Faculty of Design

2023

Reframing for Transitions: A theoretical model to support designing for transformative design interventions

Peeters, Anna-Louisa, Tromp, Nynke and Hekkert, Paul

Relating Systems Thinking and Design
(RSD12) Symposium | October 6–20, 2023

Reframing for Transitions: A theoretical model to support designing for transformative design interventions

Anna-Louisa Peeters, Nynke Tromp, and Paul Hekkert

Societal transitions are inherently comprised of wicked problems, requiring new systemic problem-solving approaches. Framing lies at the core of problem-solving, as it connects a specific problem to a promising solution space. In our study, we look at *re*framing in the context of societal transitions, which is the practice of developing an original frame to open up new routes for transformative design interventions. Based on literature from the fields of design and transitions, we have developed a theoretical model of a 'Transition Design Frame' (or TD frame), which can serve as a foundational stepping stone in the process of designing interventions to foster societal transitions. The TD frame model proposes four components that marry societal problems with behavioural solutions: 1) a societal issue, 2) a transition strategy, 3) a systemic lever and 4) a behaviour change mechanism. Through workshops with experts from three innovation agencies in the Netherlands, we evaluate our model by applying it to their existing transition design cases, each addressing a different societal transition, and assess how the model can best support their reframing practice.

KEYWORDS: reframing, transition design, design theory and methodology, design for sustainable behaviour

RSD TOPIC(S): Methods & Methodology, Sociotechnical Systems

Introduction

Why we need a reframing model for transitions

Pressing societal challenges, such as climate change, racial injustice, depletion of natural resources, malnutrition, and many more, are inherently complex and dynamic, requiring new systemic problem-solving approaches (Jensen et al., 2019; Loorbach, 2022; Norman & Stappers, 2015). Framing lies at the core of problem-solving, as it connects a specific problem to a promising solution space (Dorst, 2015; D. A. Schön, 1984). While framing is considered a key competence of designers, research on framing in the context of societal transitions is currently limited (Gaziulusoy et al., 2021). In our study, we particularly look at *reframing*, which is the practice of developing an original frame to open up novel routes for transformative design interventions (Mukherjee et al., 2020; Paton & Dorst, 2011; Stompff et al., 2016).

This work takes place at the cross-section of design and transitions, two fields of research and practice that are increasingly being regarded as complementary (Gaziulusoy et al., 2021; Irwin, 2015; Loorbach, 2022; Öztekin & Gaziulusoy, 2020). Research on framing has been studied quite extensively in transitions literature, mostly looking at the frames that are found in public discourse (for instance, see Maluf et al., 2022; Morris et al., 2018; Tziva, 2022). However, framing as part of transition *design* processes is currently limited (Gaziulusoy et al., 2021). With this study, we aim to gain a deeper understanding of the considerations that are needed with regard to framing in highly complex design contexts, as well as to provide practitioners with practical guidance in navigating framing activities in transition design projects.

We have developed a theoretical model of a transition design frame, or 'TD frame', with the aim of supporting designers' reframing practice in the context of societal transitions. The first research question in our study is, 'How internally consistent is our theoretical model of a TD frame?' Internal consistency refers to the relevance of both our chosen components of a TD frame as well as the relationships between them. The second research question is two-fold: a) 'How can the model support the development of a transition design rationale?' and b) How can the model support the development of a reframe?', informing on potential adjustments to be made to the model, so that it can

become a useful resource for transition designers when pursuing novel pathways for innovation.

This report is structured accordingly. We first position our contribution to existing theory from the design and transitions literature, followed by the presentation of our theoretical model of a TD frame. We close this report by sharing our research method, as this is a work in progress.

Theoretical background

A central phenomenon in this study is a *societal transition*. A societal transition involves long-term, multi-dimensional, and fundamental transformation processes through which established socio-technical systems shift to more sustainable, just and resilient production and consumption patterns (Hebinck et al., 2022; Markard et al., 2012; Pel et al., 2020). Transitions typically unfold over several decades or generations and involve a broad range of actors. They are characterised by deep systemic changes resulting from technological, social, organisational and institutional innovations (Ceschin & Gaziulusoy, 2016; Markard et al., 2012). Our study relates to societal transitions in a practice-oriented, 'designerly' way. This angle is distinctly different from the more descriptive approach that is common in transitions research. Thereby, we seek to complement transitions research, while our main contribution sits within the domain of design research, most specifically in transition design.

Evolving from the field of the design for sustainability, *transition design* refers to an area of research and practice that strives for profound, positive social and environmental transformations, challenging established paradigms and envisioning new ones (Irwin, 2015). Transition design draws inspiration from Meadow's theory of systems change (2001) and is characterised by its long-term and systemic thinking approach. It recognises the natural world as the overarching context for all design activities and sees lifestyles as key levers of change (Irwin, 2015). The primary goal of transition design is to initiate and expedite systemic societal change through technological, social, organisational and institutional innovation (Ceschin & Gaziulusoy, 2016; Irwin & Kossoff, 2017). Similar to other design disciplines, transition design is action-oriented and materialises in artificial forms such as physical and digital products, services, policies, communication outlets, and more (e.g., Dahle, 2019). Using the term 'artificial', we refer

to things that are not naturally occurring but instead are created or constructed by human beings.

This work looks at *framing* within the transition design process. The concept of frames originated in sociology as a means to understand human behaviour within social contexts. Since its introduction (Bateson, 1972), frames have been extensively explored across various disciplines, typically examined from two angles: sociological, which focuses on frames in communication, and psychological, which focuses on frames within individuals' minds (Borah, 2011). Combining these dual aspects of frames, Schön and Rein (1994) viewed a frame as a "diagnostic-prescriptive narrative" that encompasses perceptions, underlying belief structures, and selective interpretations. In essence, a frame represents the linkage between a specific issue (e.g., "consumers lack knowledge around preparing tasty plant-based meals") and a particular direction for a solution (e.g., "providing practical guidance and information to support them"). Frames emerge from distinct worldviews and perspectives on humanity and are thereby never neutral (Coyne, 1985).

As part of a typical design process, *reframing* can be considered a key step, referring to the deliberate act of developing a frame that is novel to the domain with the aim of creating space for transformative interventions (Dorst, 2017; Dorst & Watson, 2020; Irwin, 2020; Mukherjee et al., 2020; Paton & Dorst, 2011). By engaging in reframing, problems can be redefined, thereby revealing solution directions that might not have been considered previously (Dorst, 2017; Dorst & Watson, 2020; Irwin, 2020; Jerneck & Olsson, 2011; Mukherjee et al., 2020; Paton & Dorst, 2011). Reframing is studied as a core competence in design practice (Bijl-Brouwer, 2019; Dorst, 2015a; Fokkinga et al., 2020; D. A. Schön, 1984; Stompff et al., 2016) and is widely acknowledged as a valuable tool for navigating transitions as well (Jerneck & Olsson, 2011).

As illustrated by the example of a frame above, the TD frame model resulting from this study was developed with the *protein transition* as a reference case, referring to our collective dietary shift away from animal proteins towards mostly plant-based proteins (Aiking, 2011; Fourat & Lepiller, 2017; Hartmann & Siegrist, 2017). However, our model is intended to support practitioners in designing for other societal transitions as well.

Transition Design Frame

Theoretical model

Design scholar Kees Dorst translated the notion of a frame into a logical formula for designers (2015), which explains the function of a frame. The formula shows how a frame supports the speculation of potential change mechanisms (the 'how') for achieving a desired outcome (or why) while also aiding in conceptualising the design intervention (the what).

In more depth, the *outcome* represents the actual change brought about by the intervention, often described in terms of behaviour. In the context of societal transitions, the outcome typically revolves around increased justice, sustainability, or both within a certain domain (Avelino et al., 2020; Pel et al., 2020). For instance, a desirable outcome in the protein transition could involve consumers opting for plant-based products over animal products while shopping at the supermarket. The *how* then refers to the mechanism of change through which an intervention affects people, comprising a behavioural influence and a worldview. An example of such a change mechanism is the concept of nudging, assuming the justification of libertarian paternalism for the purpose of promoting environmental sustainability (Thaler & Sunstein, 2008; Veetil, 2011). Lastly, the what refers to the means of change, i.e. the design intervention. To proceed with the same example, a design intervention that nudges consumers to purchase plant-based products could be the placement of these products at eye level.

The TD frame expands on the logical formula from Dorst (2015) and has been tailored to the context of transitions. Typical for transitions is the consideration of various sociological levels of analysis (Ritzer & Stepnisky, 2007). In transitions, developments at a macro level, focusing on society as a whole in the longer term and across geographical boundaries, are connected to interactions at a micro level, examining individual actors' everyday local behaviours in the short term. In line with the notion that developments at a macro level and human behaviours at a micro level are intimately connected in societal transitions, we propose to integrate this holistic lens in TD frames.

Our TD frame model presents four components that marry societal problems with behavioural solutions: 1) a societal issue, 2) a transition strategy, 3) a systemic lever and

4) a behaviour change mechanism. As depicted in Figure 1, the four components of a TD frame account for the macro, meso and micro perspectives that are relevant in societal transitions (Geels, 2002) and are informed by an underlying worldview. Each of the TD frame components and their relationships will be further described next. To illustrate the model with a practical example, Table 1 depicts the TD frame underlying a plant-based burger.

Societal issues

Transition design is characterised by its inherent aspiration of facilitating radical, positive social and environmental change (Irwin, 2015). Thereby, we deemed the component of a societal issue as part of a transition design frame, indispensable. Societal issues are associated with value for the collective, often characterised by outcomes in the longer term and spatially extending beyond the direct environment of one individual (Tromp & Hekkert, 2019). Since societal issues are intimately linked with lifestyles and individual behaviours, we formulate societal issues through a behavioural lens. An example of a societal issue that is encountered in the protein transition is the fact that consumers do not want to give up eating animal-based proteins, upholding unsustainable diets.

Transition Strategy

Societal transitions cannot directly be managed or designed. However, they can be influenced by technological, organisational, social and institutional innovations, which are typically the outputs of transition designers (Ceschin & Gaziulusoy, 2016). Considering the most foundational conceptual frameworks from transitions literature (Geels & Schot, 2007; Markard et al., 2012) as well as perspectives on making these frameworks 'actionable' (Hebinck et al., 2022; Loorbach, 2022; Raven et al., 2010), we distinguish various strategies that design practitioners can deploy to stimulate a transition through their interventions.

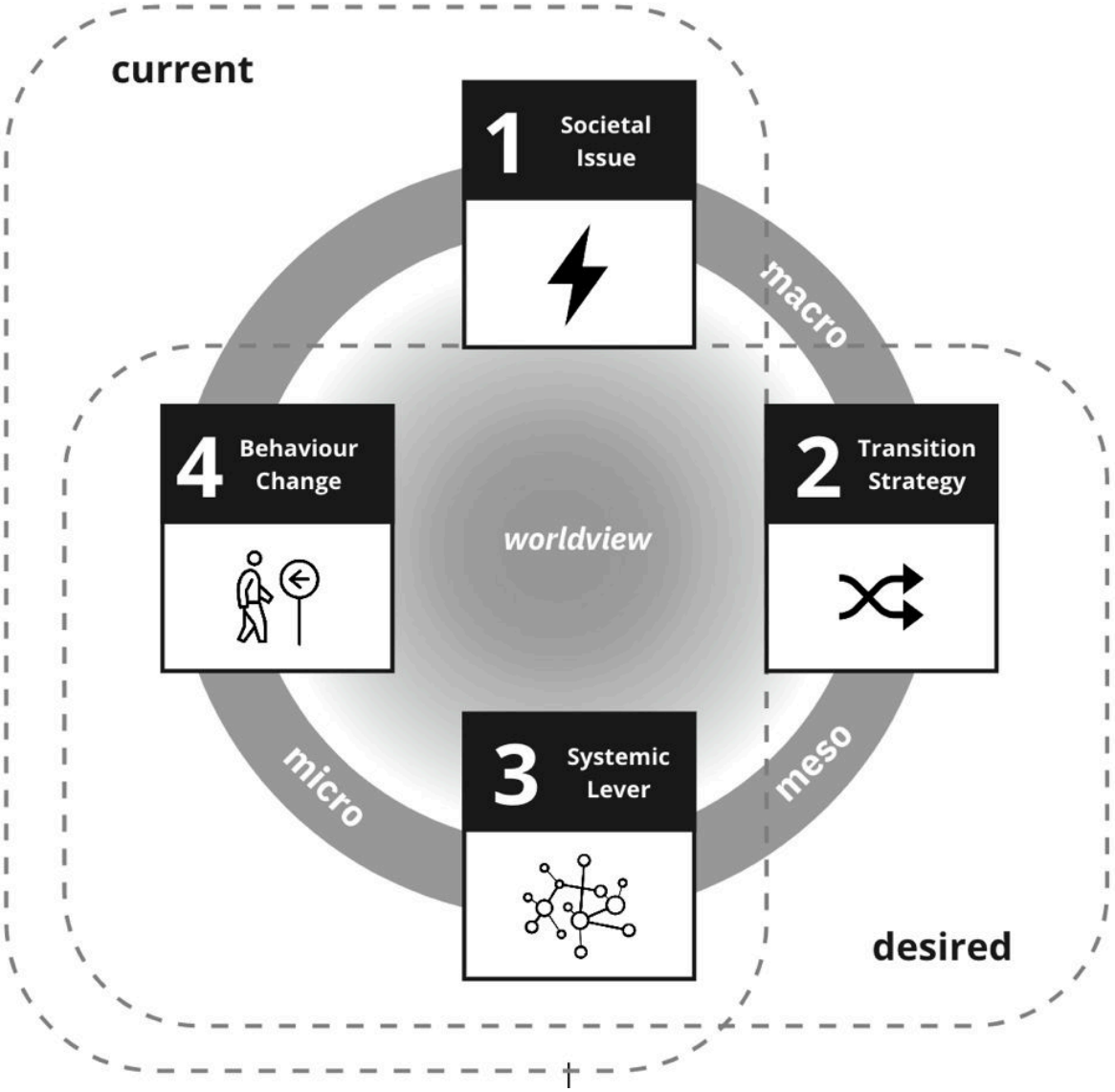

Figure 1: Theoretical model of a Transition Design Frame.

	Transition Design Frame component	Theoretical background	Example from the protein transition: a plant-based burger
1	**Societal issue**	Ceschin & Gaziulusoy, 2019; Irwin, 2015; Tromp & Hekkert, 2019	*consumers do not want to give up eating animal-based proteins, upholding unsustainable diets*
2	**Transition strategy**	Geels & Schot, 2007; Markard et al, 2019; Hebinck et al, 2022; Loorbach, 2022; Raven et al, 2010; Smith and Raven, 2012	*building up a new, more sustainable system through a fit and conform strategy*
3	**Systemic lever**	Leadbeater & Winhall, 2020; Meadows, 2001	*adjusting resource flows in the food supply chain*
4	**Behaviour change mechanism**	Irwin, 2015; Liu et al, 2015; Niedderer et al., 2016; Tromp & Hekkert, 2019	*matching existing behaviours by mimicking meat and dairy products with plant-based analogues*

Table 1: The four components of a Transition Design Frame, their theoretical foundation and examples from the protein transition

We see two general dimensions along which design interventions exert their effect in transitions. Firstly, an intervention can either foster the build-up of a new, 'better' system or support the breakdown and phase-out of parts of the system (Hebinck et al., 2022). Secondly, designers can introduce interventions within existing dominant structures and institutions (also known as the 'regime'; Geels, 2002) through a 'fit and conform' strategy, or they can be more radical and disrupt the regime from the outside, eventually replacing parts of it through a 'stretch and transform' strategy (Smith & Raven, 2012). As part of a transition strategy, design efforts can be intended to help foster a transition by influencing its *structures* (institutional, economic, physical and regulatory settings), its *cultures* (discourses, shared beliefs, values, perspectives and paradigms), or its *practices* (daily routines, behaviours, actions, choices and habits) (Silvestri et al., 2020).

Systemic Lever

Transition design requires a consideration of the levers by which a system can be stimulated to take a different, more desired shape. In our TD frame model, we adopt the four ways to achieve systems change by design from Leadbeater and Winhall (2020): *purpose* (changing what the system is for and the philosophy underpinning it), *power* (influencing the actors and institutions that determine how resources flow, what takes priority, who matters and what outcomes are considered 'good'), *resource flows* (altering the distribution of human, monetary, natural and material resources), and *relationships* (shifting social models). These four systemic levers can be seen as a practical translation of the foundational work on systems change by Donella Meadows (2001).

Behavior change

As mentioned earlier, societal transitions essentially require an adaptation of lifestyles (Irwin, 2015; Liu et al., 2016; Tromp & Hekkert, 2019), which are made up of daily behaviours. Like other design disciplines, transition design is action-oriented and results in tangible artefacts, such as physical and digital products, services, policies, and communication outlets (e.g., Dahle, 2019). Through such artefacts, design has the ability to foster behaviours that are socially and environmentally favourable (Tromp & Hekkert, 2019). 'Design for behavior change' is deemed a potent strategy to address the complex and dynamic issues that are inherent to societal transitions. In this regard, design for behaviour change has shown significant positive results, such as enabling people to recycle, use energy more efficiently, increase their physical activity, reconsider social interactions, and cross roads more safely (Niedderer et al., 2016). Demonstrating its essential role in societal transitions, behaviour change is included in our theoretical model. We have decided not to specify behaviour change mechanisms in our TD frame model, as we expect (experienced) design practitioners to be familiar with them already. Our study is intended to test this hypothesis as well.

Connecting the four components

From existing to desired

Design revolves around the transformation of an existing and often somehow problematic situation into a desired situation (Simon, 1996). Essential to transforming an existing situation into a preferred one by design is both an understanding of the factors that have contributed to the present societal challenge as well as a notion of what the preferred situation would entail. 'Vision in Design' and Social Implication Design (SID) are examples of design methods which are centred around the connection between these two states of the system one is aiming to influence (Hekkert & van Dijk, 2020; Tromp & Hekkert, 2016 2019). These methods support a deconstruction of the present within a domain of interest, followed by visioning a desirable future for that same domain. Building on these methods, our TD frame model invites practitioners to deeply consider both the present and the future states of the system undergoing the societal transition they are designing for.

Macro, meso and micro levels

Inherent to societal challenges is the variety of levels at which they occur. As mentioned earlier in this report, we distinguish several sociological levels of analysis when designing for transitions: *macro* (focusing on society as a whole, on a longer-term and across geographical boundaries, *meso* (institutions, organisations and other groups) and *micro* (examining individual actors' everyday local behaviours in the short term) (Ritzer & Stepnisky, 2007).

Underlying worldview

Every frame arises from a view of the world and humanity and is never neutral (Coyne, 1985; Hekkert & van Dijk, 2020). In the process of reframing, it is crucial to be aware of the values, preferences and biases influencing your perspective on the issue at hand. The TD frame model asks practitioners to make their worldview explicit for a more deliberate reframing process.

Method

The TD frame serves as the unit of analysis in our current study. To assess whether the theoretical model of a TD frame is internally consistent (RQ1) and whether it indeed supports the process of reframing with the aim of fostering a societal transition (RQ2a & RQ2b), we are performing a qualitative multiple-case study. We invite expert designers from three innovation agencies in the Netherlands to participate in 3 separate 3-hour workshops, each addressing a societal transition that they were already working on. The list of agencies can be found in Table 2.

Agency	**Expertise**
Freedom Lab	Transformative innovation
Livework Studio	Service design for sustainable futures
To be confirmed	To be confirmed

Table 2: The innovation agencies are participating in the study

To account for the variation between the outputs of the three agencies as a result of their varying cases and ways of working, the participants are asked to meet several criteria. The case they choose must encompass a societal transition, being a systemic shift towards a more just and sustainable future within a certain domain. Participants are expected to already have a profound understanding of relevant social, technological, cultural, political and economic factors at play within their chosen domain, as well as their worldview. Also, they need to already have chosen a way to approach their societal issue, i.e. a solution direction. In other words, participants are expected to have landed on a frame prior to the workshop, preferably as part of a running project, as that would best reflect their actual framing practice. Making their current frame explicit is part of the research procedure.

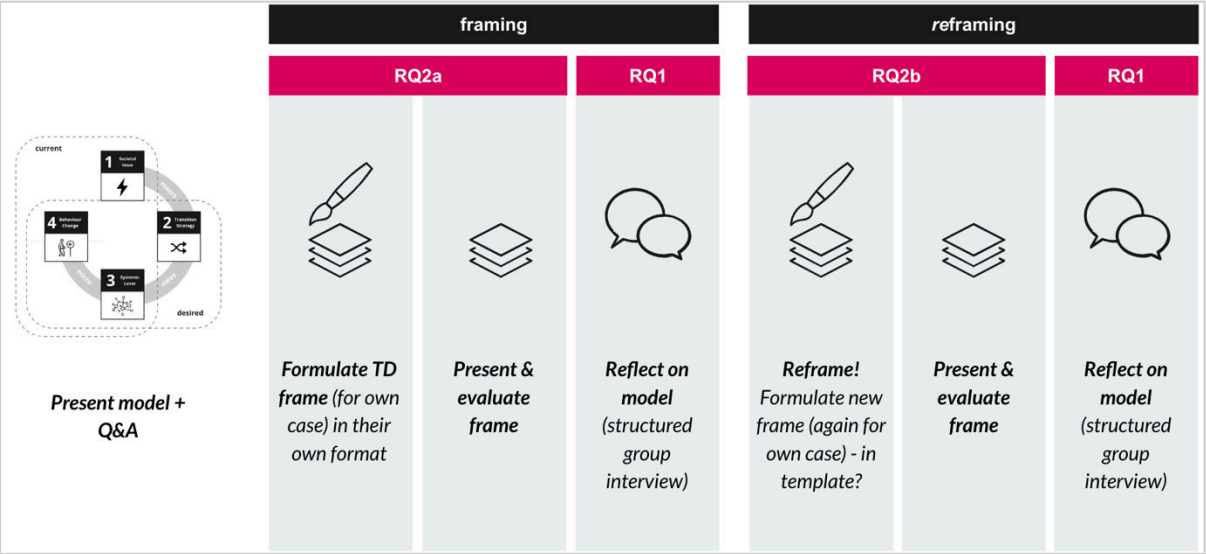

Figure 2: Set-up of the workshop.

Each workshop has the same preparatory activities, agenda, duration and material support (Figure 2). Participants work with templates to ensure that the frames from the three different workshops have a similar composition and an equal level of granularity. Since the research questions revolve around the experience of designers with the model, the workshop agenda includes rounds of reflection on each question, supported by an interview guide

Procedure

The agencies are recruited via e-mail and phone by the primary researcher through their personal network. By means of a 45-minute intake call, each participating agency is given the opportunity to share their transition case and their current frame, guided by questions from the primary researcher.

At the start of the workshop, participants are asked to present their case, including its societal drivers, their worldview and their solution direction in a format of their choice to stay as close as possible to their own way of working. After familiarisation with the TD frame model, supported by examples from the protein transition, they reflect on the model through a structured group interview. Next, participants are invited to develop a novel frame for their own case, inspired by the model, for which they receive a template. They present the reframe to the primary researcher, followed by another

group reflection and closing remarks. The audio of the workshop is recorded, and materials are captured in (anonymous) photographs.

By means of a thematic analysis, the outputs of the three workshops are compared to identify patterns and themes that shed light on the leading research questions.

References

1. Avelino, F., Dumitru, A., Cipolla, C., Kunze, I., & Wittmayer, J. (2020). Translocal empowerment in transformative social innovation networks. *European Planning Studies*, *28*(5), 955–977. https://doi.org/10.1080/09654313.2019.1578339
2. Bateson, G. (1972). *Steps to an Ecology of Mind: Collected Essays in Anthropology, Psychiatry, Evolution, and Epistemology*. University of Chicago Press.
3. Borah, P. (2011). Conceptual Issues in Framing Theory: A Systematic Examination of a Decade's Literature. *Journal of Communication*, *61*(2), 246–263. https://doi.org/10.1111/j.1460-2466.2011.01539.x
4. Ceschin, F., & Gaziulusoy, I. (2016). Evolution of design for sustainability: From product design to design for system innovations and transitions. *Design Studies*, *47*, 118–163. https://doi.org/10.1016/j.destud.2016.09.002
5. Coyne, J. C. (1985). Toward a Theory of Frames and Reframing: the Social Nature of Frames. *Journal of Marital and Family Therapy*, *11*(4), 337–344. https://doi.org/10.1111/j.1752-0606.1985.tb00027.x
6. Dahle, C. L. (2019). Designing for Transitions: Addressing the Problem of Global Overfishing. *Cuadernos Del Centro de Estudios de Diseño y Comunicación*, *73*, 213–233. https://doi.org/10.18682/cdc.vi73.1046
7. Dorst, K. (2015). Frame Innovation: Create new thinking by design. *The MIT Press*.
8. Gaziulusoy, I., Veselova, E., Hodson, E., Berglund, E., Oztekin, E. E., Houtbeckers, E., Hernberg, H., Jalas, M., Fodor, K., & Ferreira, M. (2021). Design for sustainability transformations: A deep leverage points research agenda for the (post-)pandemic context. *Strategic Design Research Journal*, *14*(1), 19–31. https://doi.org/10.4013/sdrj.2021.141.02
9. Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: A multi-level perspective and a case-study. *Research Policy*, *31*(8–9), 1257–1274. https://doi.org/10.1016/S0048-7333(02)00062-8

10. Geels, F. W., & Schot, J. (2007). Typology of sociotechnical transition pathways. *Research Policy*. https://doi.org/10.1016/j.respol.2007.01.003
11. Hebinck, A., Diercks, G., von Wirth, T., Beers, P. J., Barsties, L., Buchel, S., Greer, R., van Steenbergen, F., & Loorbach, D. (2022). An actionable understanding of societal transitions: the X-curve framework. *Sustainability Science*, *17*(3), 1009–1021. https://doi.org/10.1007/s11625-021-01084-w
12. Hekkert, P., & van Dijk, M. (2020). *VIP Vision in Design: A Guidebook for Innovators*. BIS Publishers.
13. Irwin, T. (2015). Transition design: A proposal for a new area of design practice, study, and research. *Design and Culture*. https://doi.org/10.1080/17547075.2015.1051829
14. Irwin, T., & Kossoff, G. (2017). *Mapping Ojai's Water Shortage: A Workshop*. http://www.design.cmu.edu/
15. Jensen, C. L., Goggins, G., Røpke, I., & Fahy, F. (2019). Achieving sustainability transitions in residential energy use across Europe: The importance of problem framings. *Energy Policy*, *133*(July), 110927. https://doi.org/10.1016/j.enpol.2019.110927
16. Leadbeater, C., & Winhall, J. (2020). *Building Better Systems: A Green Paper on System Innovation*. https://www.systeminnovation.org/article-system-innovation-on-purpose
17. Liu, W., Oosterveer, P., & Spaargaren, G. (2016). Promoting sustainable consumption in China: a conceptual framework and research review. *Journal of Cleaner Production*, *134*, 13–21. https://doi.org/10.1016/j.jclepro.2015.10.124
18. Loorbach, D. (2022). Designing radical transitions: A plea for a new governance culture to empower deep transformative change. *City, Territory and Architecture*, *9*(1). https://doi.org/10.1186/s40410-022-00176-z
19. Maluf, R. S., Burlandy, L., Cintrão, R. P., Jomalinis, E., Carvalho, T. C. O., & Tribaldos, T. (2022). Sustainability, justice and equity in food systems: Ideas and proposals in dispute in Brazil. *Environmental Innovation and Societal Transitions*, *45*(December 2021), 183–199. https://doi.org/10.1016/j.eist.2022.10.005
20. Markard, J., Raven, R., & Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Research Policy*, *41*(6), 955–967. https://doi.org/10.1016/j.respol.2012.02.013

21. Meadows, D. (2001). Dancing with Systems. *Whole Earth*, pp. *106*, 58–64.
22. Morris, C., Mylan, J., & Beech, E. (2018). Substitution and Food System De-Animalisation. *International Journal of Sociology of Agriculture & Food*, *25*(1), 42–58.
23. Mukherjee, M., Ramirez, R., & Cuthbertson, R. (2020). Strategic reframing as a multi-level process enabled with scenario research. *Long Range Planning*, *53*(5), 101933. https://doi.org/10.1016/j.lrp.2019.101933
24. Niedderer, K., Ludden, G., Clune S, J., Lockton, D., Mackrill, J., Morris, A., Cain, R., Gardiner, E., Evans, M., Gutteridge, R., & Hekkert, P. (2016). Design for Behaviour Change as a Driver for Sustainable Innovation : Challenges and Opportunities for Implementation in the Private and Public Sectors. *International Journal of Design*, *10* (September), pp. 67–85. http://www.ijdesign.org/ojs/index.php/IJDesign/article/viewFile/2260/733
25. Norman, D. A., & Stappers, P. J. (2015). DesignX: Complex Sociotechnical Systems. *She Ji*, *1*(2), 83–106. https://doi.org/10.1016/j.sheji.2016.01.002
26. Öztekin, E. E., & Gaziulusoy, İ. (2020). Co-positioning design for sustainability transitions - practice theory and transitions theories: towards dialogue and collaboration. *Journal of Design Research*, *18*, 196–223.
27. Paton, B., & Dorst, K. (2011). Briefing and reframing: A situated practice. *Design Studies*, *32*(6), 573–587. https://doi.org/10.1016/j.destud.2011.07.002
28. Pel, B., Haxeltine, A., Avelino, F., Dumitru, A., Kemp, R., Bauler, T., Kunze, I., Dorland, J., Wittmayer, J., & Jørgensen, M. S. (2020). Towards a theory of transformative social innovation: A relational framework and 12 propositions. *Research Policy*, *49*(8), 104080. https://doi.org/10.1016/j.respol.2020.104080
29. Raven, R., Van Den Bosch, S., & Weterings, R. (2010). Transitions and strategic niche management: Towards a competence kit for practitioners. *International Journal of Technology Management*, *51*(1), 57–74. https://doi.org/10.1504/IJTM.2010.033128
30. Ritzer, G., & Stepnisky, J. (2007). *Sociological Theory* (7th ed.). McGraw-Hill Education, Europe.
31. Schön, D. A. (1984). Problems, frames and perspectives on designing. *Design Studies*, *5*(3), 132–136. https://doi.org/10.1016/0142-694X(84)90002-4
32. Schön, D., & Rein, M. (1994). *Frame Reflection: Toward the Resolution of Intractable Policy Controversies*. Basic Books.
33. Silvestri, G., Wittmayer, J., & De Geus, T. (2020). *TOMORROW Workbook for urban*

transition makers.

34. Simon, H. A. (1996). The Sciences of the Artificial. In *Technology and Culture*. MIT Pre4ss. https://doi.org/10.2307/3102825
35. Smith, A., & Raven, R. (2012). What is protective space? Reconsidering niches in transitions to sustainability. *Research Policy*, *41*(6), 1025–1036. https://doi.org/10.1016/j.respol.2011.12.012
36. Stompff, G., Smulders, F., & Henze, L. (2016). Surprises are the benefits: reframing in multidisciplinary design teams. *Design Studies*, *47*, 187–214. https://doi.org/10.1016/j.destud.2016.09.004
37. Thaler, R. H., & Sunstein, C. R. (2008). Nudge: Improving decisions about health, wealth, and happiness. In *Nudge: Improving Decisions about Health, Wealth, and Happiness*. Yale University Press. https://doi.org/10.1016/s1477-3880(15)30073-6
38. Tromp, N., & Hekkert, P. (2016). Assessing methods for effect-driven design: Evaluation of a social design method. *Design Studies*, *43*, 24–47. https://doi.org/10.1016/j.destud.2015.12.002
39. Tromp, N., & Hekkert, P. (2019). Designing for Society: Products and Services for a Better World. *Bloomsbury Publishing*.
40. Tziva, M. (2022). *Transitions towards sustainable food systems: The case of the protein transition*.

Authors

Anna-Louisa Peeters, Ir, Delft University of Technology, Faculty of Industrial Design Engineering, a.l.peeters@tudelft.nl

Nynke Tromp, Dr, Delft University of Technology, Faculty of Industrial Design Engineering, n.tromp@tudelft.nl

Paul Hekkert, Prof Dr, Delft University of Technology, Faculty of Industrial Design Engineering, p.p.m.hekkert@tudelft.nl