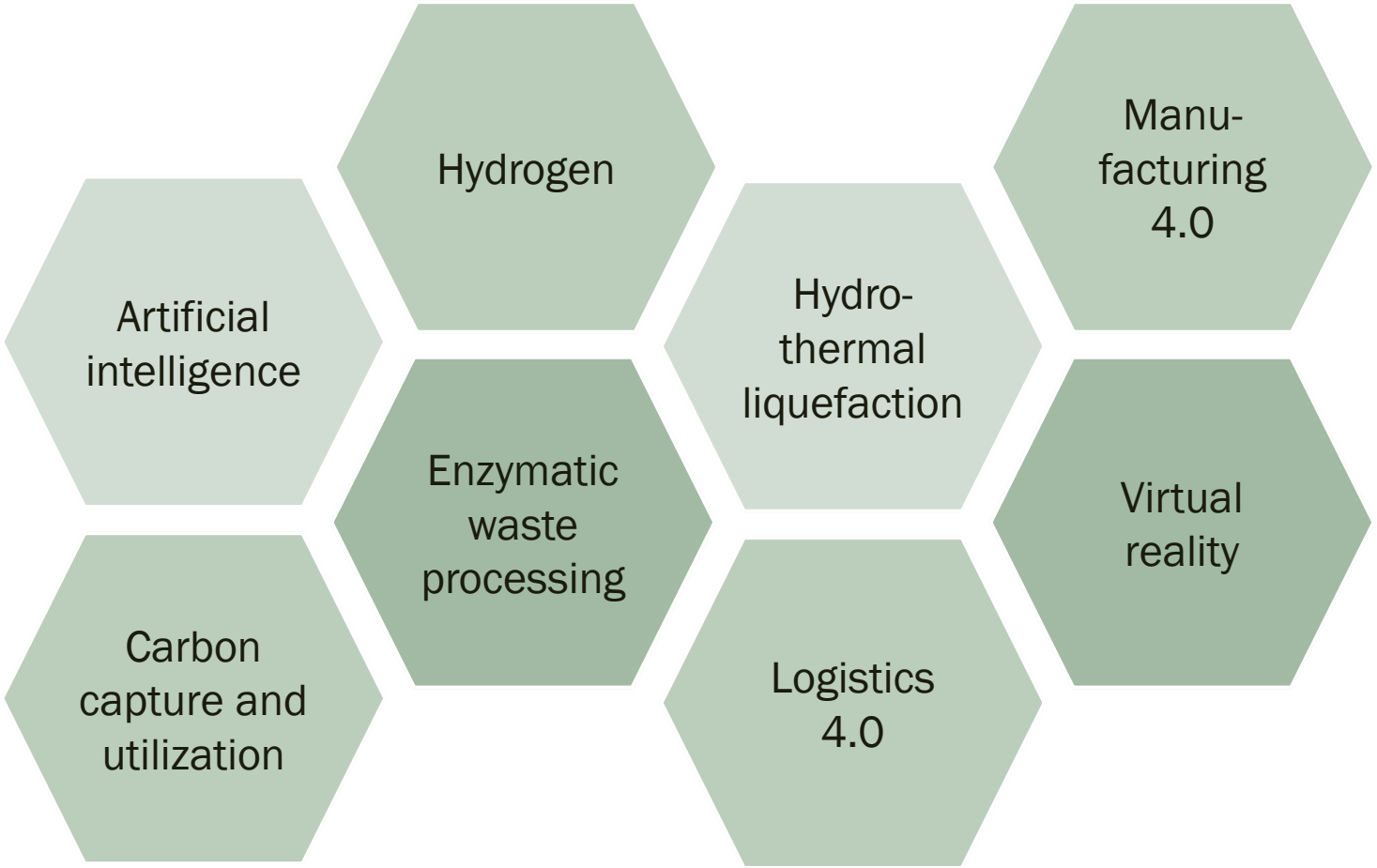

Fig. 2: Selected disruptive technologies relevant to the Austrian manufacturing industry

Ecological Sustainability Impacts (I)

Artificial intelligence	• Ability of machines to perform tasks autonomously • Need for high computing power → negative effect • All sectors
Carbon capture and utilization	• CO_2 extracted from air or exhaust gas → raw material • Delays release of CO_2 emissions • Most sectors, large companies
Enzymatic waste processing	• Plastic waste enzymatically processed → feedstocks for new syntheses • Less primary plastic production • Few sectors → chemical industry
Hydrogen	• Electrolysis of water → fuel, energy carrier, feedstock • **Green** hydrogen can substitute fossil energy sources → less GHG • All sectors and companies

Ecological Sustainability Impacts (II)

Hydrothermal liquefaction	• Thermal process, biomass → crude oil substitute • Substitute fossil crude oil • Few sectors → refineries, energy production, waste management
Logistics 4.0	• Transport of goods with automated driving, loading and unloading • Optimization of routes and fuel usage → less GHG emissions • All industries and companies
Manufacturing 4.0	• Smart automation of manufacturing processes • Increased energy efficiency • Most manufacturing companies
Virtual reality	• Digital visualization of products and processes • Virtual prototype → less raw materials, virtual meetings → less travelling • Manufacturing → product development

Sustainability Potential of the Selected Technologies

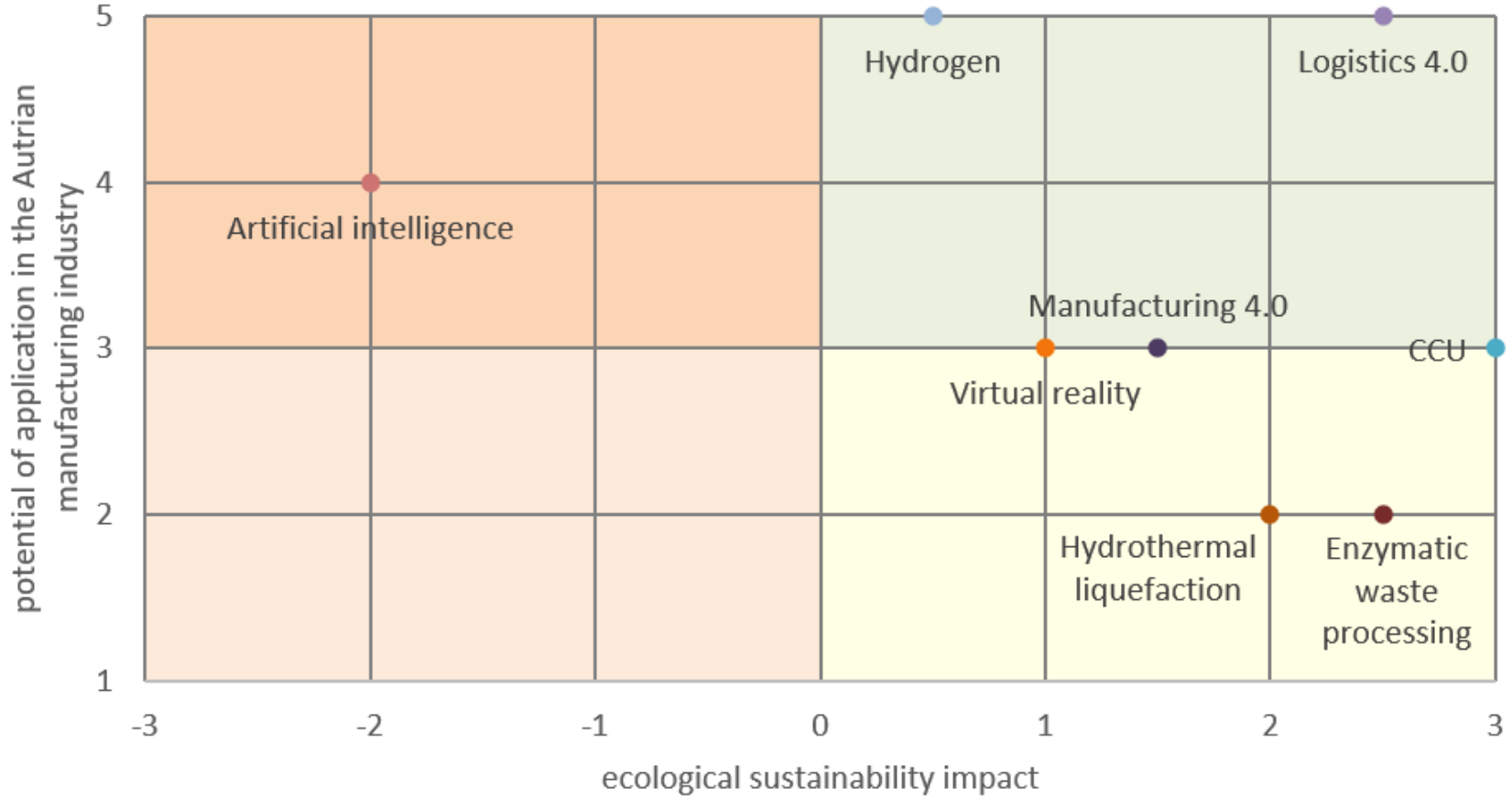

Fig. 3: Classification of technologies according to their ecological sustainability potential

Conclusion

- A technology's sustainability impact and range of application in the industry → sustainability contribution
- High pos. sustainability impact and high application range → high sustainability potential
  - *Hydrogen*
  - *Carbon capture and utilization*
  - *Logistics 4.0*
  - *Manufacturing 4.0*
  - *Virtual reality*
- Potential to accelerate sustainability transformation in the Austrian material goods production

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THANK YOU FOR YOUR ATTENTION!

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