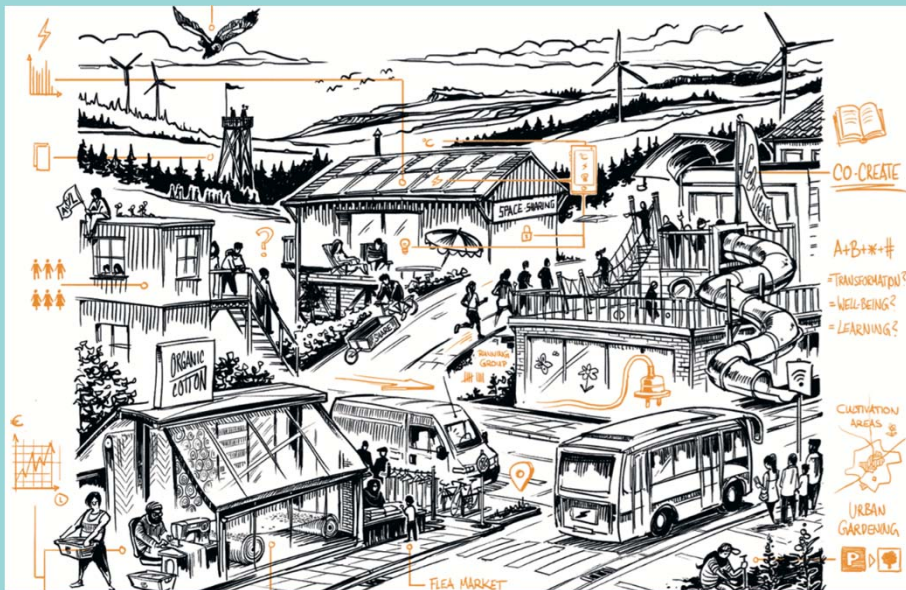


Transdisciplinary learning in Real-World Laboratories to foster sustainability transformation

Prof. Dr. Daniel J. Lang,

12. International Symposium on Human Sustainability, Kyoto University, 06.11.2023



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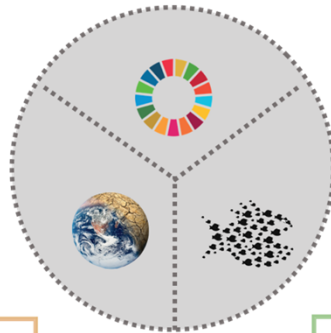




Action-oriented knowledge for Sustainability

Actions for sustainability...

... are intentionally designed to create transformative change towards sustainability



... are contextually realised in constantly evolving and emergent settings

... involve shared agency of multiple actors developed through social interactions

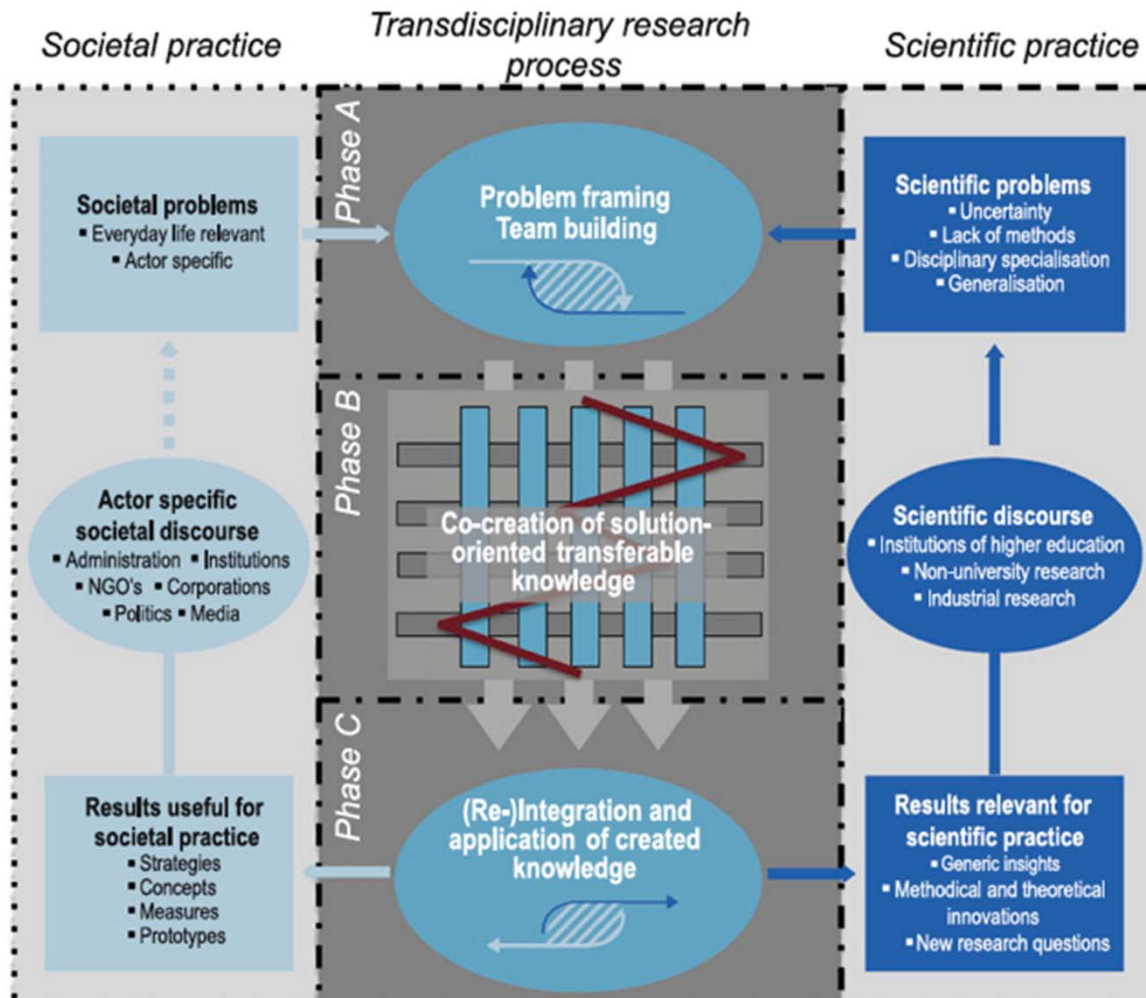
Action oriented knowledge...



Source: Caniglia et al. 2021

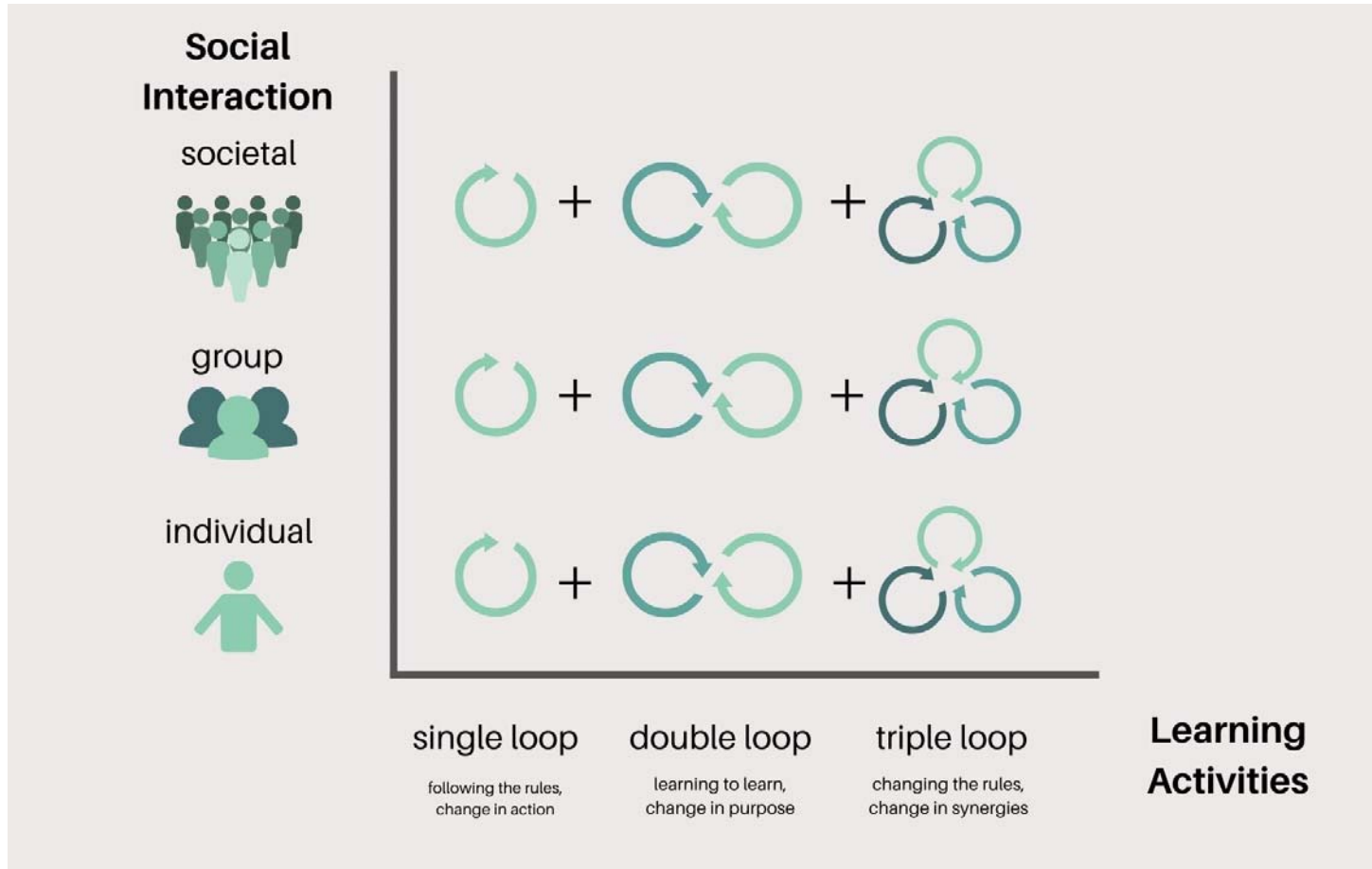


Transdisciplinarity as research mode to address societal problems and! produce knowledge



Source: Lang et al. 2012

Transdisciplinary learning as processes to foster sustainability transformation



Source: Barth et al. 2023

Real-World Laboratories (RWL) as research settings to enable transdisciplinary learning

Characteristics of RWL

- (i) Contribution to (sustainability) transformation
- (ii) Experiments as core research methods
- (iii) Transdisciplinarity as core research mode
- (iv) Long-term orientation, scalability and transferability of results
- (v) Learning and reflexivity



Source: Schöpke et al. 2018, Bergmann et.al. 2021, Picture: T. Zett





Real World Experiments as core methodology

Table 2
A Typology of experiments in sustainability science.

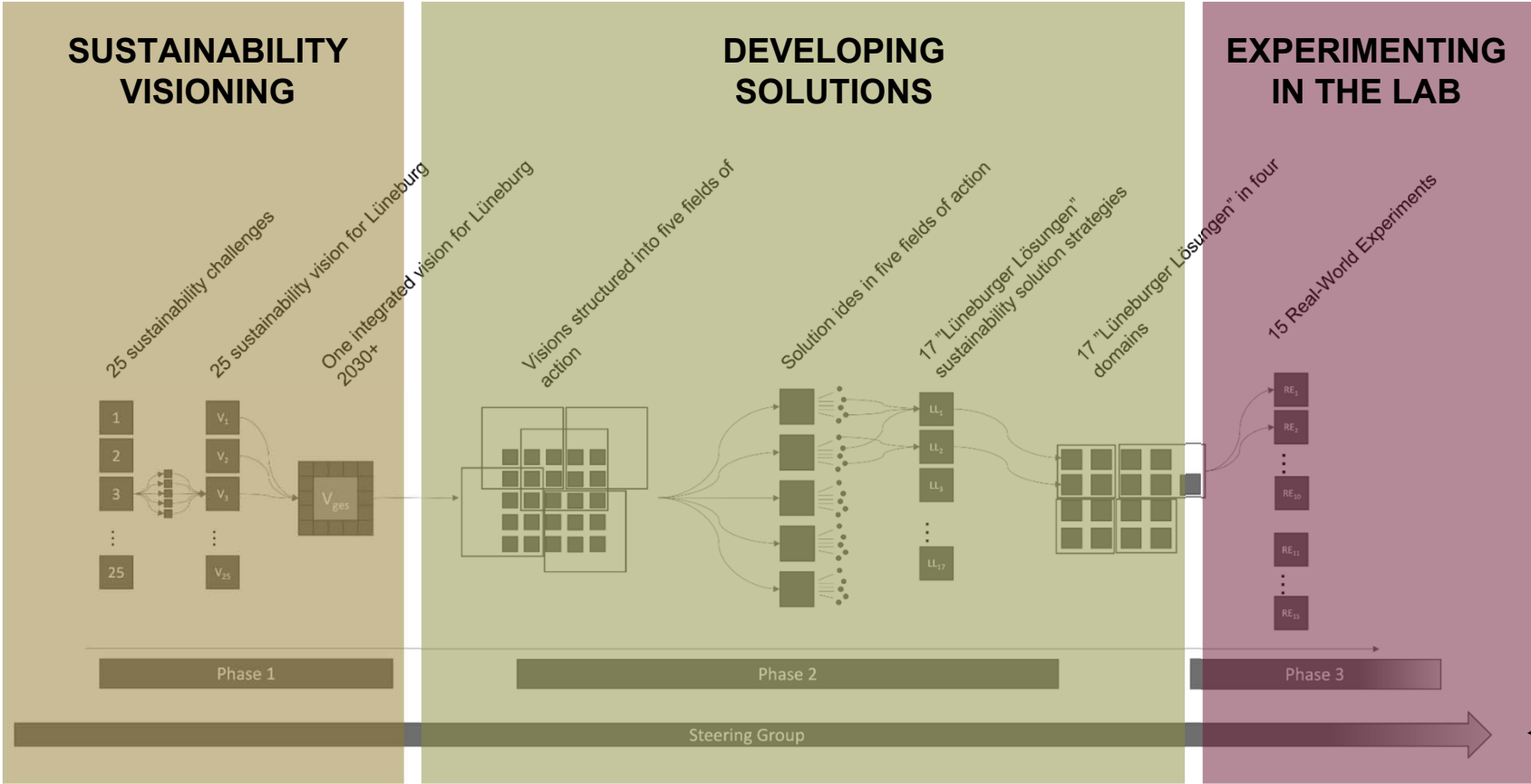
	Full control on interventions	Participatory control on interventions	No control on interventions
Experiments on sustainability problems	Type 1. <i>Problems-Full</i> Producing evidence about causes of sustainability problems with full control on interventions	Type 2. <i>Problems-Participatory</i> Producing evidence about causes of sustainability problems with participatory control on interventions	Type 3. <i>Problems-NoControl</i> Producing evidence about causes of sustainability problems without control on interventions
<i>Examples</i>	Lab and Field experiments	Adaptive experimentation	Implicit, natural, quasi-natural experiments
Experiments on sustainability solutions	Type 4. <i>Solutions-Full</i> Producing evidence about solutions to sustainability problems with full control on interventions	Type 5. <i>Solutions-Participatory</i> Producing evidence about solutions to sustainability problems with participatory control on interventions	Type 6. <i>Solutions-NoControl</i> Producing evidence about solutions to sustainability problems without control on interventions
<i>Examples</i>	Innovation experiments in living labs	Experiments in real-world, transitions, and living-labs	Studies in strategic niche management

Source: Caniglia et al. 2017



Real World Experiments as core methodology

Example *Lüneburg 2030+*



2015 - 2023

SUSTAINABILITY-ORIENTED

JOINT OWNERSHIP

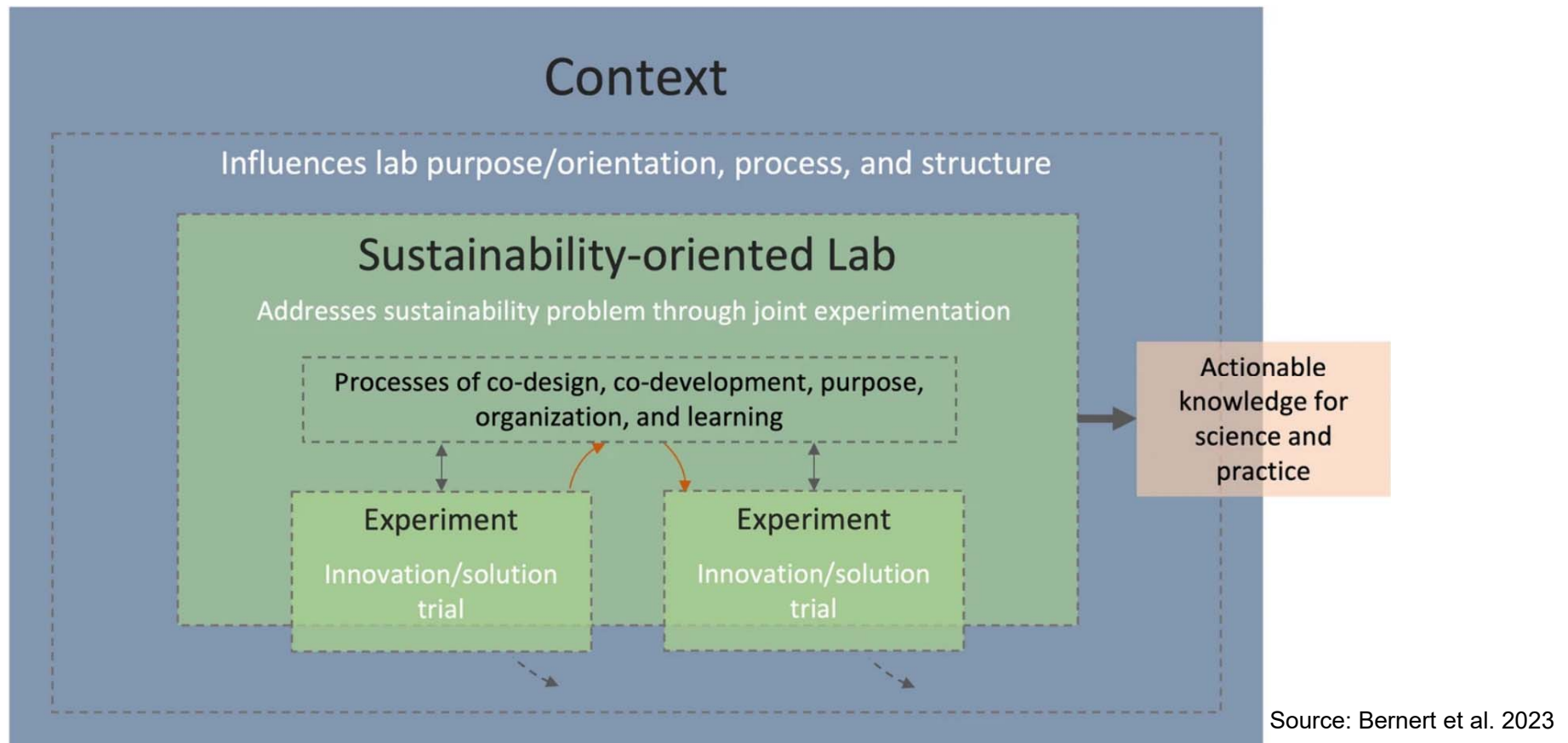


Real World Experiments as core method

Example Lüneburg 2030+ - Experiments

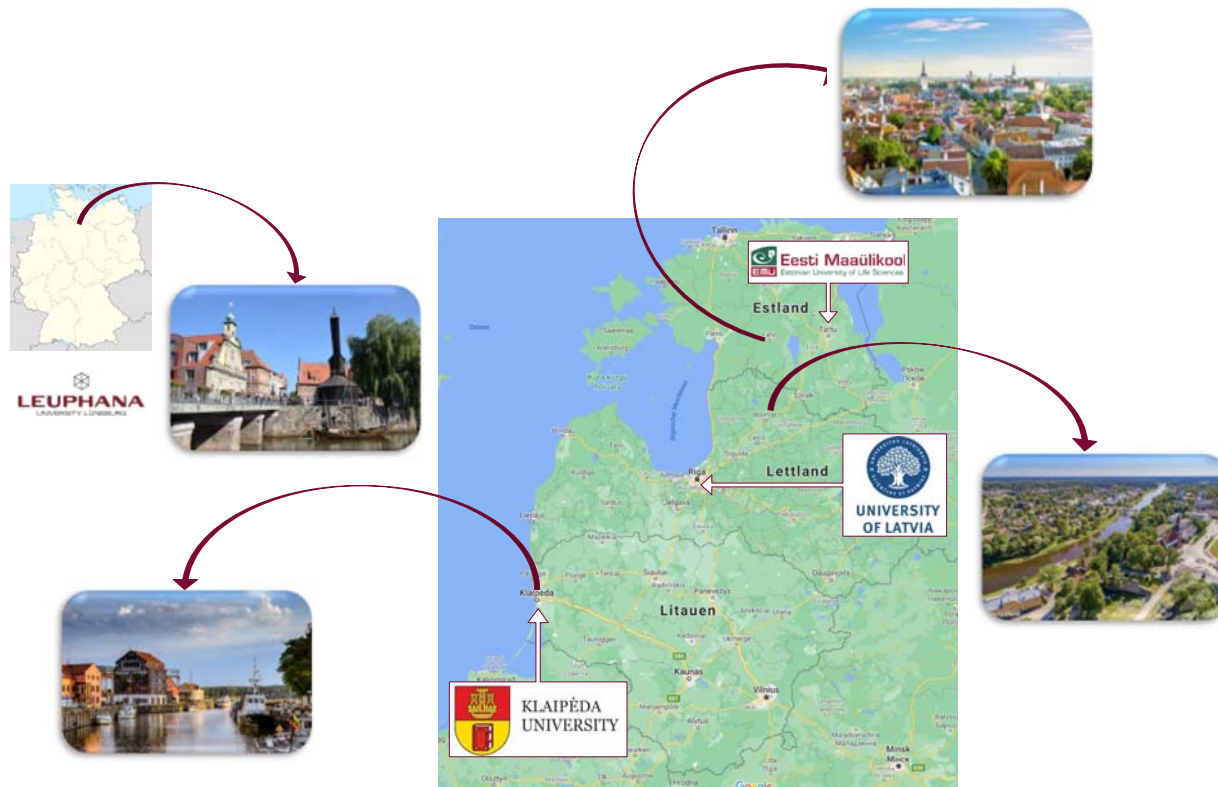


Accompanying Research and Cross-Case Analysis



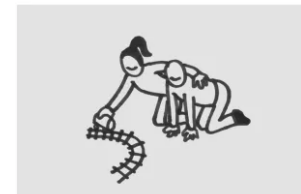
Accompanying Research and Cross-Case Analysis

Example: Project ESD for 2030



Factors for successful RWL implementation *as a result of an accompanying research process*

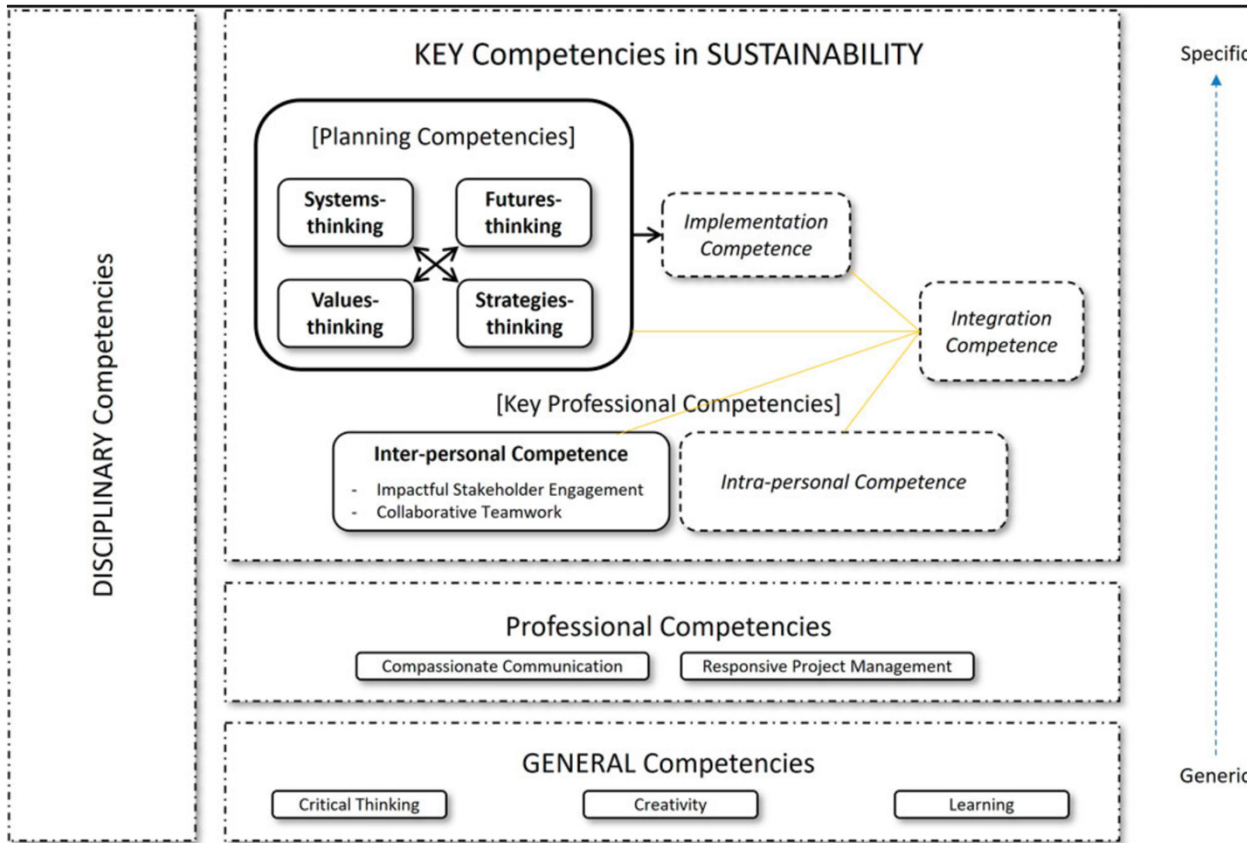
- Finding the right balance between scientific and societal goals
- **Taking into account the needs, interests and constraints of practitioners**
- Using the concept of experimentation
- Active communication
- **Developing a "culture of collaboration" between science and society**
- ***Be tied to concrete places***
- **Create sustainable impact and transferability**
- Provide and acquire sufficient time and financial resources
- Be prepared for adaptability
- **Provide research-based learning and reflection in the context of RwL**
- **Consider dependence on external factors**



Source: Bergmann et al. 2021, pictures O. Mark



Real world Laboratories as spaces to enable learning and competence development



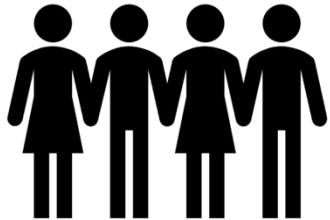
Content-dependent ——— Content-independent



Source: Redman and Wiek 2021; John et al. 2017



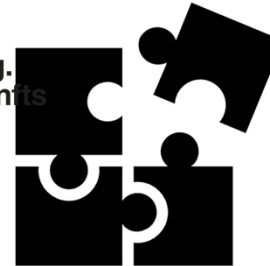
Example Lüneburg 2030+ as a “learning space”



Students on all levels and from diverse programmes



Lüneburg.
Die Zukunfts
Stadt.



Different degrees of involvement

All first year students of
Leuphana (all Majors)

Student assistants

Integration into specific
experiments

BA Environmental and
Sustainability Science (Major +
Minor)

Content related collaboration

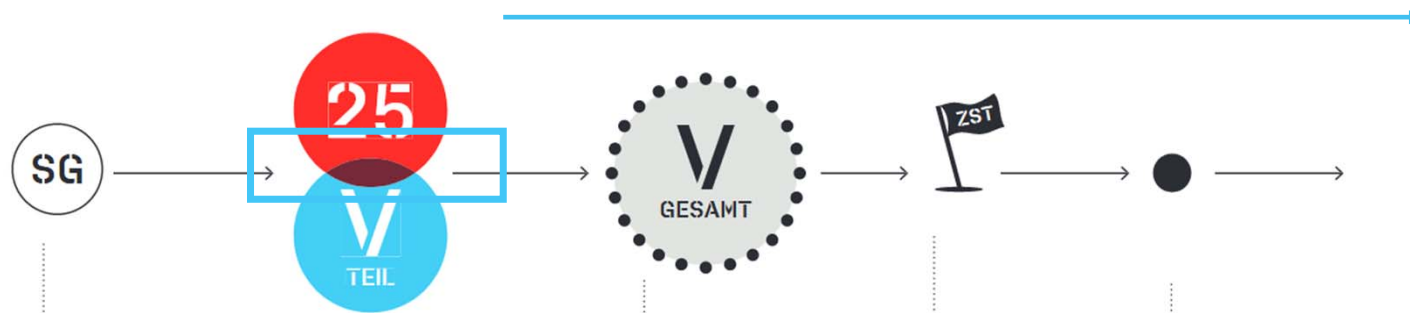
MSc. Sustainability Science

Theses

Content related contributions



Example Lüneburg 2030+ as a “learning space”



Seminare und Gruppen mit
Pat:innen

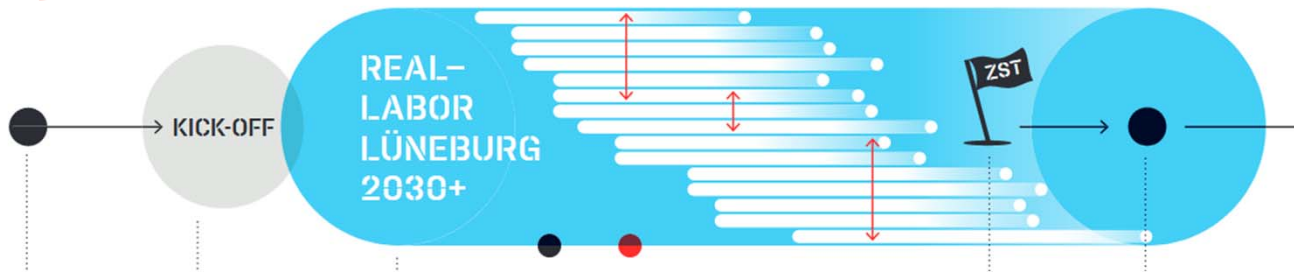
Arbeiten an Einzelaspekten
der 25 späteren Teilvisionen



Phase 1



Example Lüneburg 2030+ as a “learning space”



- Integration into specific experiments
- Content related collaboration
- Content related contributions







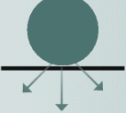


Phase 3






Amplifying impacts of solution options

TYPOLOGY OF AMPLIFICATION PROCESSES			
Categories		Processes	
Amplifying within an initiative	Doing the same initiative longer or faster	STABILIZING 	SPEEDING UP 
		Subcategory dependent: Doing the same initiative (dependent) in a similar or dissimilar context	GROWING  similar context
Subcategory independent: Doing a similar initiative (independent) in a similar or dissimilar context	TRANSFERRING  similar context		SPREADING  dissimilar context
Amplifying beyond an initiative	Changing rules and values	SCALING UP 	SCALING DEEP 

Source: Lam et al. 2020



Connecting solution-oriented research for Sustainability

	Ex-ante	In-situ	Ex-post
Distant			
Engaging			

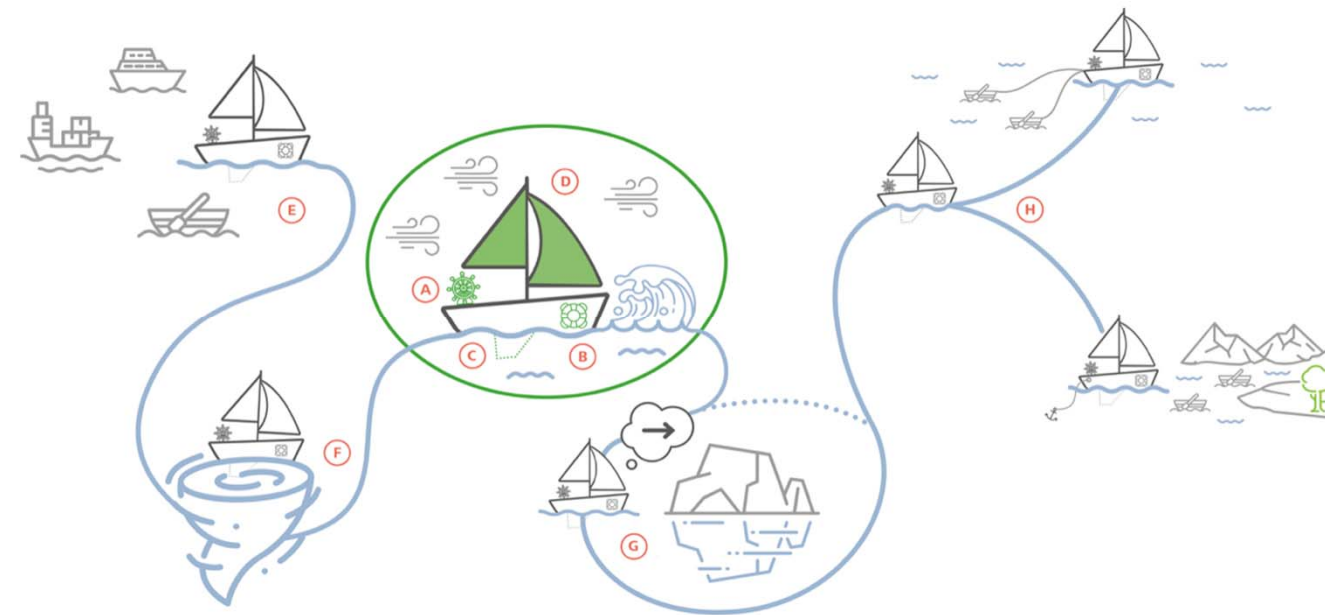
Advancing solution-oriented sustainability research

- Focusing on deep leverage points and complexity
- Cross-Case Comparison to transfer and scale solutions
- Connecting research efforts to advance solutions

Source: Lang & Wiek, 2022 (Spoerri 2009)



Practical Wisdom for knowledge co-production in Sustainability Science



A: Justice
B: Care
C: Humility
D: Courage

E: Agility (multiple values)
F: Intelligence (power)
G: (transferring) Discontentments
H: Strategy

Source: Caniglia et al. 2023



**THANK YOU VERY MUCH FOR YOUR
ATTENTION!**

References

- Barth, M., Jiménez-Aceituno, A., Lam, D. P., Bürgener, L., & Lang, D. J. (2023). Transdisciplinary learning as a key leverage for sustainability transformations. *Current Opinion in Environmental Sustainability*, 64, 101361.
- Bergmann, M., Schöpke, N., Marg, O., Stelzer, F., **Lang, D. J.**, Bossert, M., Gantert, M., Häußler, E., Marquardt, E., Piontek, F. M., & others. (2021). Transdisciplinary sustainability research in real-world labs: Success factors and methods for change. *Sustainability Science*, 16(2), 541-564.
- Bernert, P., Wahl, D., von Wehrden, H., & **Lang, D. J.** (2023). Cross-case knowledge transfer in transformative research: enabling learning in and across sustainability-oriented labs through case reporting. *Urban Transformations*, 5(1), 12.
- Caniglia, G., Freeth, R., Luederitz, C., Leventon, J., West, S. P., John, B., ... & Vogel, C. (2023). Practical wisdom and virtue ethics for knowledge co-production in sustainability science. *Nature Sustainability*, 1-9.
- Caniglia, G., Luederitz, C., von Wirth, T., Fazey, I., Martín-López, B., Hondrila, K., König, A., von Wehrden, H., Schöpke, N. A., Laubichler, M. D., & **Lang, D. J.** (2021). A pluralistic and integrated approach to action-oriented knowledge for sustainability. *Nature Sustainability*, 4(2), 93-100.
- Caniglia, G., Schöpke, N., **Lang, D. J.**, Abson, D. J., Luederitz, C., Wiek, A., ... & von Wehrden, H. (2017). Experiments and evidence in sustainability science: A typology. *Journal of Cleaner Production*, 169, 39-47.
- John, B., Caniglia, G., Bellina, L., Lang, D.J., Laubichler, M. (2017). *The Glocal Curriculum: A Practical Guide to Teaching and Learning in an Interconnected World*. Hamburg: Tredition.
- Lam, D. P., Martín-López, B., Wiek, A., Bennett, E. M., Frantzeskaki, N., Horcea-Milcu, A. I., & **Lang, D. J.** (2020). Scaling the impact of sustainability initiatives: a typology of amplification processes. *Urban Transformations*, 2, 1-24.
- Lang, D. J., & Wiek, A. (2022). Structuring and advancing solution-oriented research for sustainability: This article belongs to Ambio's 50th Anniversary Collection. Theme: Solutions-oriented research. *Ambio*, 51(1), 31-35.
- Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., ... & Thomas, C. J. (2012). Transdisciplinary research in sustainability science: practice, principles, and challenges. *Sustainability science*, 7(1), 25-43.
- Schöpke, N., Stelzer, F., Caniglia, G., Bergmann, M., Wanner, M., Singer-Brodowski, M., Loorbach, D., Olsson, P., Baedeker, C., & **Lang, D. J.** (2018). Jointly experimenting for transformation?: Shaping real-world laboratories by comparing them. *GAIA*, 27, 85–96.
- Redman, A., & Wiek, A. (2021, November). Competencies for advancing transformations towards sustainability. In *Frontiers in Education* (Vol. 6, p. 785163).