universität freiburg

Addressing the challenges of system building

An overview of strategies to deal with new lock-in and path dependencies in the transition process

IST Conference 2023: Responsibility and reflexivity in transitions

Chair of Sustainability and Transitions Research
Caterina Pacini, Dierk Bauknecht, Sarah Olbrich

Utrecht, August 2023

Research problem: combining system elements without risking to fall into lock-in(s) in advanced transitions

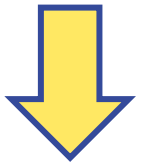
- As sustainability transitions unfold and **stabilize** around different combinations of old and new system elements, **new path dependencies and consequent lock-in(s)** might develop [1].

  →**Emergent lock-in:** the lock-in effect is not resulting from the incumbent system, but occurs potentially during the transition pathways.

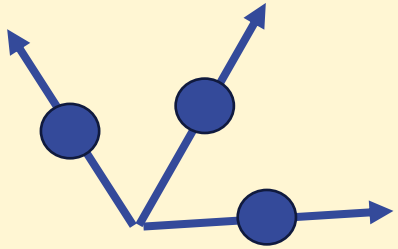
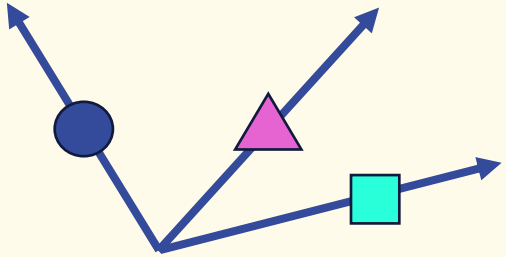
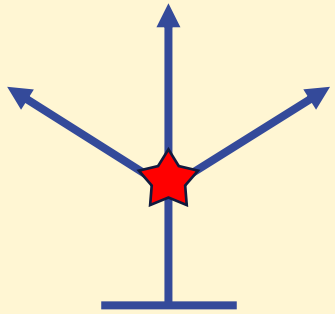
- **Research gap**: Most works in sustainability transition studies don't focus on

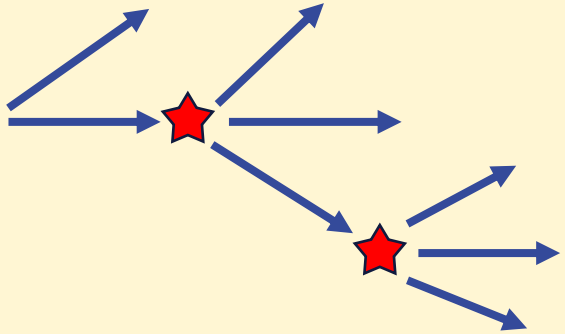
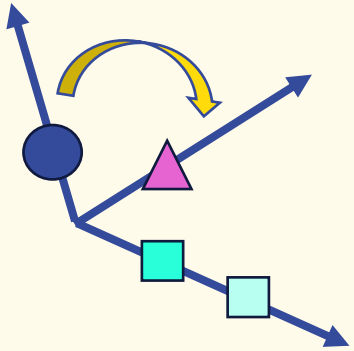
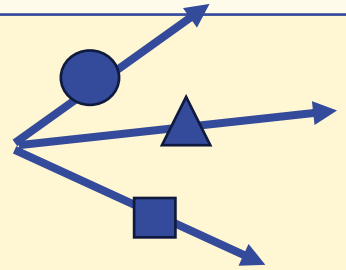
  → emergent lock-in(s) [2] in advanced transitions [3]; and

  → analysis of the strategies to prevent this risk, rather referring to some common knowledge solutions.



- **Target**: elaborate a **structured overview** of general **strategies** to deal with potential lock-in in unfolding sustainability transitions through a systematic literature review.

Strategy	Definition	Visualisation	Characteristics and Relation to lock-in
1) Robust solutions	Choosing solutions that are sufficiently performing in every kind of pathway [4]; [5]		-It is exclusive to keeping options open; -It aims at robustness.
2) Keep options open	Developing a range of different options as long as possible to keep them available [6];[7]		-It aims at optimality; -Postpone decisions; -Options that seems promising although affected by uncertainty are developed; -It needs an 'exit-plan'.
3) Bridging solutions	They deal with the unavailability and the economic unviability of the best option by building a bridge to low carbon sources [8];[9]		-It aims at optimality; -Postpone decisions; -It needs an 'exit-plan'.

Strategy	Definition	Visualisation	Characteristics and Relation to lock-in
4) Identify branching points	Identify major decision points on a pathway where actors' agency reacting to pressures, determine whether and in which ways the pathway is pursued [10];[11];[12]		-Change directionality; -Postpone branching points; -It allows re-evaluation/ it brings up momentum for re-evaluation
5) Contingency planning	Plans that report the 'triggers', indicating the necessity for defensive or corrective actions of the measure(s) or even complete re-evaluation [13];[14]		-Change directionality; -It allows re-evaluation
6) Granular solutions	Develop the options that display medium- smaller unit sizes; lower unit investment costs; are modular [15]		-It aims at optimality; -It allows rapid technological change

References

- [1] Olbrich, S., & Bauknecht, D. (2023 under review). System Building: Thinking about transitions from the end
- [2] Seto, K. C., Davis, S. J., Mitchell, R. B., Stokes, E. C., Unruh, G., & Ürge-Vorsatz, D. (2016). Carbon Lock-In: Types, Causes, and Policy Implications. Annual Review of Environment and Resources, 41(1), 425–452. https://doi.org/10.1146/annurev-environ-110615-085934.
- [3] Köhler, J., Geels, F. W., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., . . . Wells, P. (2019). An agenda for sustainability transitions research: State of the art and future directions. Environmental Innovation and Societal Transitions, 31, 1–32. https://doi.org/10.1016/j.eist.2019.01.004
- [4] Dittrich, R., Wreford, A., & Moran, D. (2016). A survey of decision-making approaches for climate change adaptation: Are robust methods the way forward?. Ecological Economics, 122, 79-89.
- [5] Castrejon-Campos, O., Aye, L., & Hui, F. K. P. (2020). Making policy mixes more robust: An integrative and interdisciplinary approach for clean energy transitions. Energy Research & Social Science, 64, 101425.
- [6] Wanitschke, A., & Hoffmann, S. (2020). Are battery electric vehicles the future? An uncertainty comparison with hydrogen and combustion engines. Environmental Innovation and Societal Transitions, 35, 509-523.
- [7];[10] Foxon, T. J., Pearson, P. J., Arapostathis, S., Carlsson-Hyslop, A., & Thornton, J. (2013). Branching points for transition pathways: assessing responses of actors to challenges on pathways to a low carbon future. *Energy Policy*, *52*, 146-158.

References

- [8] Gürsan, C., & de Gooyert, V. (2021). The systemic impact of a transition fuel: Does natural gas help or hinder the energy transition?. Renewable and Sustainable Energy Reviews, 138, 110552.
- [9] Brauers, H., Braunger, I., & Jewell, J. (2021). Liquefied natural gas expansion plans in Germany: The risk of gas lock-in under energy transitions. Energy Research & Social Science, 76, 102059.
- [11] Malekpour, S., Walker, W. E., de Haan, F. J., Frantzeskaki, N., & Marchau, V. A. (2020). Bridging decision making under deep uncertainty (DMDU) and transition management (TM) to improve strategic planning for sustainable development. Environmental Science & Policy, 107, 158-167.
- [12] Lovell, K., & Foxon, T. J. (2021). Framing branching points for transition: Policy and pathways for UK heat decarbonisation. Environmental Innovation and Societal Transitions, 40, 147-158.
- [13] Walker, W. E., Rahman, S. A., & Cave, J. (2001). Adaptive policies, policy analysis, and policy-making. European journal of operational Research, 128(2), 282-289.
- [14] Moallemi, E. A., & Malekpour, S. (2018). A participatory exploratory modelling approach for long-term planning in energy transitions. *Energy research & social science*, *35*, 205-216.
- [15] Wilson, C., Grubler, A., Bento, N., Healey, S., De Stercke, S., & Zimm, C. (2020). Granular technologies to accelerate decarbonization. *Science*, *368*(6486), 36-39.

Thank you for your attention!