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# System change science & the indispensability of excellent interdisciplinarity

*Japan Austria Science Exchange Center (JASEC)*

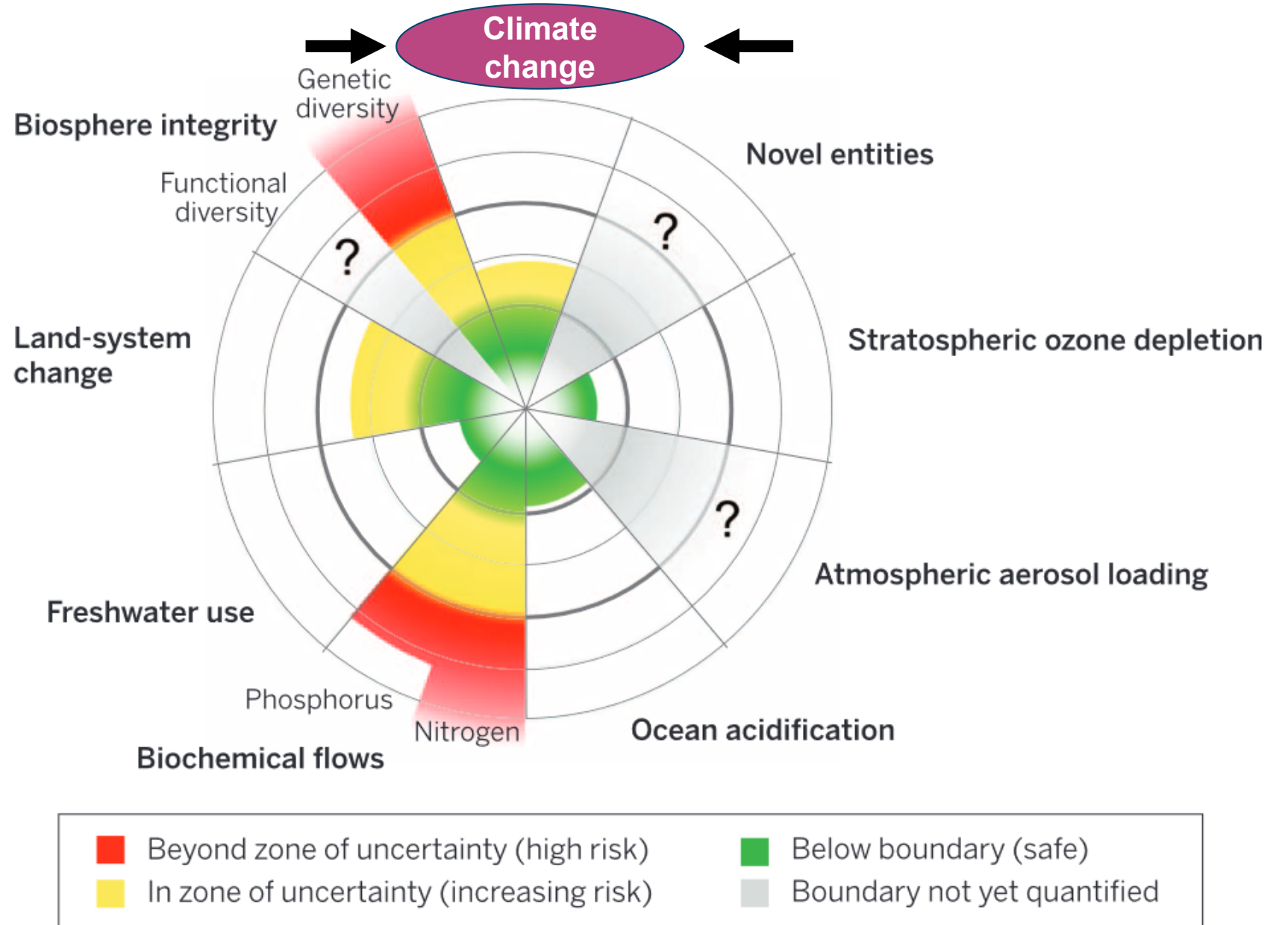
Fabian Schipfer - March 2023

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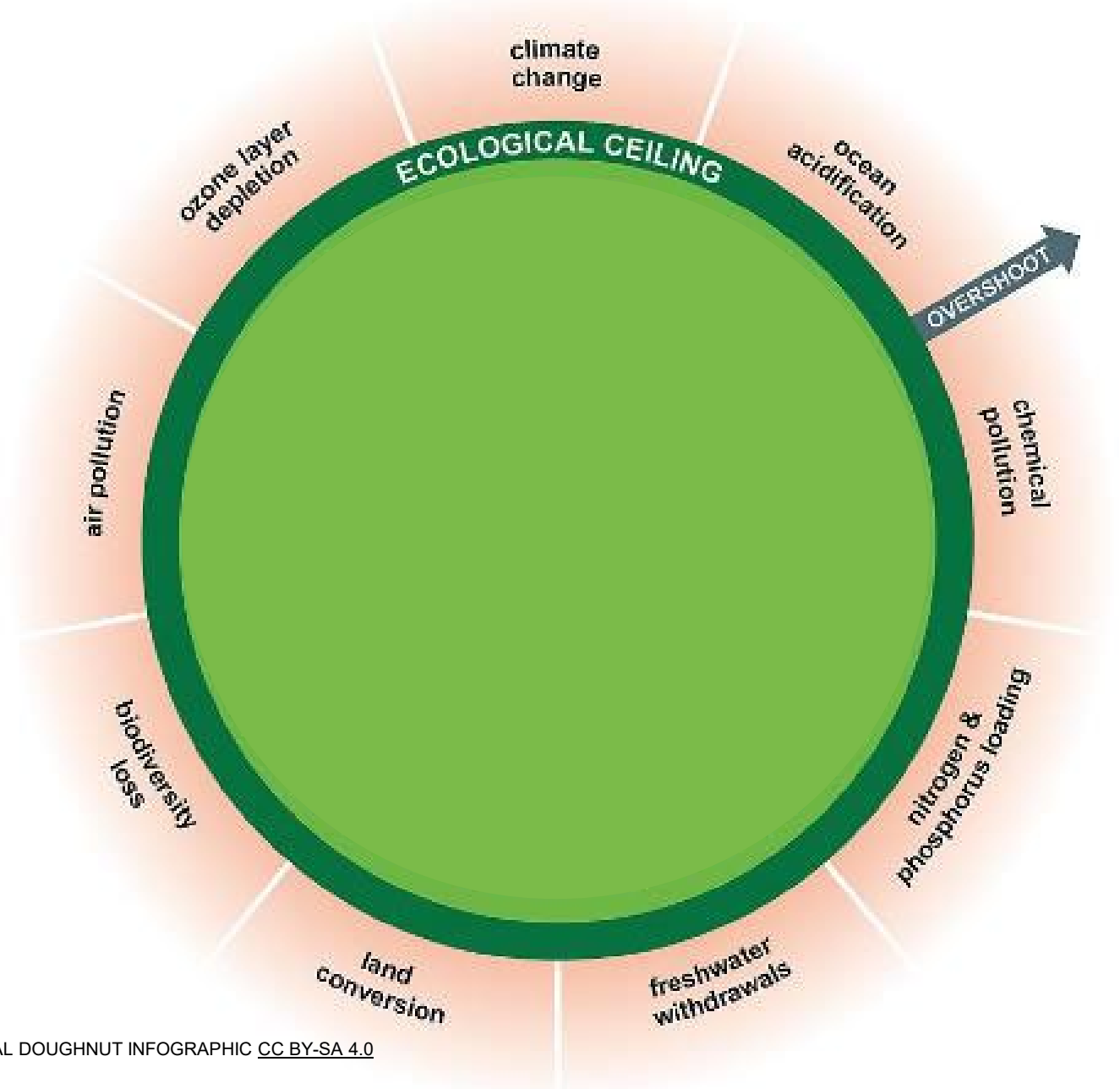
[www.tuwien.at](http://www.tuwien.at)

## Planetary Boundaries:

Ecological ceiling for  
the stress we exert on  
the planet we live on



SOURCE: STEFFEN, W., RICHARDSON, K., ROCKSTROM, J., CORNELL, S.E., FETZER, I., BENNETT, E.M., BIGGS, R., CARPENTER, S.R., DE VRIES, W., DE WIT, C.A., FOLKE, C., GERTEN, D., HEINKE, J., MACE, G.M., PERSSON, L.M., RAMANATHAN, V., REYERS, B., SORLIN, S., 2015. PLANETARY BOUNDARIES: GUIDING HUMAN DEVELOPMENT ON A CHANGING PLANET. SCIENCE 347, 1259855–1259855. [HTTPS://DOI.ORG/10.1126/SCIENCE.1259855](https://doi.org/10.1126/science.1259855)



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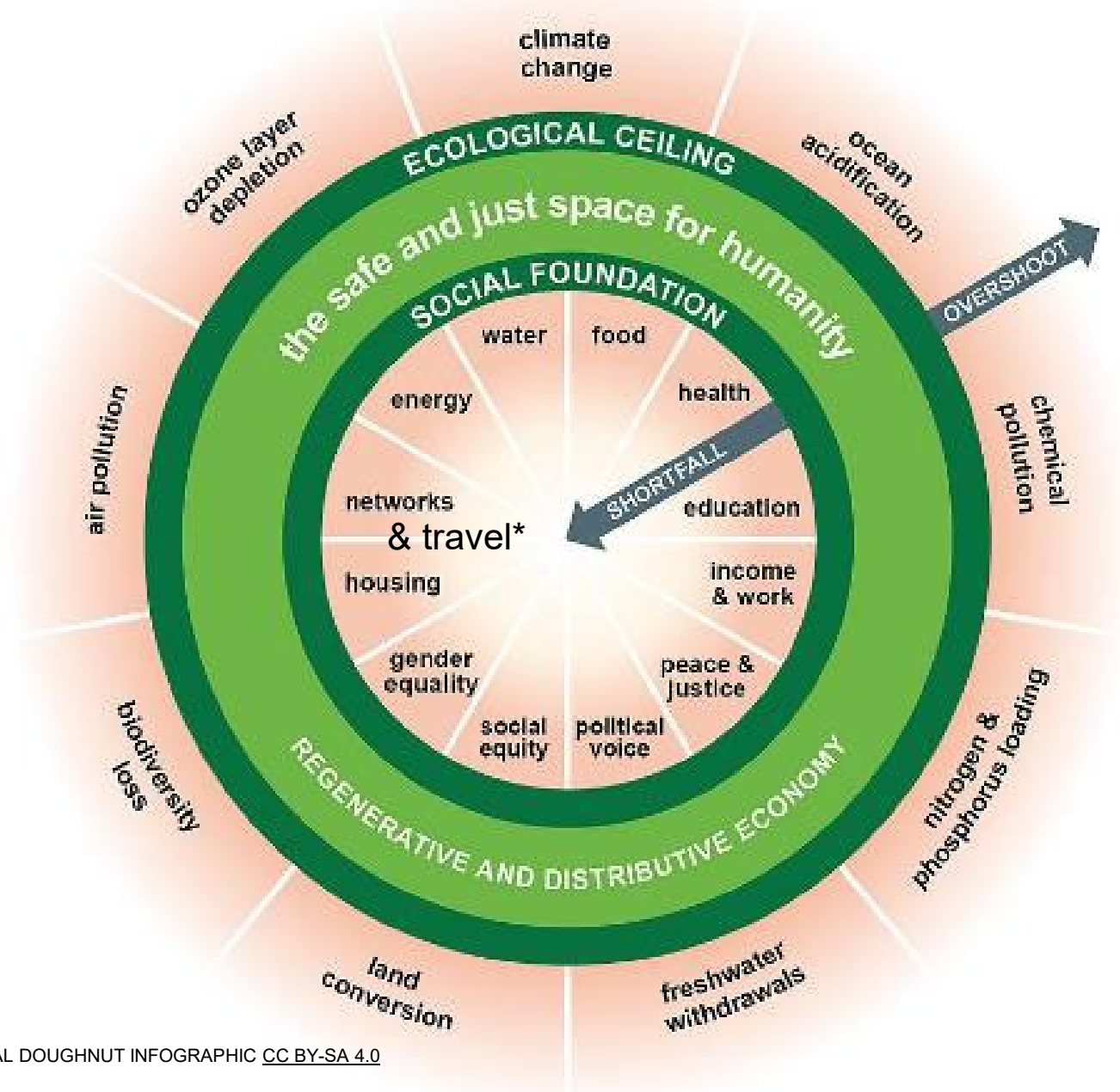
## Doughnut Economy:

Balancing the

ecological ceiling with

a social foundation of current and

future generations



SOURCE: ADOPTED FROM [HTTPS://DE.WIKIPEDIA.ORG/WIKI/DONUT-%C3%96KONOMIE](https://de.wikipedia.org/wiki/Donut-%C3%96konomie) ENVIRONMENTAL DOUGHNUT INFOGRAPHIC CC BY-SA 4.0



Image by **Matthew Montrone** by **Pexels**  
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# BIOSPHERE

Image by **Suat iNAN** by **Pexels**



Image by **Johannes Strötter** by **Pexels**



Image:  
<https://www.mcecleanenergy.org/energy-procurement/>

# TECHNOSPHERE



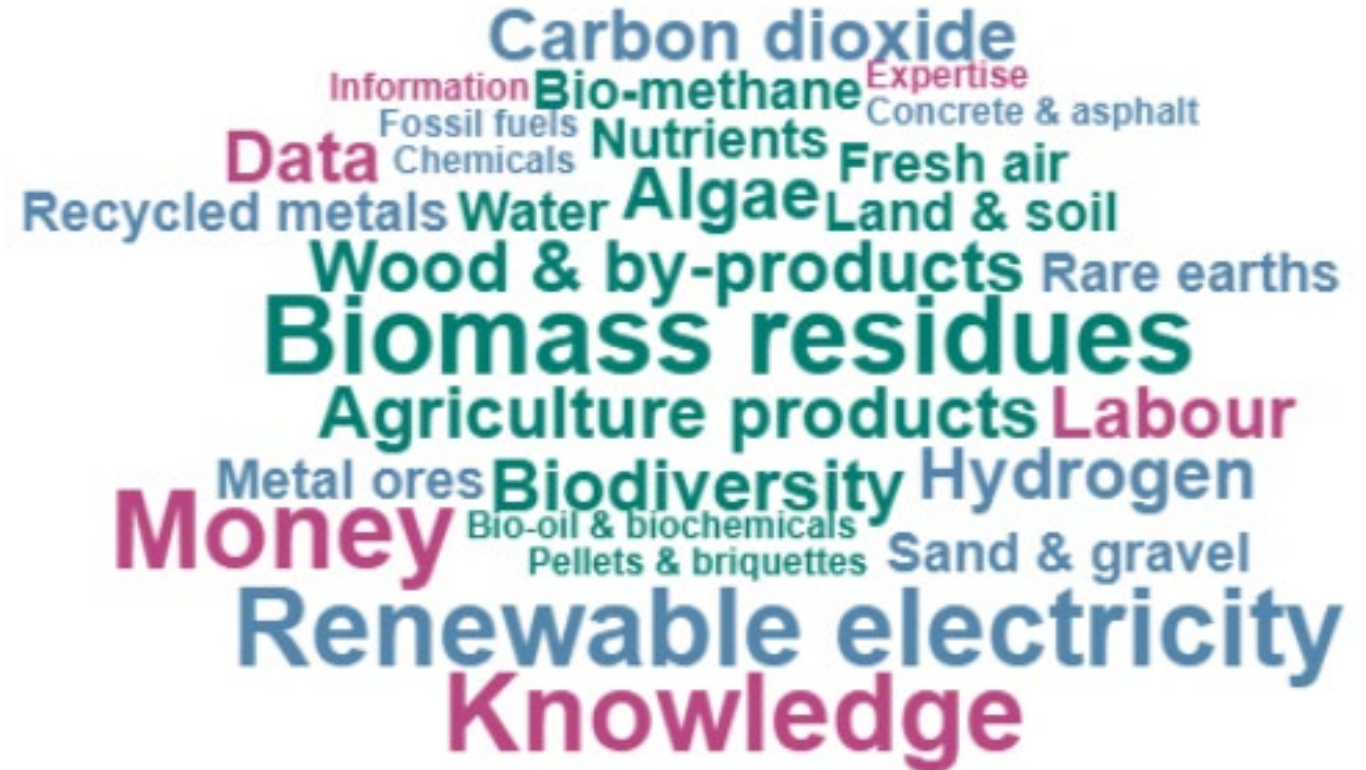
Image: Tesla



Image: Climeworks

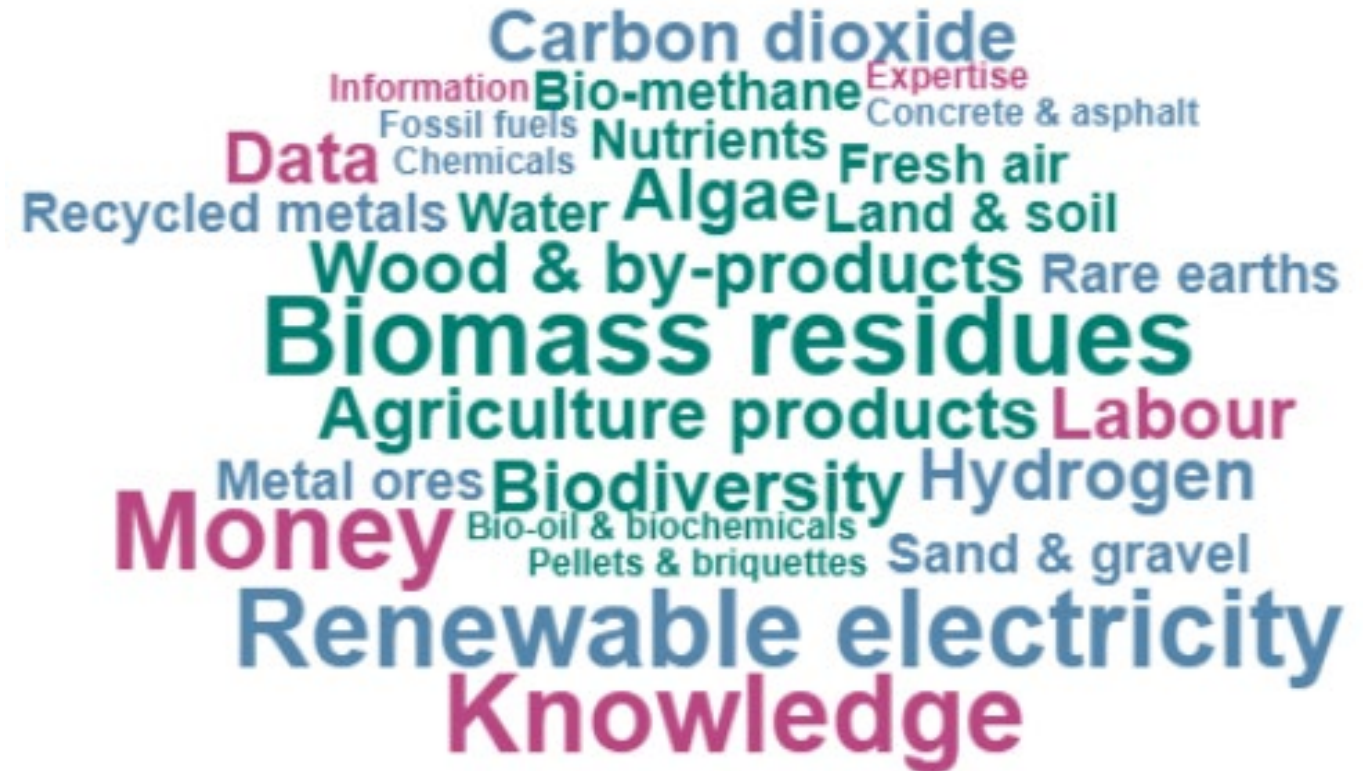
# Roughly $8 \cdot 10^9$ people need resources

Relevant resources can be **biogenic** or **abiotic**, in different states of matter (solid, liquid, gaseous), or even **intangible**.



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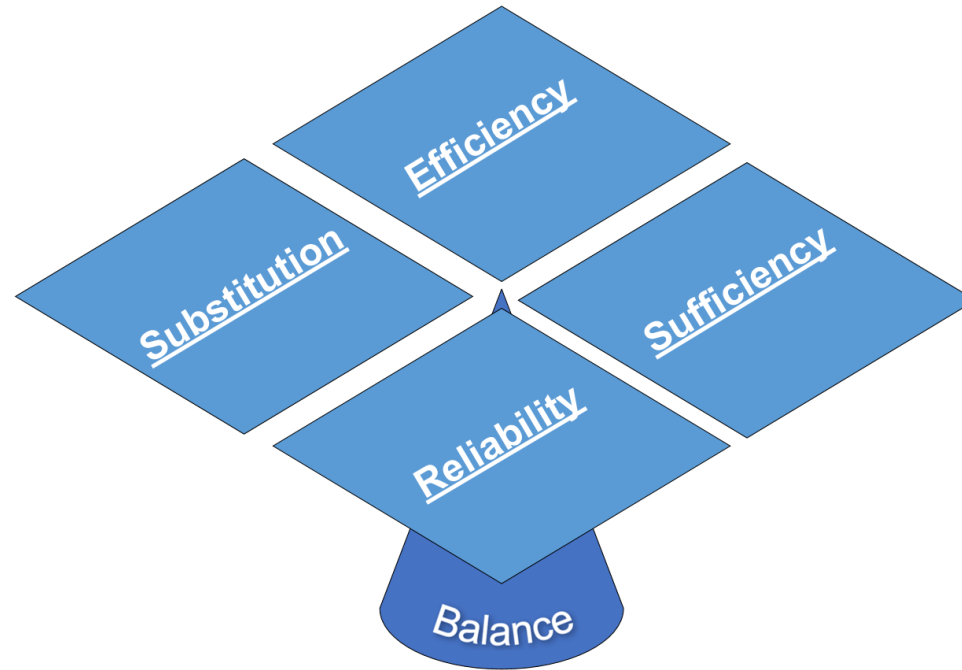
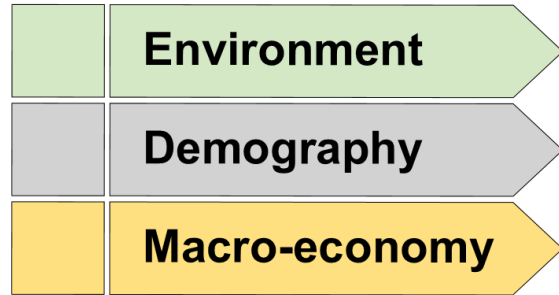
Relevant resources can be **biogenic** or **abiotic**, in different states of matter (solid, liquid, gaseous), or even **intangible**.



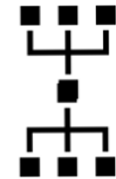
**But we can and have to change the way how we extract, supply, process, distribute, deploy, waste, and recycle these resources!**



# Current change measures are insufficient!



Restructuring resource inputs, processes and circular flows



for a sustainable & resilient coverage of societal needs for energy, materials & food



# System change measures:

## ➤ Efficiency measures

“Making more with less” by reducing or valorizing resources that would be lost or wasted otherwise

## ➤ Substitution measures

“Making things differently” by fulfilling the same functionality with another type of resource

## ➤ Reliability measures

“Making things that do not fail” through enabling the shifting of surplus resources to times, places, sectors, and people in need

## ➤ Sufficiency measures

“Rethinking what is needed” by scrutinizing the urgency of resource consumption and adequacy of non-consumption

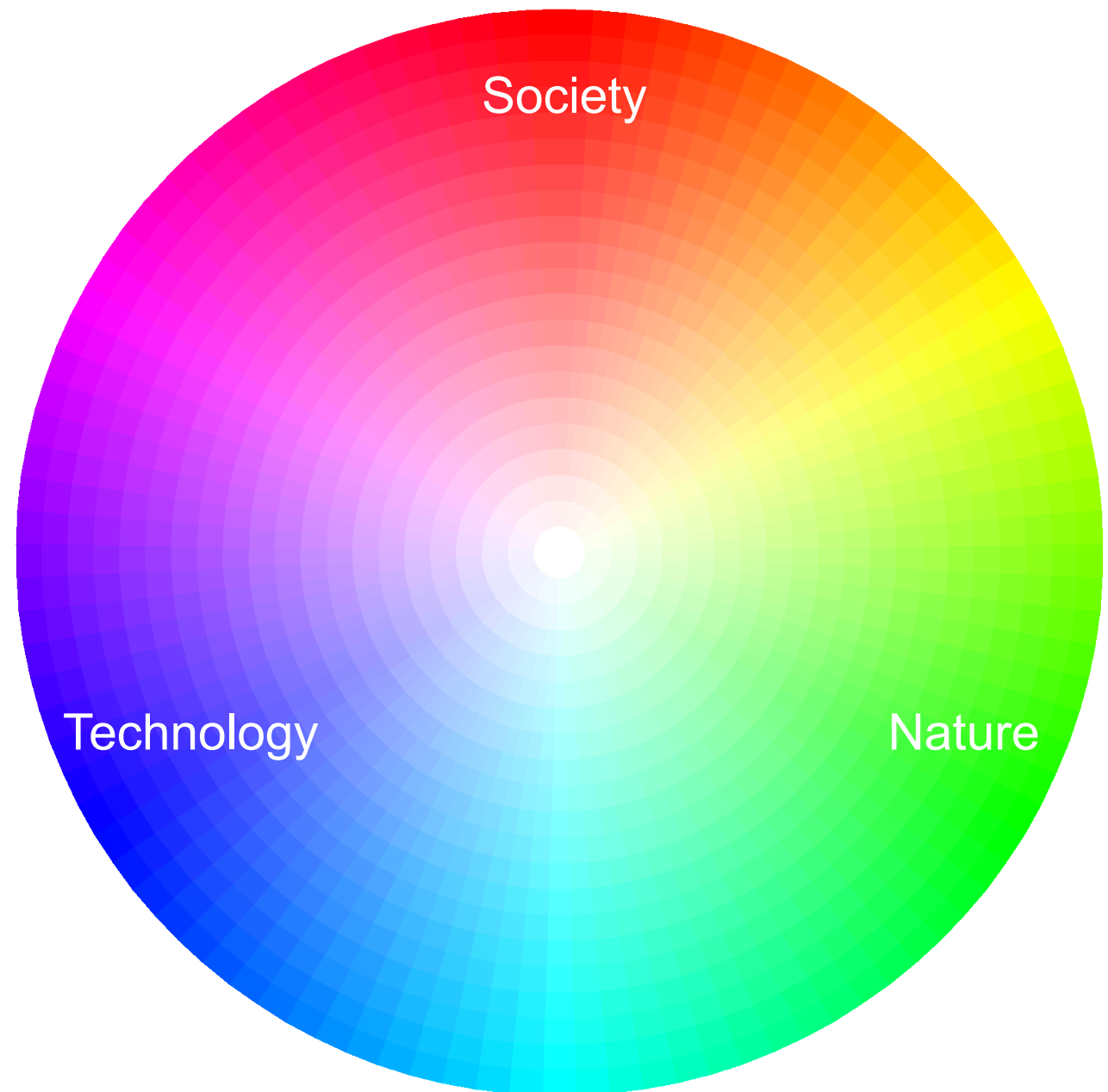
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These four measure types must be well balanced to reduce the systemic risks of their dynamic impacts!

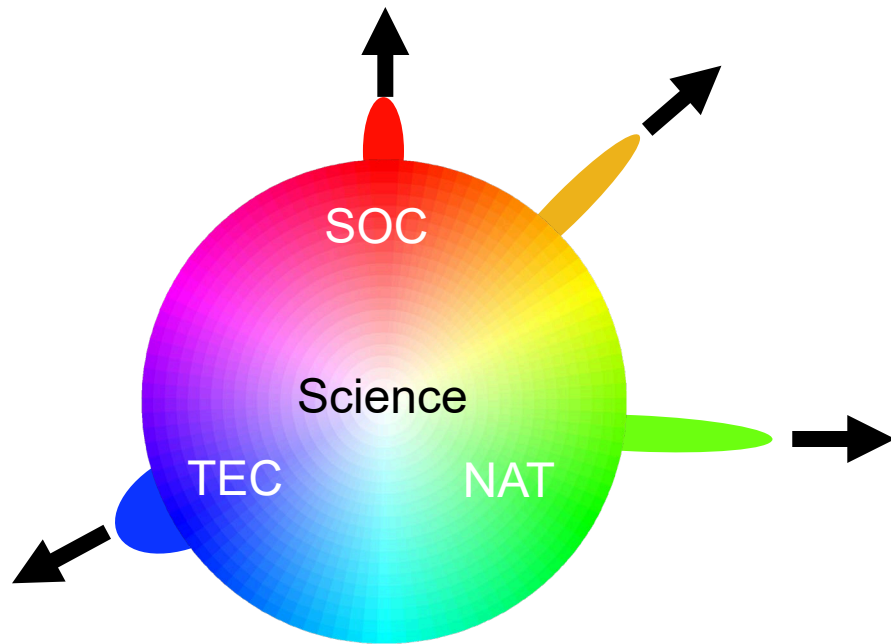
**What type of knowledge and knowledge creation is required to inform system change?**

**Scientific disciplines** based on the  
Common EU Research Classification Scheme:

- Humanities (incl. Philosophy, History & Arts, Philology ...)
- Social Science (incl. Law, Economics, Psychology, Pedagogy ...)
- Natural Science and Maths (incl. Physics, Chemistry, Geology, Astronomy ...)
- Biomedical Science (incl. Botany, Medicine, Zoology, Ecology ...)
- Technological Science (incl. Electronics, Construction, Transport, Energy ....)



## Disciplinary progress



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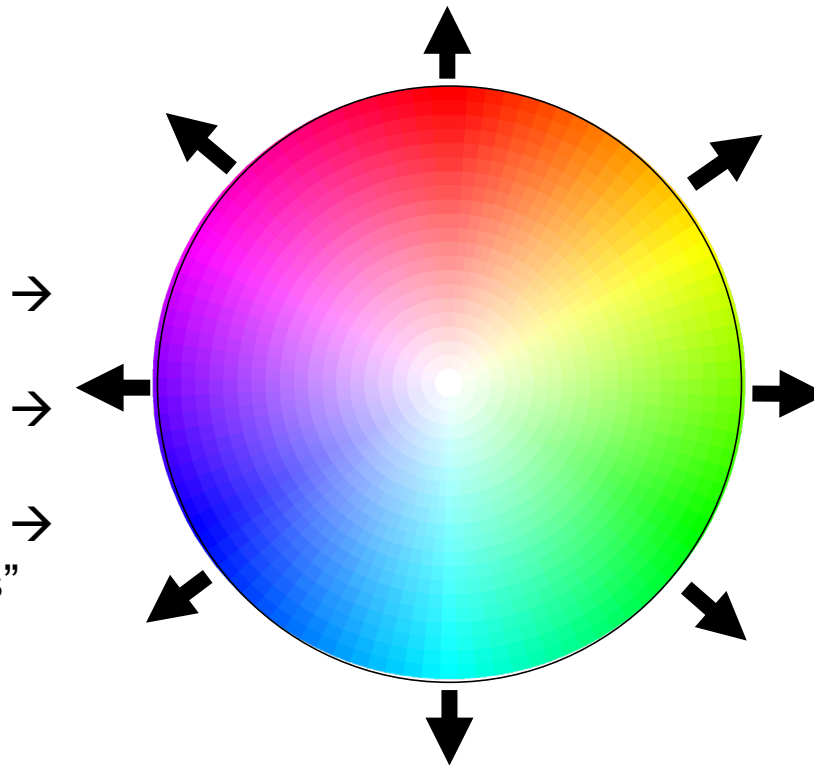
## Interdisciplinary progress

Actively try to fill the gaps

→ Siloed thinking yes

→ but also **integrators**

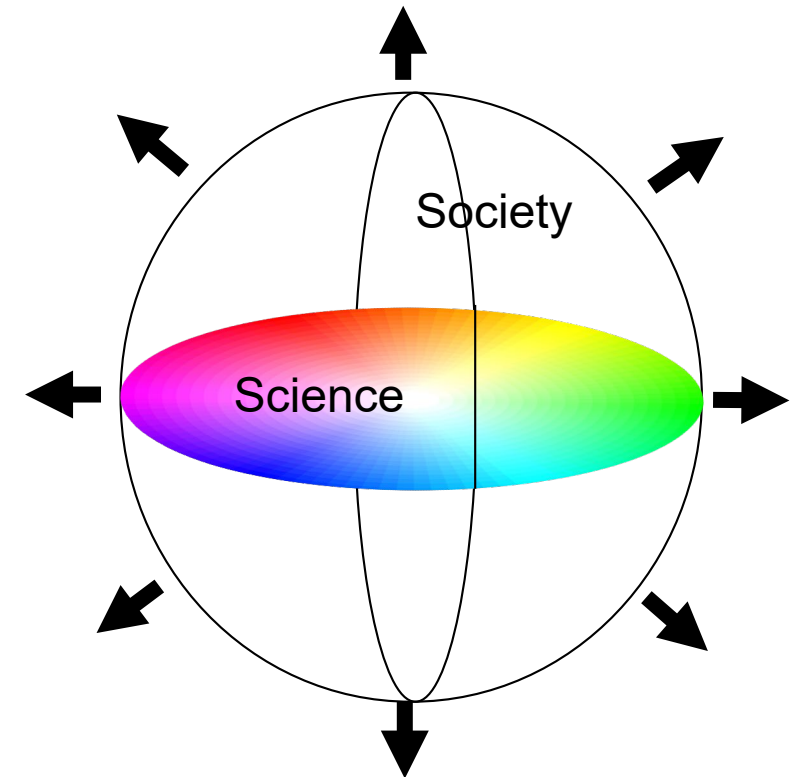
→ building “wheelchair ramps”  
to & between ivory towers



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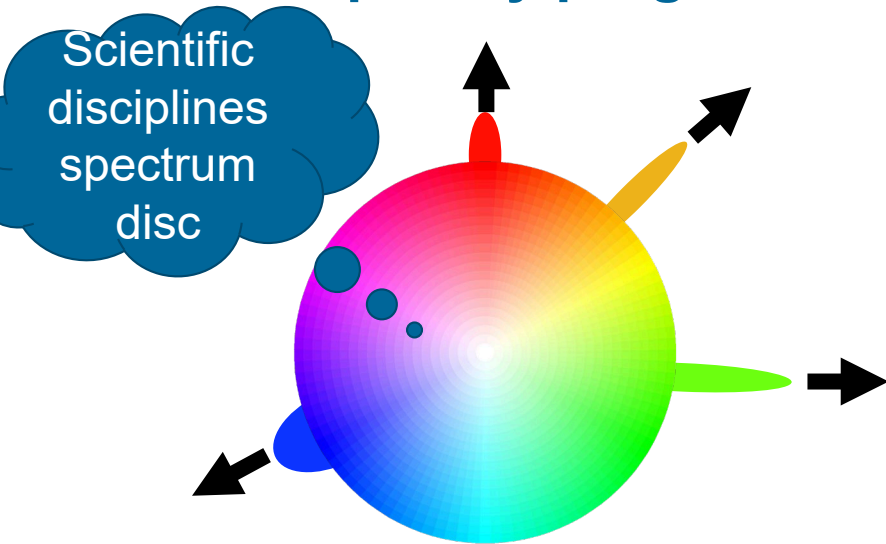
Progress with and for all →  
 Which perspectives do we miss? →  
 What's needed to integrate them? →

## Transdisciplinary progress

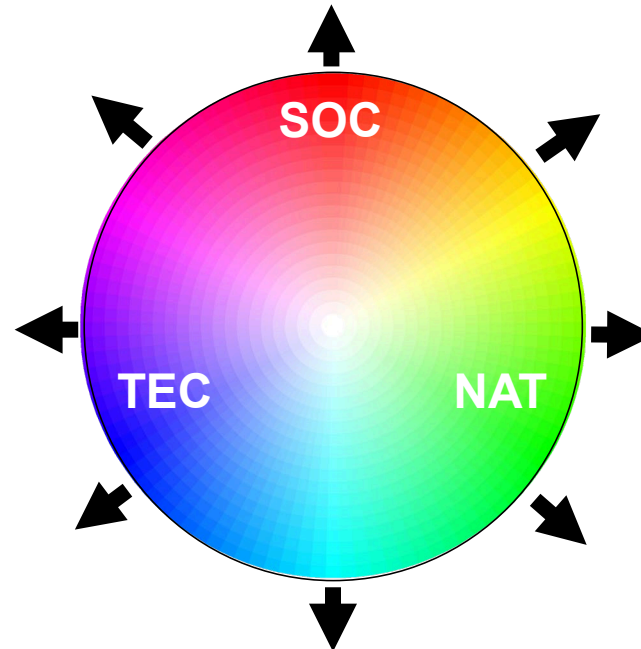


Society: Workforce, farmers, Technology providers, Politicians, Organizations, Communication experts, Educators

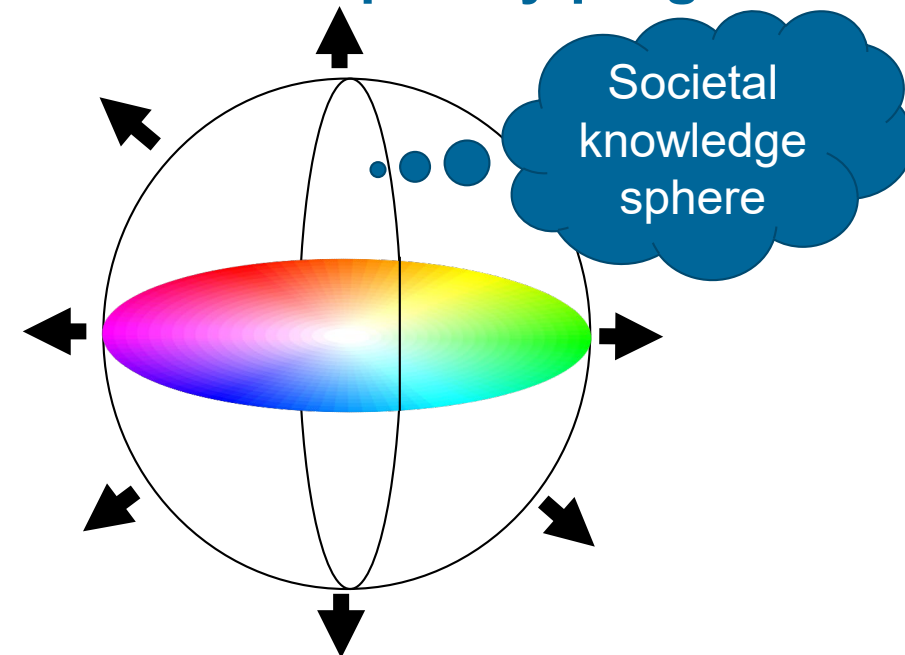
### Disciplinary progress



### Interdisciplinary progress



### Transdisciplinary progress

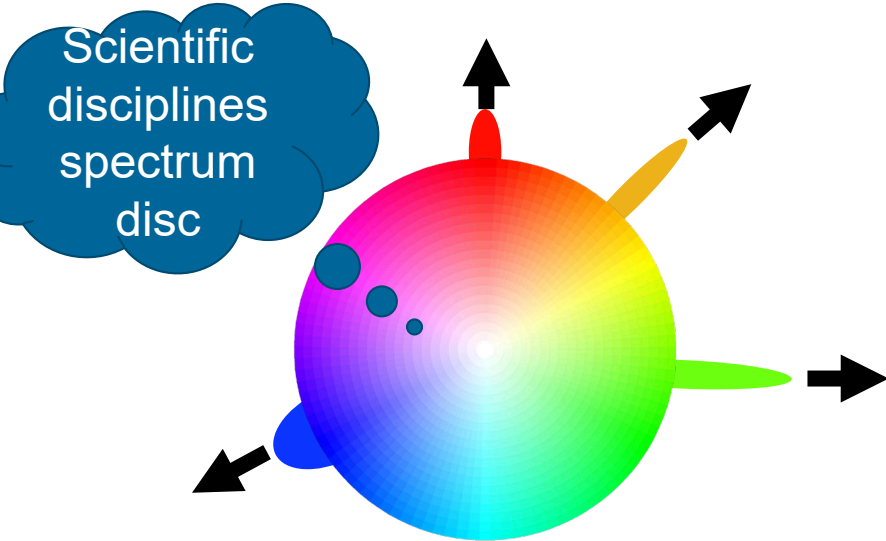


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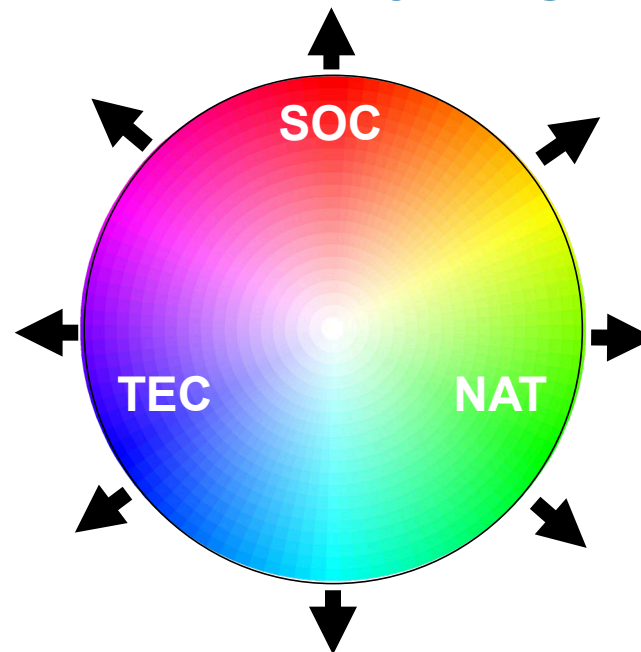


# Most wanted skills for system change science: Empathy & the ability to create and maintain safe spaces for inclusive and diverse teams

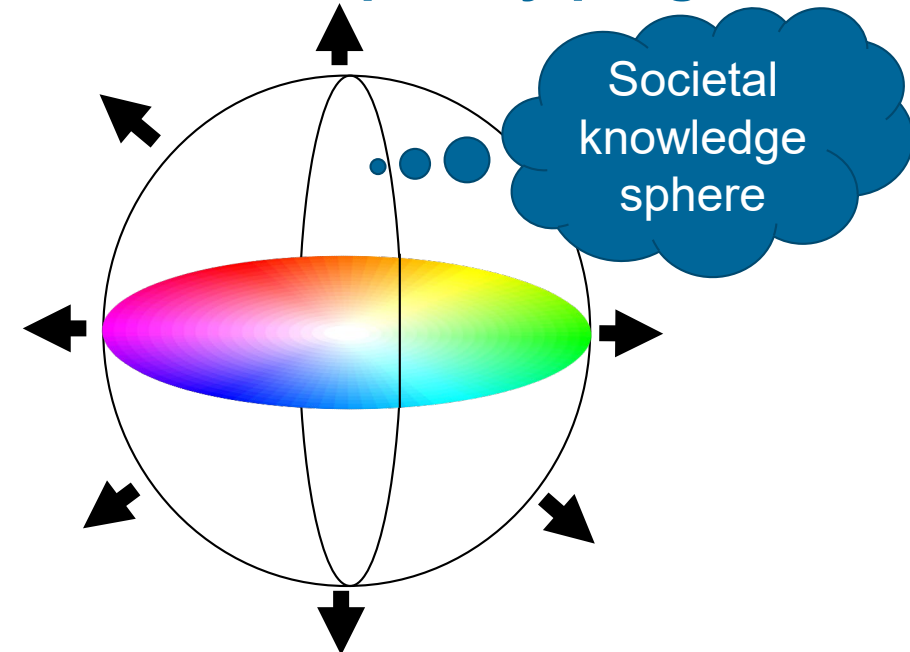
## Disciplinary progress



## Interdisciplinary progress



## Transdisciplinary progress



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# Thank you for your attention

**Fabian Schipfer** - [fabian.schipfer@tuwien.ac.at](mailto:fabian.schipfer@tuwien.ac.at)

<https://www.linkedin.com/in/fabian-schipfer-a0869468/>

<https://orcid.org/0000-0001-6732-6919>

Technische Universität Wien  
Institute of Chemical, Environmental & Bioscience Engineering  
Thermal Process Engineering - Computational Fluid Dynamics

Getreidemarkt 9/166

A-1060 Vienna

[www.vt.tuwien.ac.at](http://www.vt.tuwien.ac.at)

[www.schipfer.eu](http://www.schipfer.eu)