

ID 1543 | SHAPING SPACES OF INTERACTION FOR SUSTAINABILITY TRANSITIONS

Emma Puerari^{1,2}; Jotte de Koning^{1,2}; Ingrid Mulder¹; Derk Loorbach²

¹TU Delft - IO - Faculty of Industrial Design Engineering; ²DRIFT - Dutch Research Institute for Transitions
e.puerari@tudelft.nl; jotte.deKoning@tudelft.nl; i.j.mulder@tudelft.nl; loorbach@drift.eur.nl

1 INTRODUCTION

Cities are complex environments where different actors and stakeholders co-exist and learn how to live together. Within these complex environments, different types of citizens initiatives are arising that we consider to be important starting points for achieving urban transformations to sustainability (Niki Frantzeskaki et al., 2016). These kind of initiatives, typically enacted by social entrepreneurs, civic volunteers, local activists, freelance civil servants etc., are challenging the traditional ways of city making through which urban services, spaces and buildings are usually developed through policy and planning. They seem to stimulate the rise of several new types of interactions between citizens, entrepreneurs and freelance civil servants but so far are hardly facilitated and linked to urban planning in a systematic way. Such interactions can be considered as transformative social innovations (Avelino & Wittmayer, 2016) that redefine the relations and interactions between actors to realize sustainable alternatives contributing to wider transitions. These transformative initiatives can be nurtured, developed, replicated, or complemented in protected environments and are often seen as part of a broader transition movement (Gorissen, Vrancken, & Manshoven, 2016). Those transformative initiatives are triggering the rise of spaces for the interaction between different stakeholders in urban environment, which is a key element of participatory city making. This paper aims to explore the role of planning in participatory city making. It connects complexity in planning and transition theory in order to describe the space of the interaction between the different urban stakeholders.

2 TRANSITIONS IN CITY MAKING

Participation and interaction of different actors and stakeholders has always been a hot topic in planning research. The discussions about the necessity to include more actors in the planning process resulted in governance replacing government in planning discourses and practices. Following different paradigms emerged; such as traditional public administration, new public management and networked governance (Hartley, 2005). Consequently, new approaches were developed, i.e. the inclusion of private actors in different types of collaboration and partnerships in "making" the urban realm or in providing urban public services (R.C. Holland, 1984). Emphasis arose on the emerging role of citizens and communities in city making, this spread during the XXI century (Majamaa, 2008; Zhang & Kumaraswamy, 2011). What these diverse approaches have in common, is the willingness to open-up the decision making process to different stakeholders. While these approaches are developed in practice, also the academic discourse is repositioning the role of planning, highlighting how they moved from a technocratic practice to a communicative practice where planning is intended to enhance reaching consensus in decision making processes. Different modes of planning emerged from theories about urban and regional regimes (Hamilton, 2004), discursive and collaborative governance (Forester, 1989; Healey, 2007), relational geographies (Massey, 2005), agonism and institutional ambiguity (Bäcklund & Mäntyselä, 2010), and theories of spatial complexity (Portugali, Benenson, & Omer, 1994).

In the last years, there is a growing interest among planners to address complexity and its ongoing fluidity, openness, non-linearity and unpredictable development, considering this to be more in line with the reality of cities' development (Boelens & Roo, 2014; Roo & Boelens, 2014). Here, planners are questioning about

the role of their discipline within processes in which the system well as the sub-systems that acts in parallel, is co-created by a variety of actors (Boonstra & Boelens, 2011; Byrne, 1998; Urry, 2003).

Such discourse is grounded in complexity theory, which in turn has its roots in general system theory (Von Bertalanffy, 1968). Complexity theory arose during the 90s (Holland 1995; Kauffman 1993, 1995), focusing on how systems co-evolve. It focuses on complex systems that are open, interact with their environment and constantly evolve and unfold over time (J. H. Holland, 1995; Holling, 1987; Kauffman, 1995; Prigogine & Stengers, 1984). As highlighted by Rotmans and Loorbach (2009), the literature within the main category of complex systems identifies the special cases of complex adaptive systems: "These are systems that have the capacity to change and learn from experience. They are able to respond to and adjust themselves to changes in their environment. What makes a complex adaptive system special is the set of constantly adapting nonlinear relationships. Complex adaptive systems contain special objects - agents - that interact with each other and adapt themselves to other agents and changing conditions" (Rotmans and Loorbach, 2009 p.186).

Complex adaptive systems are indeed described through unique elements, such as co-evolution (Mittleton-Kelly, 2003), emergence (Goldstein, 1999) and self-organization (Bak, 1999; Prigogine & Stengers, 1984). Next to planning theory, transition research is another field that discusses the co-evolving dynamics in complex systems. It is an interdisciplinary field that takes complex systems theory as a starting point. Transition theory attempts to better understand the behavior of complex systems that run through cycles of relatively long periods of equilibrium, order, and stability interspersed with short periods of instability and chaos. Transitions are described as societal changes that involve a variety of actors (Geels, 2011), consisting of different patterns (De Haan & Rotmans, 2011; Geels & Schot, 2007), various phases (Grin, Rotmans, & Schot, 2010) and high levels of co-evolution, complexity, and uncertainty (Geels & Schot, 2010; Rotmans & Loorbach, 2009). One of the main analytical frameworks on transitions is the Multi-Level Perspective (MLP). It describes three levels of structuration and stability: niche, regime and landscape. The regime concept has been described as a set of rules and practices carried by different social groups (Geels, 2002). The niche concept refers to spaces for innovations. The landscape concept is seen as an exogenous, wider context. Transitions are understood as "outcomes of alignments between developments at multiple levels" (Geels & Schot, 2007, p.399). Geels and Schot also highlighted how alignments are always enacted by social groups, and it is through their activities that different levels of structuration (i.e. niche, regime) are continuously reproduced (Wittmayer, Avelino, Steenberg, & Loorbach, 2016). The regime is said to "orient and coordinate the activities of the social groups that reproduce the various elements of socio-technical systems" (Geels, 2011; p. 27). In a transition perspective, cities are complex systems where the actions and interactions of different stakeholders generate structural changes. These changes are the results of both top-down activities and bottom-up emergent actions that generate self-organised adaptations of the system that are not necessarily under people's direct control (Cozzolino, 2015), but influenced by the dynamics happening between actors and agency in city making.

Those adaptations of the system take place at the urban level in a space where a variety of actors interact, here different transformative initiatives can be referred to as niches within a dominant regime because of the strong transformative power that they have. This space is defined as the space of interaction in transitions. A specific focus on actors and agency dynamics in transitions has been developed in the field of the governance of transitions (N. Frantzeskaki, Loorbach, & Meadowcroft, 2012; Grin et al., 2010). Different approaches have been described and developed in this field with transition management as an important one. Transition management has been described as the "attempt to influence the societal system into a more sustainable direction" by exploring future options through "searching, learning and experimenting" (Rotmans & Loorbach, 2010, pp. 108–109). Transition management is based on five guidelines that are partly descriptive, in the sense of basic principles, and partly prescriptive, in terms of rules for management (see Rotmans & Loorbach, 2009) for targeted interventions in complex systems, as cities, to influence the speed and direction of emerging transition dynamics towards more sustainable futures. The past few years a growing literature has emerged specifically addressing urban sustainability transitions and a particular form of transitions in which cities are simultaneously the places of experiments and niches for broader societal transitions as well as subjects of transitions themselves (Niki Frantzeskaki et al., 2016). This perspective leads to new approaches to urban transition management as a multi-actor process of experimentally developing new and sustainable urban regimes (Loorbach et al 2016). This approach implies new roles and tools for policy-makers and planners to work in a more organic, emergent yet selective and long-term focused way.

3 THE SPACE OF INTERACTION

During the last years, in the time of the implementation of austerity policies, in many cities different types of transformative initiatives are arising. Even though such initiatives have different natures (i.e. top-down, bottom-up) statuses (i.e. formal, informal, etc.), purposes and aims (i.e. business oriented, and current existing regime). They are creating new visions and actions, they attract attention and foster the rise of new type of coalitions between the urban stakeholders (public administration, citizens, third sector, private entrepreneurs). As highlighted in the previous paragraph, the groups of stakeholders acting in urban contexts are diverse. Generally, four type of actors are identified, the public and the private sector, the citizens' initiatives and the third sector. This paper takes special interest in the relationship between two of these groups: the public and the citizens' initiatives, which can be organised in different types of groups (i.e. associations, NGOs, informal groups, etc.). The reason for this special interest in these two stakeholders is that in an urban context the public sector is obviously playing a crucial role and, on the other hand, the term citizens allows for the inclusion of a broad range of types of stakeholders.

The emergence of the new coalitions highlighted before give rise to the space of the interaction between the different stakeholders; where the diverse sub-systems can find the opportunity to emerge, co-evolve and self-organise. The possible collaboration (or participation) between these different city makers is explored according to the description of the space of the interaction as represented in Figure 1. Such spaces are learning environments that can force an adaptation of the existing contextual conditions. We define the space of interaction of participatory city making by means of four quadrants, represented by two axes: (1) the citizen-government axis; and (2) the axis of the internal and the external way of working of the two groups of stakeholders.

In the space of interaction (Figure 1) the outside of the four coloured quadrants represents the boundaries of the existing regime, where the mainstream sub-cultures and rules are grounded. Within each of the quadrants, new transformative initiative can develop or arise as niches, represented in the figure by the black dots in the white circle. These niches are challenging the usual way of working of the system and they introduce new ways of working to the regime. They pressure the existing regime to change its ways of working but at the same time they receive pressure from the regime. Sometimes niches arise from the external way of interacting with other stakeholders, other times they develop within a specific organisation or social group. In transitions, while niches develop, scale and spread, they replace the existing regime. The interaction between these niches and the regime, both on the government and citizen side, internally and externally, is what constructs the 'space of interaction'. The interaction sometimes arise between groups of stakeholders as a whole, other times they are triggered and forced by specific actors within the existing groups. The latter are actors, often represented by freelance civil servants or by specific active

citizens, that are trying to facilitate the rise of experimental environments. They battle the cultural and practical resistance existing both in the way of working of the public administration and that of the citizen initiatives.

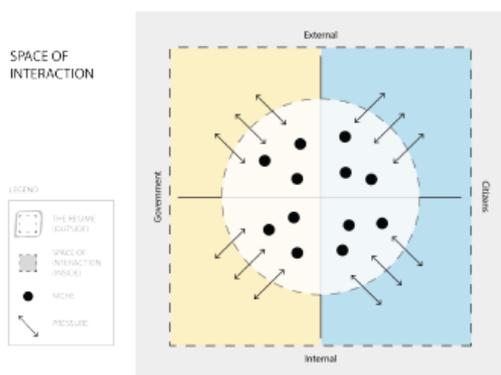


Figure 1 – Niches development within the space of interaction of Participatory City Making

Almost everything that it has been written about Neoliberalism in planning theory is on the negative side, despite few voices outside of the box that have tried to shift the attention on other issues (Stefano Moroni, 2016). Neoliberalism has been addressed as the cause of the shift of the border between public and private spaces, tending to expand consumer space and narrow citizens' space (Roivainen, 2002). The figure above highlights how the picture is much more complicated, as already Mantysalo started to explore (Mantysalo, 2016). Indeed, the consumers space do not correspond only to the citizens' space, but to the regime space, that can be found on both government and citizens side. The consumer space is shaped by those actors that are resisting to the changes that the transformative initiatives are trying to make. However, the citizens' space can be found where the niches are arising. Citizens and government become producer of services, while acting and experimenting new practices (Puerari, 2016). While experimenting

with transformative initiatives, they conquer space where they can interact with government and making pressure to the current regime.

In a transition management perspective, the interaction between the different urban stakeholders that are collaborating to make such transformative initiatives work, is a starting point for governance interventions. Through transition arenas (Loorbach, 2007) or urban transition labs (Neuens, Frantzeskaki, Gorissen, & Loorbach, 2013) actors representing such initiatives are brought together with entrepreneurial policymakers and other societal actors to develop shared strategies, visions and plans. But more often than that, societal initiatives are experimenting with new practices often acting with reference to the dominant cultural, practical and normative conditions, but not necessarily in conformity with them (see the concept of nomotropism in: Chiodelli & Moroni, 2014; Conte, 2000) or in a structured way seeking to contribute to a long term systemic change. Besides targeted governance interventions aimed at guiding and accelerating transitions, we thus argue that there is a much broader dynamic of unstructured interactions between citizen initiatives and policy that could offer a basis for contributing to desired sustainability transitions. To explore this potential and possibly increase its contribution to wider societal changes, we seek to better understand why and how such initiatives emerge and subsequently interact with policy to move forward.

4 DISCUSSION

The fields of complexity in planning and transition management form the basis to conceptualise the space of interaction as represented in Figure 1. In this article the values of combining the two fields have been presented for two stakeholders' perspectives: government and citizens' initiatives. There are three main notions that come forward from the combination of the two fields for the two stakeholders that are discussed below.

The first notion is that there is a shift from the focus on the dichotomy between government and citizen initiative towards a focus on niches and regimes irrespective of their traditional function of citizen or government. This shift from public administration versus the public towards the niches versus regime has been represented in the figure by a shift from a horizontal dichotomy towards an omnidirectional one. This shows the value of the combination of transition management and planning because it provides a different lens for looking at the different stakeholders or possible partners to involve.

This also brings forward the second notion, namely the consequence for participatory approaches between different stakeholders as also advocated by complexity theory in planning. It suggests that there is a need for approaches that recognize this second dichotomy and that are able to include both niche and regime actors from both citizen initiatives and government. Approaches that are able to bridge the gap between niche and regime, rather than government and citizen initiative; or, leastwise approaches that acknowledge the differences within each 'traditional' group of stakeholders.

This relates directly to the third notion: the three potential directions towards more participatory approaches in the space of interaction of city making. One can think of approaches that enable the niches to increase their pressure on the regime, to increase their influence and expand their reach. On the other hand, one can also think of approaches that lower the pressure of the regime on the niches, ones that give more space to niches and liberty to develop. The last potential direction for more participatory methods would be the one that is most in line with participatory thinking (Björgvinsson, Ehn, & Hillgren, 2010) and would be based on exchange. These approaches would foster the exchange and bridge or even diffuse the borders between niches and regime.

In this way does the conceptualisation of the space of interaction open up our understanding of multi-actor governance and introduces a more nuanced understanding of how government and society interact. It does however not explicitly address the types of interaction that would be most suitable to empower (or disempower) related to achieving specific urban goals. Taking a transition management approach for example would imply starting from a normative agenda containing long-term sustainability goals (such as achieving a shift to renewable energy, changing urban mobility systems or decentralizing specific social services) and then strengthening initiatives that contribute to such goals. However, as transitions imply structural changes and power shifts, this approach is also political: it implies institutional changes that not necessarily are desired by incumbent actors or structures. The space of interaction in this way also

represents that more informal waysthrough which ultimately existing policies and institutions might be disrupted and transformed.

5 CONCLUSIONS AND FUTURE RESEARCH

The notions listed above provide a new perspective to reflect upon potential roles of planners in facilitating, empowering and guiding transformative social innovation in cities. We here formulate three considerations but emphasize that these are not yet translated into practical tools or methods. But we do argue that our perspective necessitates a more fundamental reflection upon the roles and attitudes of planners, shifting from coordinators or semi-controlled planning processes producing policies and projects towards identifying potential societal challenges and emerging alternatives that can be synthesized, strengthened and empowered to more effectively contribute to desired urban transitions.

The first consideration descends directly from the first notion. Indeed, planners, in order to create and design places for dignity, should go beyond a dichotomy between public and the private space of citizens, embracing the fact that niches and regime are part of both groups. The lens described in this paper allow to think differently about what the space for citizens' action and influence is. The perspective changes: niches of new coalitions and initiatives can be found on both the government and the citizens side.

Hence, the second consideration is that the space of passive consumerism can be found on both sides. Stakeholders acting in conformity the dominant cultures and practices, resting to innovation and changes, are spread around the two groups of stakeholders. Planning should acknowledge this difference and approach the issue in alternative ways.

This leads to the third consideration, namely the necessity for planning to enable the emergence, self-organization and co-evolution of the system. Although, within complex systems, it is impossible to predict and to guide the emergent nature of cities with perfect solutions, planning should be able to generate the condition in which the stakeholders can act and interact producing new coalitions and niches within the system. As intentional action, planning gives rise to variations in the systems that remains unpredictable, its intervention can foster the emergence of certain conditions, through which an adaptable complex systems is better suited to deal with (S. Moroni, 2015).

Further research and action is required, however, in order to identify how planning can contribute to create the condition for the self-organisation, and adaptation of the system to arise. The next envisioned step will be the analysis of the transition dynamics happening within a specific city in order to first identify the barriers and mechanisms that are shaping the space of the interaction between the stakeholders in a specific case studies. Interviews with different actors and urban stakeholders will be carried out, as well as co-creative events that will be useful to understand existing problems and dynamics. Then, a further step will be taken in order to overcome the identified barriers through participatory design methods (Björgvinsson, Ehn, & Hillgren, 2012), aimed to experiment what could be the conditions that could foster the emergence of the conditions mentioned above.

ACKNOWLEDGEMENTS

This work is part of the research programme Research through Design with project number 14604, which is (partly) financed by the Netherlands Organisation for Scientific Research (NWO) and Taskforce for Applied Research SIA. The partners of the project are Delft University of Technology (TU Delft), Dutch Research Institute for Transition (DRIFT), Hogeschool Rotterdam, Gemeente Rotterdam.

BIBLIOGRAPHIC REFERENCES

Avelino, F., & Wittmayer, J. M. (2016). Shifting Power Relations in Sustainability Transitions: A Multiactor Perspective. *Journal of Environmental Policy & Planning*, 18(5), 628–649. <https://doi.org/10.1080/1523908X.2015.1112259>

- Bäcklund, P., & Mäntysalo, R. (2010). Agonism and institutional ambiguity: Ideas on democracy and the role of participation in the development of planning theory and practice – the case of Finland. *Planning Theory*, 9(4), 333–350.
- Bak, P. (1999). *How Nature Works: the science of self-organized criticality (Copernicus)*. New York: Springer.
- Björgvinsson, E., Ehn, P., & Hillgren, P. (2010). Participatory design and “democratizing innovation .” In *Proceedings of the 11th Biennial Participatory Design Conference* (pp. 41–50). <https://doi.org/10.1145/1900441.1900448>
- Björgvinsson, E., Ehn, P., & Hillgren, P.-A. (2012). Agonistic participatory design: working with marginalised social movements. *CoDesign*, 8(2–3), 127–144. <https://doi.org/10.1080/15710882.2012.672577>
- Boelens, L., & Roo, G. de. (2014). Planning of undefined becoming: First encounters of planners beyond the plan. *Planning Theory*, 1473095214542631. <https://doi.org/10.1177/1473095214542631>
- Boonstra, B., & Boelens, L. (2011). Self-organization in urban development: towards a new perspective on spatial planning. *Urban Research & Practice*, 4(2), 99–122. <https://doi.org/10.1080/17535069.2011.579767>
- Byrne, D. (1998). *Complexity Theory and the Social Sciences: An Introduction*. London: Routledge.
- Chiodelli, F., & Moroni, S. (2014). The complex nexus between informality and the law: Reconsidering unauthorised settlements in light of the concept of nomotropism. *Geoforum*, 51, 161–168. <https://doi.org/10.1016/j.geoforum.2013.11.004>
- Conte, A. G. (2000). *Nomotropismo: agire in funzione di regole (Sociologia)*. Franco Angeli.
- Cozzolino, S. (2015). Insights and reflections on Jane Jacobs’ legacy. Toward a Jacobsian theory of the city. *Territorio*, 72, 151–157.
- De Haan, J., & Rotmans, J. (2011). Patterns in transitions: understanding complex chains of change. *Technological Forecasting and Social Change*, 78(1), 90–102.
- Forester. (1989). *Planning in the Face of Power*. Berkeley: University of California Press.
- Frantzeskaki, N., Dumitru, A., Anguelovski, I., Avelino, F., Bach, M., Best, B., ... Rauschmayer, F. (2016). Elucidating the changing roles of civil society in urban sustainability transitions. *Current Opinion in Environmental Sustainability*, 22, 41–50. <https://doi.org/10.1016/j.cosust.2017.04.008>
- Frantzeskaki, N., Loorbach, D., & Meadowcroft, J. (2012). Governing societal transitions to sustainability. *International Journal of Sustainable Development*, 15(1), 19–36.
- 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.
- Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1(1), 24–40. Retrieved from [http://www.sciencedirect.com/science/article/pii/S2210422411000050?_rdoc=3&_fmt=high&_origin=brows e&_srch=docinfo\(#toc%2523633%25232011%2523999989998%25233267766%2523FLA%2523display%2523Volume\)&_docanchor=&_ct=21&_refLink=Y&_zone=rslt_list_item&md5=c627b](http://www.sciencedirect.com/science/article/pii/S2210422411000050?_rdoc=3&_fmt=high&_origin=brows e&_srch=docinfo(#toc%2523633%25232011%2523999989998%25233267766%2523FLA%2523display%2523Volume)&_docanchor=&_ct=21&_refLink=Y&_zone=rslt_list_item&md5=c627b)
- Geels, F. W., & Schot, J. W. (2007). Typology of sociotechnical transition pathways. *Research Policy*, 36(3), 399–417.
- Geels, F. W., & Schot, J. W. (2010). The dynamics of transitions: a socio-Technical perspective. In J. Grin, J. Rotmans, J. W. Schot, I. c. w. D. Loorbach, & F. W. Geels (Eds.), *Transitions to Sustainable Development; New Directions in the Study of Long Term Transformative Change*. Routledge.
- Goldstein, J. (1999). Emergence as a construct: History and issues. *Emergence*, 1(1), 49–72.
- Gorissen, L., Vrancken, K., & Manshoven, S. (2016). Transition Thinking and Business Model Innovation—Towards a Transformative Business Model and New Role for the Reuse Centers of Limburg, Belgium. *Sustainability (Switzerland)*, 8(2), 112.
- Grin, J., Rotmans, J., & Schot, J. W. (2010). Understanding transitions from a governance perspective. In D. Loorbach & F. W. Geels (Eds.), *Transitions to Sustainable Development. New Directions in the Study of Long Term Transformative Change* (pp. 221–319). New York: Routledge.
- Hamilton, D. (2004). Developing regional regimes: A comparison of two metropolitan areas. *Journal of Urban Affairs*, 26(4), 455–477.
- Hartley, J. (2005). Innovation in Governance and Public Services : Past and Present. *PUBLIC MONEY & MANAGEMENT*, (January), 27–34.

- Healey, P. (2007). *Urban Complexity and Spatial Strategies*. London/New York: Routledge.
- Holland, J. H. (1995). *Hidden order: How adaptation builds complexity (Ulam Lectu)*. Cambridge, MA: Helix Books/Perseus Books.
- Holland, R. C. (1984). The new era of public-private partnerships. In P. R. Porter & D. C. Sweet (Eds.), *Rebuilding America's Cities: Roads to Recovery*. New Brunswick, NJ: Center for Urban Policy Research.
- Holling, C. S. (1987). Simplifying the complex: The paradigms of ecological function and structure. *European Journal of Operational Research*, 30, 139–146.
- Kauffman, S. (1995). *At home in the universe: The search for laws of complexity*. Oxford, UK: Oxford University Press.
- Loorbach, D. (2007). *Transition management: new mode of governance for sustainable development*. Erasmus University Rotterdam.
- Majamaa, W. (2008). The 4th P - PEOPLE - In *Urban Development based on Public-Private-People Partnership*. Helsinki: Helsinki University of Technology TKK Department of Structural Engineering and Building Technology. Retrieved from <https://aaltodoc.aalto.fi/bitstream/handle/123456789/4559/isbn9789512295852.pdf?sequence=1>
- Mäntysalo, R. (2016). Human Smart Cities, 141–157. <https://doi.org/10.1007/978-3-319-33024-2>
- Massey, D. (2005). *For space*. London: Sage.
- Mitleton-Kelly, E. (2003). Ten principles of complexity and enabling infrastructures. In E. Mitleton-Kelly (Ed.), *Complex systems and evolutionary perspectives of organizations: The application of complexity theory to organizations*. London: Elsevier.
- Moroni, S. (2015). Complexity and the inherent limits of explanation and prediction: Urban codes for selforganising cities. *Planning Theory*, 14(3), 248–267.
- Moroni, S. (2016). Interventionist responsibilities for the emergence of the US housing bubble and the economic crisis: “neoliberal deregulation” is not the issue. *European Planning Studies*, 24(7), 1295–1312. <https://doi.org/10.1080/09654313.2016.1168786>
- Nevens, F., Frantzeskaki, N., Gorissen, L., & Loorbach, D. (2013). Urban Transition Labs: co-creating transformative action for sustainable cities. *Journal of Cleaner Production*, 50, 111–122. <https://doi.org/10.1016/j.jclepro.2012.12.001>
- Portugali, J., Benenson, I., & Omer, I. (1994). Sociospatial Residential Dynamics: Stability and Instability within a Self-organizing City. *Geographical Analysis*, 26(4), 321–340.
- Prigogine, I., & Stengers, I. (1984). *Order out of chaos: Man's new dialogue with nature*. Boulder, CO: New Science Library.
- Puerari, E. (2016). *Urban Public Services Innovation. Exploring 3P and 4P Models*. Politecnico di Milano.
- Roivainen, I. (2002). Täällä Kaino – kuuleeko kunta? Päättäjänä kuntalaisten ja virkamiesten välimaastossa. *Janus*, 10(3), 266–273.
- Roo, G. de, & Boelens, L. (Eds.). (2014). *Spatial planning in a complex unpredictable world of change: Towards a proactive co-evolutionary type of planning within the Eurodelta*. Groningen: InPlanning.
- Rotmans, J., & Loorbach, D. (2009). Complexity and Transition Management. *Journal of Industrial Ecology*, 13(2), 184–196. <https://doi.org/10.1111/j.1530-9290.2009.00116.x>
- Rotmans, J., & Loorbach, D. (2010). Towards a better understanding of transitions and their governance: a systematic and reflexive approach. In J. Grin, J. Rotmans, J. W. Schot, D. i. c. w. Loorbach, & F. W. Geels (Eds.), *Transitions to Sustainable Development; New Directions in the Study of Long Term Transformative Change* (pp. 105–222). New York: Routledge.
- Urry, J. (2003). *Global Complexity*. Cambridge: Polity Press.
- Von Bertalanffy, L. (1968). *General system theory: Foundation, development and applications*. New York: Braziller.
- Wittmayer, J. M., Avelino, F., Steenbergen, F. Van, & Loorbach, D. (2016). Actor roles in transition: Insights from sociological perspectives. *Environmental Innovation and Societal Transitions*. <https://doi.org/10.1016/j.eist.2016.10.003>
- Zhang, J., & Kumaraswamy, M. M. (2011). Public-Private-People Partnerships (4P) for Disaster Preparedness , Mitigation and Post-disaster Reconstruction. The University of Hong Kong. Retrieved from <http://hub.hku.hk/handle/10722/180983>