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To cite this article: Jifke Sol Ir, Merel M. van der Wal, Pieter Jelle Beers & Arjen Wals (2017): Reframing the future: the role of reflexivity in governance networks in sustainability transitions, Environmental Education Research, DOI: [10.1080/13504622.2017.1402171](https://doi.org/10.1080/13504622.2017.1402171)

To link to this article: <https://doi.org/10.1080/13504622.2017.1402171>



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Published online: 30 Nov 2017.



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Reframing the future: the role of reflexivity in governance networks in sustainability transitions

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ABSTRACT

Regional sustainability networks in the Netherlands are rooted in regional culture and have an emphasis on social learning and effective collaboration between multiple actors. The national 'Duurzaam Door' (Moving Forward Sustainably) Policy Programme regards these networks as generative governance arrangements where new knowledge, actions and relations can co-evolve together with new insights in governance and learning within sustainability transitions. In order to understand the dynamics of the learning in these networks we have monitored emergent properties of social learning between 2014 and 2016. Our focus is particularly on the interrelated role of trust, commitment, reframing and reflexivity. Our aim is to better understand the role and the dynamics of these emergent properties and to see which actors and roles can foster the effectiveness of social learning in regional transitions towards more sustainable ways of living. We used a retrospective analysis with Reflexive Monitoring in Action (RMA), which we combined with the Most Significant Change approach. We found that reflexivity in particular is a critical property at moments that can make or break the process.

ARTICLE HISTORY

Received 2 June 2017

Accepted 30 October 2017

KEYWORDS

Sustainability; transitions; regional governance networks; social learning; trust; commitment; reframing; reflexivity

1. Introduction

In The Netherlands, a new policy on 'Learning for Sustainability' became active in the year 2000, as a follow up to earlier national programs on Environmental Education (EE). The Learning for Sustainability Policy can be linked to the 1992 Earth Summit and Agenda 21 in that it promotes boundary crossing between different societal actors. This policy focussed on themes that went beyond the traditional EE themes (e.g. issues related to health, economy and social equity were also included, not just the usual, water, waste, air, energy and nature). Also, novel in the policy was the move away from outcomes to processes. The facilitation of learning processes and the brokering of interaction between actors (from the world of civil society, education, research, business and government) and levels (individual, organisation, community, region, country) was considered a core mechanism for transitions to sustainability.

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The successor policy of this program, the 'Duurzaam Door' (Moving Forward Sustainably) Policy (2014–2017) focuses even stronger on the capacity building for organisational and societal learning in and through local and regional networks. The programme anticipates on 'the creation of new societal tissue, new value communities and responsible citizenship, a "silent revolution" that eventually opens windows of opportunity for sustainable solutions for energy, raw material resources and the quality of food' (Duurzaam Door, 3, 2015a). One aim of Duurzaam Door is that those regional networks develop as equal partnerships, towards, for example, local/regional energy cooperatives. As such, the programme is intended to strengthen the societal social basis in regional/local networks for working towards sustainability. The programme therefore connects with the dreams of the people in place based sustainability networks, working for circular economy and new value streams (e.g. chains that create value other than material or monetary ones). An interesting notion is that the programme also aims to 'redefine its role and learns on the basis of equal participation in those networks' (Duurzaam Door, 7, 2015a). In other words: the policy's success does not so much depend on the realization of hard predetermined measurable socio-ecological outcomes – in fact none were identified of that nature – but rather on the extent to which the policy successfully facilitated interaction and dialogue and to which the program itself could learn from successes and failures in the interaction. As such, the policy can be considered as one of the first 'reflexive' policy programs in The Netherlands that reflects, what we might call, a shift from governing sustainability to sustainability governance.

On paper, these ambitions might sound great, but how are they enacted in practice? What are the actual social learning processes taking place in these place-based governance networks that are supposed to have high levels of autonomy, self-determination and interaction?

In order to understand these social learning processes within these new governance dynamics we have studied three regional 'Duurzaam Door' policy supported networks in the Netherlands. These networks can be regarded as social transition arenas where uncertainty is faced and challenged. The monitoring of the processes in the three cases is focused on: (a) initial network visions and expectations, (b) the diversity of actors, (c) social learning dynamics and the perceived levels of trust, commitment and reframing (Sol, Beers, and Wals 2013), and (d) how reflexivity and change agency is applied in concrete local/regional sustainability aims, in the nexus nature, energy and food.

First we will introduce the theoretical framework (Section 2), followed by methodological aspects and methods used (Section 3) and the empirical findings in the three regions (Section 4). In Section 5, the findings are discussed through the lens of new trends in governance networks and some overall conclusions are drawn.

We should preface the theoretical section by declaring what might be seen as a bias towards Dutch transition and social learning scholars which we justify by our own familiarity with these scholars, their international status (they are often cited in these areas internationally) and the focus of this special issue which in a sense invites such a bias. This is not to suggest that there are no others outside of The Netherlands (we inevitably do refer to some already) who have something to say about these emergent areas. On the contrary, there is a growing group of transition scholars around the world whom we could have brought into this article as well but chose not to.

2. Theory

2.1. A sustainability transition perspective

Current societal problems such as environmental degradation, failing educational systems and economic crises are regarded as wicked problems (Rittel and Webber 1973) in that they are complex, contested and ambiguous with respect to their underlying values and causes. All these characteristics make them essentially unsolvable; at best, attempts can be made to improve the situation and to learn from the attempt. In order to meaningfully engage with wicked problems and to adapt to changing situations, a so-called transition perspective is advocated by activist scholars. One of the key transition scientists and advocates in The Netherlands, Jan Rotmans, describes a transition as entangled non-linear processes

of social change by which a societal system is structurally transformed (Rotmans and Loorbach 2006). A transition perspective suggests that rather than optimizing existing systems, practices and routines (continue doing the things we do, but only better), we need to radically reconsider the assumptions and values upon we have built these systems, practices and routines in the first place (doing better things altogether). A transition perspective implies new ways of policy (e.g. a shift from 'governmentality' to reflexive governance; Beck 2006; Grin 2006), behaviour (e.g. a shift from individual learning, personal development and competition to joint learning, community building and solidarity), new relationship building (trust) and radical new ways of knowledge creation and learning.

Capra (1996) writes that a more diversified and complex network enables many different relationships and approaches to problem solving and learning, which can lead to the enrichment of both the individual and the whole community. It appears that sustainability transitions evolve from a stage of self-perpetuating and self-replicating unsustainability towards one that is more sustainable. This requires that, among other things, we need to make better use of diversity by inviting voices that represent different ways of viewing and knowing the world or, put more academically, by inviting epistemological and ontological pluralism.

2.2. Governance networks

Governance networks are networks where many actors are involved (e.g. municipalities, entrepreneurs, educational institutes, NGO's, citizens and other actors), with a relatively stable character where solutions proposed for (wicked) problems and challenges are contested. The different actors are engaged in relationships with a high degree of interdependency (Klijn, Edelenbos, and Steijn 2010). Governance networks are regarded as a sort of platform 'where a multitude of actors are involved in multilateral negotiations' (van Kersbergen and van Waarden 2004, 150). These networks can help communities respond to wicked problems, as they consist of a plurality of actors in society and aim to co-create new knowledge, new relations and new policy. Governance networks (Hajer and Versteeg 2005; Newig, Günther, and Pahl-Wostl 2010; Termeer and Dewulf 2012) seek to invite this pluralism in situations where old routines no longer suffice in light of wicked sustainability challenges. As such, governance networks can be regarded as multi-level networked forms of governance (in contrast to mono-centric forms, with state hierarchy), and are considered to self-organize, resist government steering, to develop their own policies and to exchange resources.

Many governance networks are guided by governments, using subsidies and/or different types of coordination and facilitation (Beers and Geerling-Eiff 2013). As such, they can be regarded as *facilitated* governance networks. The regional networks of Duurzaam Door, which are studied in this contribution, can be considered facilitated governance networks because the national government creates and facilitates them with subsidies and some coordination through provincial support. Without facilitation these networks would either not exist or would purely function as grassroots networks that are empowered from within (van den Heiligenberg et al. 2017).

In terms of goal formulation, problem definition and equity (Rittel and Webber 1973) such networks act in a flexible, place-based and contemporary way, because each network can represent local/regional identities and culture by bringing together relevant actors from both state and society, creating issue-specific constituencies (Termeer and Dewulf 2012). A network becomes, so to say, tailor-made. This gives a governance network an advantage over more 'top-down' forms of government as governance networks are de facto 'rooted in trust and regulated by rules of the game negotiated and agreed by network participants' (van Kersbergen and van Waarden 2004, 148). It seems that especially trust in and within governance networks is important for achieving better outcomes (Klijn, Edelenbos, and Steijn 2010).

Governance networks can be used to trigger a transition as stated before: a structural change of the result of developments that interact, influence and enforce each other (Rotmans and Loorbach 2006). Moreover, governance networks can be seen as a potentially reflexive since they provide room for experimenting and developing the means for transforming information to new interpretation and action (Sotarauta and Srinivas 2006). In this study, we are particularly preoccupied with the *social learning learning dynamics* and the role of reflexivity in governance networks.

2.3. Social learning

Before we will elaborate on different concepts of (social) learning, we will first explain that we look from a social-constructivist background, mixed with educational and organisational learning theories. We see learning basically as a social interactive process (Wenger 1998) where boundaries (Akkerman and Bakker 2011) and zones of development (Vygotsky 1978) are playing a role in the making and changing of meaning. Argued by Vygotsky is, that interpersonal communication is transformed during development into intrapersonal communication (talking to the self). In this, learning supposes a specific social nature (Piaget 1964) in which the learning actor or learner learns from its own practice (Friedman 1987).

Because social learning in turn presupposes individual learning, but it is as well more than the sum of its parts -of individual learning- (Wildemeersch 2009, 4), we like to explain the definition of learning first. A quite general definition of learning is about changes in behaviour (including conscious thought), or a change in practical activity (Friedman 1987; De Houwer, Dermot, and Moors 2013, 631). Learning can be understood as 'the process of using a prior interpretation to construe a new or revised interpretation of the meaning of one's experience as a guide for future action' (Alexander, Schallert, and Reynolds 2009), which is mostly induced by an disorienting dilemma (Mezirow and associates 2000). This definition can be applied on both an individual and social level. The concept of learning can also be understood with the opposed features of *non-learning*: 'when processes are self-sealing, compulsively repetitive, non-interruptible and non-changeable by the very people' (Argyris 2003, 1178).

Learning encompasses the ability to detect and correct errors and when this happens without changing the underlying values this is called single loop learning. Learning is called double loop learning (Argyris 2003), when the underlying values and other features of the status quo are changed first. Double loop learning is seen as transformational in nature, rather than transactional and occurs when understandings, insights and explanations are connected with action and effectiveness (Argyris 2003). Double loop learning is akin with the concept of transformative learning because it basically implies changes in the identity of the learner(s). Transformative learning refers to the process by which we transform our taken-for-granted frames of reference (meaning perspective, habits of mind, mindsets) to make them more inclusive, open and involves participating in constructive discourse. Transformative learning has both individual and social dimensions and implications (Mezirow and associates 2000). It is accommodative in the sense that the learning actor changes its meaning, perspectives or ways of behaviour in certain situations. In this, the learning involves overcoming barriers in the form of defence or resistance (Illeris 2014). Although both Argyris, Illeris and Mezirow seem to speak about an individual learner, we would like to propose that these definitions of learning equally apply to any actor, either an individual or a group, team, organisation or network. What matters is the learning process and its outcomes.

Transition scholars (Kemp, Loorbach, and Rotmans 2009; Loorbach 2010) argue that learning processes are at the core of transitions (see also Beers, Van Mierlo, and Hoes 2016, Beers et al, 2014). However, they have offered little on the way of conceptualising these learning processes, which makes it difficult to study and foster those (Beers, Van Mierlo, and Hoes 2016). The concept of social learning is promising in this context (e.g. Wals 2007; Ison, Blackmore, and Iaquinto 2013; Vinke-de Kruijf and Pahl-Wostl 2016), because it takes the diversity of actors, knowledge, perspectives, languages and interests, which is inherent in transitions, as a starting point (Wals 2007; Sol, Beers, and Wals 2013) for the creation of new shared knowledge (van der Wal 2015).

The concept of social learning has been developed to understand processes of social transformation as learning processes (Wildemeersch 2009) as being a form of tacit and informal learning (Friedman 1987). Through this lense, social learning can be seen as a double-edged process: where individual learning and interactive learning take simultaneously place 'in a process of social change with effects on wider social-ecological systems' (Reed et al. 2010, 2). Social learning as defined by Reed et al. (2010, 6) is 'a change in understanding that goes beyond the individual to become situated in wider social units or communities of practice through social interactions between actors in social networks'. Social learning manifests itself by changes in attitude, behaviour, norms, trust and respect. Based on a review

of social learning discourses (Rodela 2011) it appeared that scholars tend to see the mechanism of the emergence of social learning. Secondly, it appeared in this same review that scholars approach social learning as either individual-centric or network-centric. As there are quite many different definitions and approaches of social learning altogether, we define social learning as 'an interactive and dynamic process in a multi-actor setting where knowledge is exchanged and where actors learn by interaction and co-create new knowledge through on-going interaction' (Pesch 2015). In this sense, it is a process that can contribute to system innovation by providing a basis for action (Beers and van Mierlo 2017). Moreover, we believe in dealing with wicked problems, that there is a way out -exactly through reflexive social learning- in governance networks, because in social learning we can make effective use of the diversity of actors for looking at possible root causes and possible solutions.

Due to the diversity of actors (research institutes, firms, government, NGO's, societal initiatives, educational institutes etc.) engaged in social learning and therefore the implicit or explicit differences in perspectives, interests, values, cultures and languages, social learning can either lead to surprising processes of knowledge cocreation and/or towards deep conflicts. Moreover, social learning cannot be seen in a vacuum: 'it is a vulnerable activity, which can be greatly influenced by the context in which it takes place. Especially when these contexts are turbulent or discordant there is a great chance that these characteristics will affect the inner dynamics of social learning within the system involved' [...] Apparently double loop learning takes place in more or less protected zones or discursive spaces, (Pesch 2015; Wildemeersch 2009, 113). This means that social learning entails both opportunities and risks. Effective or successful social learning processes can be recognised by high information sharing, improved communication, relation building leading towards new knowledge, new relations and new actions (Beers and van Mierlo 2017). Ineffective or weak and unsuccessful social learning can be recognised by lack of engagement, lack of accountability, ambiguous decision-making and deficient coordination (Reed et al. 2010).

Although there is some evidence of effective and ineffective social learning (Leys and Vanclay 2011), it is not clear which properties play a role in the dynamics of the social learning processes. And although in some cases social learning has been proven to foster innovation and to create avenues for sustainability transitions (Keen, Brown, and Dyball 2005; Wals 2007), the challenge of understanding the interactions and the dynamics in knowledge and relations remains (Sol, Beers, and Wals 2013).

These dynamics are for example manifested in a sudden increase or drop in trust and commitment. We hypothesize that a better understanding of these dynamics can help improve the facilitation and support of social learning in complex change processes involving multiple actors. Our assumption on successful social learning is that changes in reflexivity, trust, commitment and reframing foster the effective use of the diversity of actors.

Social learning outcomes emerge from communicative interactions among learning partners when they are giving meaning to problems, new technology, social innovations and societal developments. Learning processes and outcomes that contribute to system innovation are assumed to include knowledge, actions and relation (Beers and van Mierlo 2017, 244). Knowledge is considered as new insights, ideas, views and visions. Actions is considered as new agreements and decisions that will possibly be followed by real world actions. And new relations are seen as new roles and identities between (new) actors (Beers and van Mierlo 2017). Social learning outcomes are regarded as emergent too; and could be distinguished as rather 'soft and invisible': such as empathy, involvement and trust or rather 'hard and visible' such as knowledge, decisions, new relations and actions.

The learning outcomes arguably include change agency (Grin et al. 2011) and the new surprising ways of looking, deciding and developing new knowledge, policy and action (Guijt 2008). So social learning can be regarded both as a process for achieving change and as an outcome of an ongoing emergent process of reflexivity in interaction, relationship building and generative conflict. Investing and or engaging in social learning is thought to potentially transform complex situations when the social learning persists over time (Ison, Blackmore, and Iaquinto 2013).

Within networks social learning takes place within a discursive space (Pesch 2015) where different meanings, perceptions and behaviours interact, take place and shape new meaning, new knowledge,

new worlds and actions in the making (Chaves 2016). This space can also be regarded as a reflexive space, where opportunity for dialogue, negotiation, and learning is available. If not, the space can become an arena, where new ideas are slaughtered and lack of trust creates inflexibility and ineffectiveness (Thompson and Pascal 2012) which might lead to an inability to deviate from the path taken even in light of clear signs that it's the wrong path to take, a phenomenon sometimes referred to as lock in (Barnes, Gartland, and Stack 2004; Klitkou et al. 2015). The challenge might be to find the right balance between open curiosity and fixed standpoints within an arena with enough courage and safety, to 'freely engage in conflictive social practices, with unpredictable outcomes' (Castells 2000, 5).

2.4. Reflexivity, trust, commitment and reframing in transformation dynamics

Trust, commitment and reframing are regarded as emergent and dynamic properties (Sol, Beers, and Wals 2013), lubricating the permeability of existing actor's frames and essential in triggering transformational change. Emergent means that they gradually evolve, sometimes dissolve and pop up at unexpected moments, in a rather unplanned way.

Trust we define as (Sol, Beers, and Wals 2013) as the expectation that others will act in a way that is agreeable for you without the possibility of you intervening (based on Peeman 2009). Commitment refers to how and the extent to which participants and their organisational backgrounds expend their resources on the goals of the project. Resources can be motivation and passion, but also time and money. Reframing here refers to 'the emergence of new, shared perceptions on the issues faced by a relatively heterogeneous group exploring a mutually perceived but somewhat ill-defined challenge such as regional sustainable development' (Sol, Beers, and Wals 2013). Trust, commitment and reframing are different, but interrelated aspects of the process of social learning. For example, a slow decline in commitment from specific actors in a network can result in sudden decline of mutual trust later on. Or, when trust is high in a network, a process of reframing can start when actors are willing to drop old beliefs and exchange them for new beliefs about for example a regional identity (Sol, Beers, and Wals 2013).

The scholarly literature offers some variation in how reflexivity is defined. Reflexivity concerns the ability to recognize our own influence on the type of knowledge we create and the way we create it (Fook 1999). Reflexivity also refers to the ability to consciously understand one's place in the social structure and to shift this (Malthouse, Roffey-Barentsen, and Watts 2014). This is also called agency, the capacity to position oneself within the broader social and organisational context and create change or exert power. Through reflexivity an experience becomes transformative, in that it involves an expansion of one's perception of the world, which can be noticed when actors attach new significance and meaning to an aspect of the world (Pugh 2011). So some expansive activity is needed. In addition to this view of understanding, Mezirow describes reflexivity as a strategy of dealing with complexity: 'the process of using a prior interpretation to construe a new or revised interpretation of the meaning of one's experience in order to guide future action' (Mezirow 1991, 162) by mulling over, evaluating, recapturing experiences, and re-orienting on actions. As such, *being* reflexive gives options to handle situations where frictions, misunderstandings and conflicts are rising. In a similar manner, 'reflexive monitoring-inaction' (van Mierlo, Arkesteijn, and Leeuwis 2010) enhances the process of making the implicit explicit, especially in relatively unplanned innovation processes (Regeer 2010).

For the use of the concept reflexivity in this article we decided to combine the definitions of Pugh (2011), Malthouse (2014) and Mezirow (1991) as follows: Reflexivity is reorienting and making the meaning of one's beliefs and experiences explicit by assessing and articulating the new significance and meaning of this. As such, reflexivity includes the willingness to explore underlying frames and create unpredictable new frames. We consider reflexivity to be an active notion. It is a more expansive way of learning, leading to a change in perception and behaviour.

Reflexivity can occur at an individual level, but also as social reflexivity (Archer 2010), which refers to the sharing of individual findings and the shared act of defining new explicit beliefs, intentions and

acts. It is believed that a reflexive society, where creativity, flexibility and diversity are encouraged (Wals, van der Hoeven, and Blanken 2009) has the capacity to make existing routines, norms and values more explicit and has the power to reframe and reorient beliefs and actions. Even so, a 'reflexive turn' has been emphasized, to be seen as a reflexive change being related to a change in learning outcomes (Beers and van Mierlo 2017). Reflexivity is seen as important for system innovation, learning and sustainable transitions, it is an approach 'that systematically raises doubt about its own assumptions and practices and seeks to find an enlightened alternative' (Perez 2014). It can unlock the tacit knowledge and understanding that actors have of their experience and use this to generate knowledge for future practice (Malthouse, Roffey-Barentsen, and Watts 2014). These acts of critical reflexivity belong to a social learning process (Groot 2008) because social learning requires reflection and reflexivity throughout the entire process, if only to improve the quality of the process itself and to monitor change progress throughout (Wals 2007, 41).

2.5. Agency, change agents and free actors

As indicated before, social learning dynamics and outcomes can create a certain change agency (Chreim et al. 2010) which may contribute to transitions. Agency here refers to as 'The making of independent choices by actors' (Grin et al. 2010, 78). Grin (2006) suggests that agency influences whether, how and how fast a particular transition will develop. A network consists both of change agency and change agents. A 'free actor' (Wielinga and Geerling-Eiff 2009) is a change agent with the ability of exercising discretion in choosing to act, who acts as a network manager, identifying which actors that are crucial in the network, and then activating and connecting these actors in the network. Such an actor must have 'connective ability' (Klijn, Edelenbos, and Steijn 2010). We will use the above concept of change agent in the sense of a free actor. Free actors behave as change agents, because their intervention might lead to more trust, commitment or reframing and/or new knowledge, decisions and behaviour. This can be regarded as free actors fostering the social learning process. If they would not do this, the dynamics and development of the network eventually might crash (Zaalmink et al. 2007).

2.6. Aim of research and research question

The aim of the research is to find out what fosters (un)successful social learning in governance networks dealing with sustainability transitions. Our focus is on social learning processes aimed at transformative change. Specifically, we want to know whether there is a relation between the social learning dynamics and the outcomes of social learning in governance networks.

In this article, we explore the role of reflexivity, trust, commitment and reframing in social learning processes. Second we will focus on the role of change agents in social learning. In education for sustainability, understanding these dynamics is relevant in the current development of living labs and other hybrid learning contexts (Malthouse et al. 2014, Cremers et al. 2016; Oonk 2016).

In (Sol, Beers, and Wals 2013) we have assumed that emergent properties such as trust, commitment and reframing play a significant role in social learning, based on a descriptive case in the North of the Netherlands. In Sol and Wals (2015) we have explored and experienced the concept of reflexivity within a Dutch Policy Framework on Biodiversity and found it to be a condition in enhancing the emergence of social learning processes and its outcomes. In this article, we assume that reflexivity fosters the reorientation of ideas, values, aims, others, roles, visions etc. Reflexivity in this way may lead to more relational trust, more commitment and more willingness to reframe.

In this article, the hypothetical model on trust, commitment and reframing has been combined with the notion of reflexivity. Also, we position reflexivity as rather central. Assumed is that reflexivity fosters the possibility to reorient ideas, values, aims, others, roles, visions and their relation with the current situation. When engaged actors share this reflexive process it more relational trust, more commitment and more willingness to reframe may emerge. If so, then social learning can reshape emerging knowledge and relations within governance networks leading to new actions. In and between these phases

we might witness and foster sustainability transitions in the different niches and/or regime or landscape levels. Furthermore, we assume that a change agent can influence these processes in all phases with different interventions. The different concepts can be modelled as being related as following (see Figure 1).

This analytical framework has been applied in three Dutch regions in 2014 and 2016, in order to find empirical evidence about the relation between social learning dynamics and social learning outcomes. We will turn to the empirical cases studies to explore whether reflexive attitudes, together with trust, commitment and reframing lubricate processes of social learning through which the effectiveness and speed of innovation for regional sustainability and reflexive governance grow. Secondly, we explore the roles of change agents in inducing reflexivity, connecting actors, and creating opportunities for social- and system learning towards sustainability transitions. In short we ask:

- (1) What is the role of reflexivity, trust, commitment and reframing in social learning dynamics and how are they interrelated
- (2) What are roles of change agents in fostering the emerging properties of reflexivity and trust, commitment and reframing in social learning

3. Research methodology

3.1. The Duurzaam Door programme

Duurzaam Door's regional network approach is comprised of 12 provincial programmes, organised in 12 regional networks. The core activity of Duurzaam Door is to supply visions and social tools to support social innovation for a green economy at mainly a regional level.

Concrete network cooperation is emphasized between, ideally, five types of societal actors (Governments, Entrepreneurs, Schools, Research Institutes and NGO's) per region. As a guiding principle, the programme upholds 'the three Cs': coalitions, co-creation and co-financing. This principle is intended to include a certain level of personal commitment and inspiration (Yearly Report Duurzaam Door, 2015b).

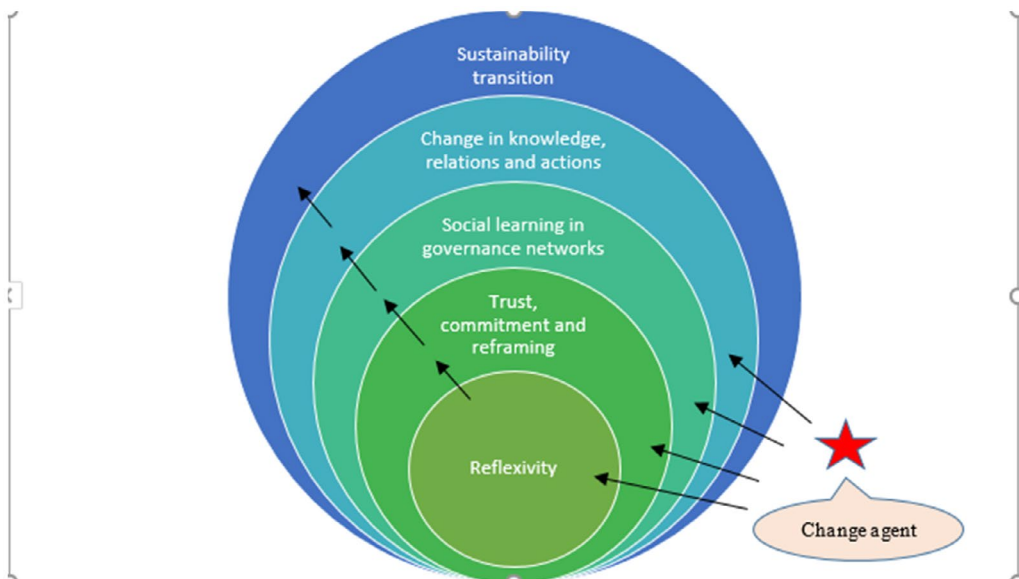


Figure 1. Analytical framework: relations between the concepts.

In deliberation with the Duurzaam Door coordination platform, it was decided in 2014 to select the three most promising networks for this study. Promising was regarded as: being able to produce results (network projects with sustainability outcomes), have good network collaboration and realise a stable self-supported network without government interventions.

Some networks can be recognised by 'people with a common drive who really want to realise something, if needed right through existing structures' (Public Thought, 2016). The research started in 2014 and ended in 2016.

3.2. Methods

Our research aims at contribution at two levels: (a) understanding the dynamics of the learning processes in governance networks and (b) contributing to dealing with sustainability problems. Our methodological approach is part of a broader trend of sustainability research on governance networks (Klijn 2010); that experience social learning processes (Wals 2007) in relatively protected discursive spaces (Pesch 2015). Examples of such research approaches can be found in a broad range of urban sustainability labs, real world laboratories, etc. (Schnäpke et al. 2015).

Given that the start of the Duurzaam Door networks preceded the start of our research, we faced the challenge of retrospectively assessing part of the network dynamics. In order to grasp past perceptions of actors' behaviours and interactions between the actors in sustainability networks between 2014 and 2016, we used three divergent but complementary methods.

- (1) Reflexive Monitoring in Action (RMA) (van Mierlo et al. 2010) techniques were combined with the Most Significant Change approach (Davies and Dart 2015) and were applied in all three networks in both 2014 and 2016. RMA is a monitoring approach that is used when heterogeneous (governance) networks have (shared) ambitions for system innovation. RMA helps to reflect on relations between ambitions, and practical developments and is action oriented. RMA techniques were applied at both personal and network level on perceptions of experiences and in discovering new perceptions for actions.

The Most Significant Change (MSC) approach consisted of asking participants -during for example a RMA workshop- to reflect on the most significant changes in time and to reflexively look at underlying values and assumptions in them. How we did this: all the network participants in the facilitated meeting were asked to remember at least three significant network moments since 2014. They were asked to shortly note these on post-its, which were stuck on a big wall with a time line until 2016. In little groups, people would talk deeper about a few selected moments, about changes in perceptions, attitudes and actions. After that, a plenary discussion followed in order to summarize the learning insights and the new future plans for action. All was written down in a small report, which they all received.

This led to specific personal and network eye-openers about roles, barriers and new opportunities in each of the networks. We regard these significant moments of change as *crucial moments*. The insights gained from the workshops in 2014 were representing how the actors perceived themselves at that moment. The reflexive workshops in 2016 provided more data than the workshops in 2014, because the reflection covered a period of two years with several significant changes per network and also led to new windows of opportunity. The analysis in both 2014 and 2016 was done with a group of researchers from different institutes and resulted in a deeper understanding of the social learning dynamics in the networks.

- (2) Surveys with active network partners were conducted in 2014 and in 2016. Network partners were considered active by the coordinators if they participated in meetings and were taking responsibility for the development of the network and/or specific tasks such as leading projects. The surveys consisted of questions about networks actors, network dynamics and network learning with for example: 'What do you consider to be a successful learning network? The survey asked about network ambitions and perceptions on trust, commitment and reframing

in 2014 and 2016. In 2016, ten statements were added referring to levels of trust, commitment and reframing. These statements were answered on a Likert Scale ranging from totally not agree (1) to totally agree (7), with room to comment in Utrecht and Flevoland. In Limburg, a mini-survey was used, because this network did not yet have enough history.

- (3) Learning histories were obtained through face-to-face interviews with three active network partners per regional network in 2016, in order to gain deeper understanding of interventions done. The selection of these actors was based on communications with the regional network coordinators. The interviews focused on changes in perceptions, actions and effects of change agents. All interviews were transcribed and coded using reflexivity, trust, commitment, reframing, learning and change as categories. Based on the analysis a learning history for each network was constructed. Each learning history was validated and, if necessary, adjusted by the respondents.

3.3. Planning of the research

The research took place in 2014 through surveys and learning workshops in all three networks. The follow-up research took place in 2016, in the same way with mostly the same questions, added were 3 interviews key actors per network to obtain individual learning histories of the period between 2014 and 2016. An overview of methods used is listed in Table 1.

3.4. Mixed methods

Combining different approaches within one research is referred to as ‘mixed method research’, which refers to a ‘combination of research methods [is] designed to balance out the strengths and weaknesses of any one method to produce a richer set of evidence’ (Pearce 2012, 844). Reflexive monitoring is considered to be the most suitable for the monitoring of system innovation and transition (Arkensteijn, van Mierlo, and Potters 2007; Groot 2008). By using RMA in combination with survey data and interviews with network partners, we aim to create a representation of the partners’ perception of (learning) dynamics in the network, while working with the practical limitations of authentic case studies.

The data from the survey in 2016 made it possible to better understand different levels of trust, commitment and reframing. The analytic coding was based on the following definitions. Reframing: the emergence of new views, new problem orientations, new solutions and visions. Trust: Stakeholders actions and utterances that suggest (daring to be) vulnerable to others’ actions. Commitment: stakeholder’s actions that commit time, money, and other resources to shared goals, values and interests. In treating trust, commitment and reframing as emergent properties of social learning (Sol, Beers, and Wals 2013) we also tried to characterise the underlying (inter)active processes for each of the regional network. Rather than identifying every action and every discursive space (to which the data give limited access), we opted to rather give ‘thick descriptions’, combined with the visual toolbox (Vicente, 2016) based on the data. This was combined with interpretations on ‘levels of trust, commitment and reframing’ from the interviews, the learning workshops, and the observations in both 2014 and 2016. The triangulation of data from these different methods made it possible to construct several figures

Table 1. An overview of methods used for each network in 2014–2016.

	Utrecht	Flevoland	Limburg
RMA 2014	Network meeting: workshop	Network meeting: workshop	Network meeting: workshop
RMA 2016	Network meeting: workshop	Learning history with coördinator	Observing meetings and learning history with coordinator
Survey 2014	8 actors	8 actors	6 actors
Survey 2016	7 actors	8 actors	10 actors (minisurvey)
Interviews 2016	3 change agents	3 change agents	3 change agents

(see Section 4), visualising the emergent properties of the social learning dynamics in time. This methodological data triangulation refers to the finding of similarities between results from different research methods (Joslin and Müller 2016). Remarks and data on trust, commitment and reframing from the survey were taken as a starting point for constructing the values ‘low, moderate, high’. The results therefore are not necessarily generally applicable mechanisms, but provide additional insight in how social learning dynamics become manifest in governance networks.

4. Results

In this section, the three regional networks are evaluated separately: first, we describe the Utrecht network, second the Flevoland network and third the Limburg network. For each network, we describe the situation as perceived by the network partners in 2014, with attention on the network structure, indications of trust, commitment and reframing and the main network ambitions. Then we describe the situation and the concrete network results in 2016, followed by a retrospective view on social learning dynamics regarding the emergence of reflexivity, trust, commitment and reframing. The data are used to construct several figures (2, 3 and 4) visualising the emergent properties of the social learning dynamics in time; trust, commitment, reframing and reflexivity as they changed over the course of the network (horizontal axis). These properties of the learning dynamics are understood to vary from low (l) to moderate (m) to high (h) (vertical axis). Finally, conclusions will be drawn about the (self-) governance and change capacity of the regional network.

4.1. Utrecht regional sustainability network

4.1.1. The situation in 2014

The network partners indicate that they do not regard the network as a network, also because the status and role of this network is not (yet) clear. They rather regard it as a programme, a temporary formation for the time being. The ambition of the network is to accelerate sustainability through grass-roots collaboration, sharing of knowledge and connecting. The network partners each bring in their own projects to work on in collaboration with the network partners. As illustrated by a statement from one of the network actors: ‘I don’t have the feeling that the common interest is very important’. We conclude that there is some tension concerning the long-term abilities of the network; actors do not yet see or experience the benefit of the network and give priority to their own projects. Network trust and network commitment are present, but perceived as moderate.

4.1.2. Network roles and results 2014–2016

By working on projects in thematic ‘sub-networks’, the Duurzaam Door network is realising initiatives as for example ‘Energy Explore Lab’, and ‘Change Lab’. In these initiatives, different stakeholders such as high schools and entrepreneurs collaborate, see Matrix 1: Three project examples of the Utrecht network.

The coordination is delegated to an NGO (NMU). The partners are asked to sign a formal agreement to commit to the network, but none of the partners really feels committed. This undermined the trust, the social learning and network development. One of the network partners mentioned: ‘We did not know what kind of collective we really were and what it meant to sign an agreement’. However when

Matrix 1. Three project examples of the Utrecht network.

Theme	Title	Output
Social entrepreneurship	Change Lab	Increased the involvement of youth in tangible sustainability issues and creating future leaders
Energetic Society	The Great Transition	The stimulation of participation of citizens in projects
Energy saving in the construction of buildings	Energy Explore Lab	Supported high school students to advise companies and private owners to co-design energy saving buildings

network successes became visible, a network partner stated: 'These are the highlights I need to embrace in order to have confidence in the future [of our network]'. This partner demonstrated how output relates to trust in the network.

During 2016, the provincial government constituted additional requirements for subsidies, which again put pressure on the partners' trust in the network.

4.1.3. Social learning dynamics

From the survey and the interviews in 2016, it becomes clear that network partners experienced a breach of trust in 2015. The signing of the agreement in 2014, where all actors promised to commit to the timely reporting of activities, was at risk the end of the programme in 2016. This failure to comply was sanctioned by withholding subsidies in 2015 by the provincial government. This seriously brought the network trust under pressure. One of the network partners indicates there is a real lesson on trust: 'Only sign an agreement when there are really explicit and binding terms, including the right mandates to make decisions'.

Also during 2015 (the second year of the programme) the coordinator realised that all subnetworks are performing well, but connecting and learning at network level is still weak. At this point, a significant change was created by the coordinator, who decided to organise 'Learn & Knowledge meetings' in order to collect the different sub-network actors towards a more joint vision and self-awareness of the network. Critical issues such as 'what can we do to create a shared identity, how can we prevent dismemberment, how can we anticipate on agendas outside the network?' were addressed. This meeting enhanced reflexivity and provided possibility to reframe on existing patterns and created more relational trust.

The meetings helped to discover a sense of shared network identity leading to a joint decision about skipping several small projects. Such a decision is considered as taking a risk, in becoming vulnerable for the actions of others. This indicates that trust was emerging that the network was committed to make a change, and that for this a process of joint reframing must have been taking place.

4.1.4. Governance and change agency

In 2016 (the third and last year of the programme), the network coordinator negotiated with the provincial government that the administrative process needed to be more flexible, because the network was experiencing an administrative burden, considering the conditions for funding. This can be regarded as a significant change, however outside the boundaries of the research.

4.1.5. Conclusions Utrecht

We can learn from Utrecht that the dynamics of TCR show a start in 2014 with medium-low trust and commitment (see Figure 2).

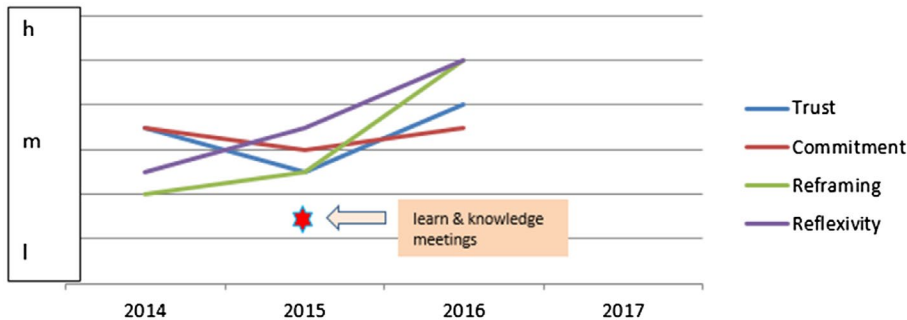


Figure 2. Dynamics of reflexivity, trust, commitment and reframing in the Utrecht network (h = high, m = medium, l = low, ★ = significant change).

In the year to come due to unclear criteria, top down regulations, lack of experience and lack of mutual learning; trust, commitment and reframing decrease even further. This is sensed in 2015 by the coordinator (NMU) and action is taken. We can regard this as a reflexive capacity and leadership of a change agent, who also creates an intervention by inviting the whole network for a ‘Learn and Knowledge’ event. This event demarcates a significant change in the social learning process, because the dynamics show that after this event trust, commitment and reframing within the regional network increase. A joint decision about skipping several small projects altogether, expresses a shared reframed decision based on social learning. In retrospect, this is regarded as a valuable learning process by the whole network. A growth in ambition is sensed in 2016, which is expressed in the future plans for 2017–2020. However, the survey also indicates that flexibility, self-steering capacity and network vigour are quite low. This can possibly be explained by the still relatively low rates of trust, commitment and reframing. Fact is that the partners in the network still tend to focus on their own projects instead of network projects.

4.2. Flevoland regional sustainability network

4.2.1. The situation in 2014

The Flevoland network partners regard the network as strong, in 2014, because it is synoptic; partners know each other quite well from preceding years. There is ambition and a feeling of possibilities; respondent: ‘I want Flevoland to be sustainable testing grounds and I expect this is possible through cooperation’. The central focus in this region is on social innovation: ‘to develop knowledge and create connections between persons, organisations, initiatives and networks’ (Flevoland 2015, 1). The partners realize that coming into action is important but difficult when priority is given to the successful development of projects for only the own organisation. Some respondents in the survey note this point of competition. Many respondents regard all features trust, commitment and reframing as moderate/high, but not all respondents share this view. Some even regard all properties as low; which is illustrated by the comment: ‘we like to talk about our successes but we are not really willing to experiment and learn’. This is an indication of low reflexivity. Remarks on expectations about the leading role of the provincial government are made several times. In sum, the atmosphere seems positive, but there are some points of concern considering partners, roles and learning.

4.2.2. Network roles and results 2014–2016

The network composition changed a bit during 2015 by the addition of the Higher Education Institute CAH in Almere and the Water board Flevoland. The three main themes are: energy (local and sustainable), food (city farming, regional products, healthy food and connections in the food chains) and resources (bio based economy, energy from biomass). Between 2014 and 2016, approximately eight different projects have been realised within the themes, such as: ‘Students looking for value’, ‘Sustainable Energy’, ‘Social Innovation for a sustainable food landscape’ (see Matrix 2). Network partners in the survey confirm this high output of projects.

Most participants experience a better network collaboration in 2016 as the result of the Duurzaam Door programme: ‘The benefit for all is that we know each other better and know how to find each other on joint themes’.

Matrix 2. Three project examples of the Flevoland network.

Theme	Title	Output
Food Sovereignty	Social Innovation for a sustainable foodscape	New connections between educational institutes and entrepreneurs
Sustainable Energy Learning Young	Learning and stimulating about energy Student looking for value in residual flows	A service point on energy for citizens and a symposium Sustainability is more integrated in the school curriculum

4.2.3. Social learning dynamics 2014–2016

Short after the start of Duurzaam Door Flevoland, relational network trust declined due to unclear procedures in project funding. The provincial government was expected to provide this as well as the management of the network, but hesitated to do so. Commitment towards the programme activities and the network project became low too, because a risk of investing time without acquiring subsidies in return was realistic. A solution was to create networks around themes, such as an energy network, a circular economy network and a food network. Within these themes, projects were formulated. The consequence was that this divided the whole provincial network into subnetworks that did not feel connected as a whole. In a particular project on sustainable food reflexive monitoring was applied, which yielded effective social learning and change agency. The reflexive questions in this specific project reframed people's perception about participation, after which they started to include neglected partners, such as schools and municipalities. Figure 3 illustrates the development of the emergent properties of the social learning dynamics.

This process implies a relation between learning, reframing and change agency. The reflexive monitoring meeting in 2015 is here regarded as a significant change, on the level of a subnetwork.

A second significant change is experienced halfway 2016, when a facilitated reflexive monitoring atelier is held with the whole network. This reflexive meeting is experienced as a social learning process and results in higher network commitment and trust in the different roles and ambitions of the partners and the network.

4.2.4. Governance and change agency

Because of the pragmatic division in subnetworks, the network as a whole was still highly dependent on thematic subsidies. For 2017 and onward more investments need to be done in the collaborative learning (i.e. reflexive) capacity of the network as a whole, in order to become self-supportive and self-organising.

4.2.5. Conclusions Flevoland

Because of the thematic approach, the network developed thematic sub-networks with relatively high trust, high commitment and high willingness for reframing. Actor (2016): 'Our cooperation is good; this is illustrated in the openness in our conversations'. At the level of the regional network however relatively low trust and commitment was developed because actors did not really need each other there. For the future of the network agency and the social learning capacity, this might have some consequences.

Considering reflexivity we see two significant moments: in 2015 and in 2016, both in and around a reflexive social learning activity (a reflexive monitoring in action meeting), and its effects. Core of both these discursive RMA practices was to reflect as a network on reflexive questions such as 'How do things go? Are we doing the right things? Are there possibilities for doing things differently?' By exchanging

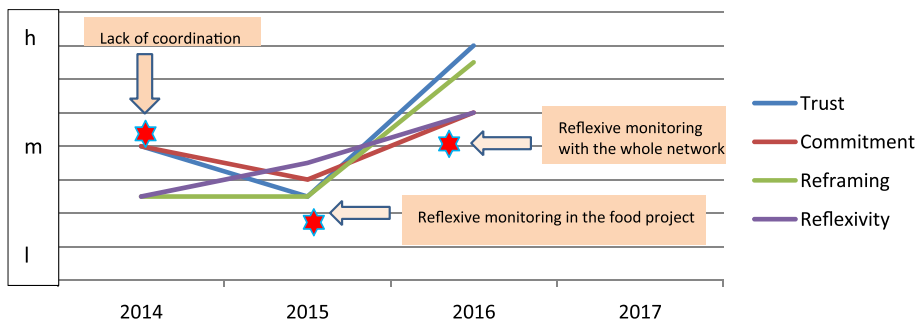


Figure 3. Reflexivity, trust, commitment and reframing and in the Flevoland network (h = high, m = medium, l = low, ★ = significant change).

ideas about these questions, the discursive space became accessible and reflexive for all actors through which possibilities for reframing, trust building and new commitment grew.

An unintended effect is the governance effect: this network makes itself dependent from a regime actor (for coordination) and makes itself dependent from learning interventions (from facilitators). The effect is that the network creates discursive space: by demanding the provincial government into a coordinating role, network learning and negotiation can take place. Meanwhile the facilitated interventions make the discursive space accessible and reflexive for all actors through which possibilities for reframing, trust building and new commitment grow.

4.3. Limburg regional sustainability network

4.3.1. The situation in 2014

In Limburg, three actors create the central network that aims at social innovation in the region. However, the three actors experience little support from the provincial government, which does not give priority to the Duurzaam Door programme. They feel the provincial government is operating at a different speed. The provincial government on the other hand, experiences the three partners as too 'aggressive'. The impression in 2014 is that the high ambition is not really supported by trust between all actors and commitment for the plans.

4.3.2. Network roles and results 2014–2016

The output of the network is not very high until the end of 2015. In the spring of 2016, the Limburg network got new inspiring leadership in the form of three individual actors (of whom two are new to the network) who cooperate closely and trust each other. They represent respectively a NGO, the Duurzaam Door programme (RVO) and a facilitating agency. Together they work as a trusting nucleus for social innovation. They agree on the strategy to create a committed network for sustainability. Several projects are started of which we show three examples in Matrix 3.

4.3.3. Social learning dynamics

Due to different characters and different interests, relational trust became really low in 2014 and 2015. Halfway the year 2015 the network collaboration between the three organisations was suddenly breached. This is the first significant change, where the RVO actor became aware that process knowledge was lacking. In order to secure this competence, RVO connected in 2015 with a facilitating agency, and ensured sufficient 'process money' for this consultancy from the provincial government. Furthermore, an independent regional actor, an NGO, was asked to take a coordinating role. In this collaboration of three persons, high trust and commitment existed as well as high willingness to reframe. The three persons worked intensely together from spring 2016 onward in order to create a vital network of networks. They felt free space for manoeuvre. They mainly foster the growth of trust, commitment and reframing in the network.

Their jointly reframed philosophy is to work from the bottom up, in connection with people's initiatives. For the first meeting in June 2016, they invited about 20 representatives of different bottom up initiatives on energy, citizenship and food production for an exchange on values and wishes. From then on, a preliminary network was created from educational institutes, citizens, NGO's, entrepreneurs and government officials. The encompassing theme is regional energy. This meeting created trust and can be

Matrix 3. Three project examples of the Limburg network.

Theme	Title	Output
Energy	GLOEI	A regional energy cooperative of engaged citizens and entrepreneurs
Circular Economy	ZERegIO	Getting maximum value from products that reached the end of their life- or user cycles
Economic Energy	Nuth on the way to sustainability	Making energy saving a simple money saving activity

regarded as a second significant change: the facilitator realised that reflexivity is needed and should be organised. The second meeting was also more analytic in character. This resulted in reframing of mind-sets and knowledge in the network. The third meeting created commitment because specific fields of actions became manifest. See Figure 4 for the significant moments of change. Participants pointed out to which topic and which action they would provide energy, time and resources. The fourth meeting is still to come; the anticipated agenda is to create a joint vision of the network.

4.3.4. Governance and change agency

‘More difficult than realising a sustainability project is to change the mind-set. We need more knowledge of processes. That is not sufficiently seen yet’ (respondent).

The RVO approach includes on three levels of learning; first the local network level, second the thematic level (which can be inter-local) and third the regional level. On this third level, we see change agency, realising sustainable output.

4.3.5. Conclusions Limburg

Lack of trust, a hard confrontation and the breach that followed brought about a deep learning insight: what comes first in collaboration, high ambitions and money, or shared values and honesty? The RVO coordinator took this lesson to heart in 2015. From then on, a bottom up reflexive path was developed from a small trusting core network that engaged approx. 20 others. The culture in this whole network has been open, curious and reflexive. There has not been sufficient time to experience the concrete results of this practice. The paradox is that there is no outcome yet, but trust and commitment in the network is very high. The social learning process is regarded as viable. Change agency seems to be derived from the triangular cooperation of three collaborative change agents, engaging others in the network to become trustful, reflexive and committed. This seems to be a very promising approach.

5. Conclusions

In this study, we have empirically examined two issues. First, we explored the role of reflexivity, trust, commitment and reframing as interrelated and emergent properties in social learning. Second, we have investigated the role of change agents in social learning processes.

Based on three retrospective case studies of new, Dutch regional governance networks for sustainability transition, we found that reflexivity fosters to the emergence of trust, commitment and reframing. In turn, the case studies also suggested that reflexivity can be an outcome of social learning, suggesting that is can be seen as an emergent condition for social learning. Additionally, we found that trust, commitment and reframing evolved together as they seemingly interact and influence each other. Higher trust was found together with higher commitment and higher reframing activity in all three regional networks. As such, these emergent properties both appear to foster social learning and

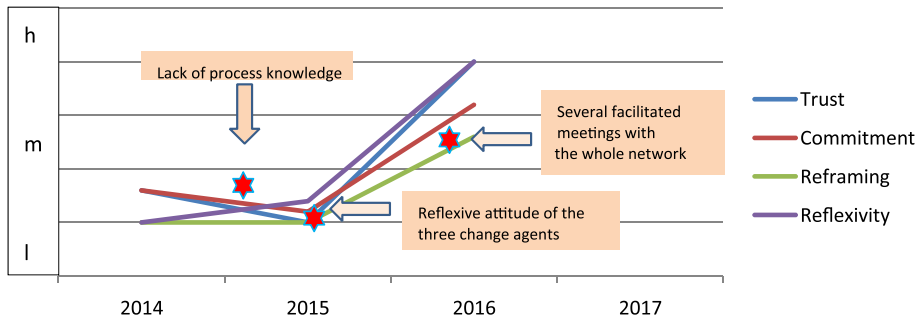


Figure 4. Reflexivity, trust, commitment and reframing in the Limburg network (h = high, m = medium, l = low, ★ = significant change).

result from social learning. These findings are in line with earlier research (Sol, Beers, and Wals 2013). In the following paragraphs we will substantiate these main conclusions.

We have seen that taking up reflexive attitudes and performing reflexive activities helps to reorient on better and other practices (Utrecht meeting in 2015). The reflexivity here induced the social learning dynamics and double-loop learning processes (Argyris 2003) with impact on levels of trust, commitment and reframing, leading to high network ambitions in 2016. In the Flevoland region, where reflexivity was facilitated in a monitoring meeting in 2015, insights about roles and possible engagement patterns of various partners were created. In Limburg, the reflexive attitude of three cooperative central actors fostered the growth of trust, commitment and reframing in the network; reflexivity induced trust in social learning processes (Klijn 2008). We conclude here, that reflexivity (Mezirow 1991; Pugh 2011; Malthouse 2014) works as a sort of lubricant in the dynamics of social learning: it fosters the emergence of trust, commitment and reframing in the social learning process.

We additionally explored a possible relation between social learning dynamics and social learning outcomes. As indicated before, in our theoretical paragraph; effective or successful social learning processes (Leys and Vanclay 2011) can be recognised by high information sharing, improved communication, relation building leading towards new knowledge, new relations and new actions (Beers and van Mierlo 2017). This, in turn, feeds into the notion that, to an important extent, effective learning comes from the experience of changing reality (Friedman 1987, 216). The present study suggests that the same holds for the three regional networks that we studied. For example, in Flevoland the new insight in the food project is, that they need new and different partners. This can be regarded as relation building, by including schools and municipalities in the project. In Utrecht, improved communication resulted in a stronger regional network identity and the joint decision to skip some smaller projects. In Limburg, new knowledge is demonstrated by the insight that a more bottom up approach is needed. The three leading actors put this understanding into effect by asking twenty local initiatives to meet and to share values and wishes. Social learning appeared to be a valuable contribution to emerging network relations (cf. Beers and van Mierlo 2017) on sustainable energy in Limburg region. The three cases suggest that taking up reflexive attitudes and performing reflexive activities helps to reorient on better and other practices. This in turn is indicative of a relation between social learning dynamics and outcomes.

The second research issue concerned the role of change agents in social learning dynamics. It is interesting to see that some change agents (Zaalmink et al. 2007; Grin 2011), be it in a coordinating role (Utrecht), a project-leading role (Flevoland) or a 'free actor' (Wielinga and Geerling-Eiff 2009) role (Limburg) can influence the development of a the network. Change agents became active at significant moments, when trust and commitment were low and social learning became difficult, and when the change agency of the whole network was under pressure. The reflexive interventions these agents did at these moments had important impacts on awareness, knowledge creation, relational trust and new orientations on action in the three networks. Through this, moments of significant change were created and experienced (cf. Davies and Dart 2005). In the Utrecht region, the intervention was to organise a 'collaborative learning event', which created a reflexive social learning moment, after which the network members knew each other better and trusted others more. This led to more collaboration and joint network ambitions than before. In the Limburg region, we saw three change agents collaborating in a very flexible and reflexive style, constantly reorienting what to do next, without fear. This attitude inspired the network members to create trust and collaboration for a next step in creating a shared vision. This indicates that even a small number of change agents can make an important difference, in the 'free actor' role. In addition, we saw that change agents can free up the space for reflexivity, for example, when there is a threat of internal competition within the network (Utrecht region) or a programme to be unsuccessful (Limburg region).

Overall, we found that change agents can (often) foster spontaneous or facilitated reflexive practice in governance networks, which induces changes in different emergent properties such as reflexivity, trust, commitment, reframing, knowledge, relations and action in the three Dutch sustainability networks. With that, we saw an important role of change agents in social learning processes.

5.1. Discussion

In all three networks, which operate independent of each other, we have witnessed *reflexive turns* (Beers and van Mierlo 2017). Reflexive turns involve a certain change in network perception or action, which can become clear in meetings. Reflexive turns can be a reaction to a threat, such as the falling apart of the network, or the missing of funding possibilities. On the one hand, the results showed that there was a trigger to become reflexive. On the other hand, we found reasoning and tendencies to be non-reflexive, such as possible attachments to the past, tendencies 'to fight for what we have' (Friedman 1987).

Ideally, according to Zaalmink et al. (2007); reflexivity is fostered either by neutral coordinators or by free actors who can facilitate the network from time to time. The challenge remains in creating a reflexive governance network that is able to adjust, reorient and change in a flexible and surprising way (Guijt 2013). The facilitation of learning processes and the brokering of interaction between actors (from the world of civil society, education, research, business and government) and levels (individual, organisation, community, region and country) are considered core mechanisms for sustainability transitions. However, reflexivity, and the explicit sharing of ideas, interests and visions may be so challenging, that it leads to new lock-in situations (Klitkou et al. 2015) where actors step out of the discursive space and withdraw within safe boundaries. This indicates that reflexive turns can result as a resilient (implicit) reaction by a network to a threat (as we saw in Limburg and Utrecht region) or from a planned and facilitated intervention (as was the case in Flevoland). However, it is always possible that other influences play a role in this mechanism. If for example funding had stopped in 2015, what would have happened in the three networks? Maybe some networks would have become extremely reflexive and would have proceeded successfully. This raises another concern: is it desirable, if possible, to direct and structure reflexivity?

A partial answer to this concern could be our perspective about the role of reflexivity in the development of agency. Reflexivity as part of social learning dynamics can be regarded as taking place in a discursive space (Wals 2007; Pesch 2015): a challenging arena with potential for sustainability transitions. These spaces possibly need reflexive practice and seem promising for further development of governance networks (Termeer and Dewulf 2012). The regional experimental projects in our study can be regarded as niche experiments or testbeds for social learning. In fact, the emergent properties of trust and commitment combined with the tangible outcomes of the social learning process such as new knowledge, relations and actions can be regarded as change agency. Change agency is an emerging result of experimenting and social learning and visible in new, shared knowledge, different behaviour and different roles of actors (Grin et al. 2010). This change is based on reflection, interaction, reflexivity and co-creation; all based on relational trust of network actors (Klijn 2008). Change of behaviour becomes visible in more openness, more flexibility and the (courage of) taking new roles, in all three regions. Change agency can be witnessed in more self-steering initiatives of for example the Limburg network and by a less controlling approach from a government actor.

In perceiving governance networks as test-beds for reflexive governance (Marsden 2013) we like to discuss here, that monitoring new governance roles in these networks might foster this. Although facilitated governance networks (Beers and Geerling-Eiff 2013) such as the Duurzaam Door networks have a reflexive attitude, and are aware of their experimental role in the sustainability transition (Loorbach and Rotmans 2010), still the social learning can be regarded as less democratic (Johansson 2004; Biesta, Bouverne-De Bie, and Wildemeersch 2014) than expected. Also, we can see here that social learning cannot be seen in a vacuum, and therefore is a vulnerable activity (Pesch 2015; Wildemeersch 2009). The networks are being affected by implicit beliefs about governmental roles: in for example a coordinating role in the Flevoland network and about unexpected hierarchy and control in the Utrecht network. In addition, there is a neglected role of the province in Limburg. All this indicates a quest for new government roles and new actors' roles in governance networks, and most of all, the need for free actor roles for fostering learning processes. This might lead to more equal, flexible and open attitudes of actors, by which the discursive space becomes inviting to be reflexive. It seems interesting to keep a close eye on programmes like 'Duurzaam Door' in the coming years as it can be regarded as a living laboratory for reflexive governance (Marsden 2013) and sustainability transitions. From the point of

view of transitions and social learning, it would be worthwhile to foster and monitor the reflexivity of these experimental governance networks.

As trust, commitment and reframing are regarded as emergent properties of social learning, we might consider these properties also as indicators of progress. In light of our findings, we would like to suggest here that new knowledge, new relations and new actions together with increases in reflexivity, trust, commitment and reframing could be indicators for effective social learning processes (Friedman 1987; Leys and Vanclay 2011). An in-effective social learning process would be regarded as the situation of lock-in (Barnes et al. 2004; Klitkou et al. 2015), a situation of inflexibility (Thompson and Pascal 2012) where changes and learning are hard or impossible. These findings need to be approached with some caution; whether effective social learning contributes to effective governance networks with agency (Grin et al. 2010) let alone sustainability transitions (Rotmans and Loorbach 2006), are relations we consider as possible topics for further research.

The present study suggests that knowledge, relations and actions, as outcomes of social learning processes in a governance network, can be seen as relatively more salient and explicit than trust, commitment and reframing. In other words, knowledge, relations and actions are more *visible* than the growth of trust, commitment and reframing and maybe even a more reflexive culture. Only by trying to understand some of these rather invisible 'undercurrents' we can attempt to make them more explicit (Regeer 2010). Through reflexive interventions, we might be able to witness dynamics in trust, commitment and reframing, and become aware of what is happening and what is needed to facilitate social learning processes.

Overall, we can say that we have contributed to the search for more insight in the emergent properties of social learning and their underlying dynamics. At this point, we might say that the analytical framework (Figure 1) is useful, because it allows us to see and discuss possible relations between reflexivity, trust, commitment and reframing, social learning, outcomes such as new knowledge, relations and actions within the context of governance networks and sustainability transitions. Further research could also elaborate on the roles, reasons and risks of reflexivity and the effects of reflexivity in order to create a more 'reflexive culture' within social learning processes.

For environmental and sustainability educators, but certainly for environmental and sustainability policy-makers and those working on curbing climate change, halting extinction, reducing inequity and poverty, and so on, one important question remains: does improved social learning lead to concrete socio-ecological outcomes? This article did not attempt to prove that it does, but if environmental and sustainability education is to be supported in the future, then the contributions of (facilitated) social learning need to be shown in one way or another, for otherwise a return to instrumentalism is likely, as much in the Dutch context as in any other.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the Duurzaam Door Programme 2014–2016, The Dutch Ministry of Economic Affairs under Reference number [DD20160005].

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References

- Akkerman, S. F., and A. Bakker. 2011. "Boundary Crossing and Boundary Objects." *Review of Educational Research* 81 (2): 132–169.
- Alexander, P., D. L. Schallert, and R. E. Reynolds. 2009. "What is Learning Anyway? A Topographical Perspective Considered." *Educational Psychologist* 44 (3): 176–192. Routledge.
- Archer, M. 2010. *Reflexivity as Internal Conversation*. ISA. Sociopedia.isa.
- Argyris, C. 2003. "A Life Full of Learning." *Organization Studies* 24 (7): 1178–1192.
- Arkensteijn, M., B. van Mierlo, and J. Potters. 2007. *Methoden voor Monitoring en Evaluatie van Innovatieprojecten* [Methods for Monitoring and Evaluation of Innovation Projects]. *Praktijkonderzoek Plant en Omgeving BV* [Research Station for Plants and Environment (PPO-BV)]. Lelystad: Cabri BV.
- Barnes, W., M. Gartland, and M. Stack. 2004. "Old Habits Die Hard: Path Dependency and Behavioral Lock." *Journal of Economic Issues* 38 (2): 371–377. doi:[10.1080/00213624.11506696](https://doi.org/10.1080/00213624.11506696).
- Beck, U. 2006. "Reflexive Governance Politics in the Global Risk Society." In *Reflexive Governance for Sustainable Development*, edited by J.-P. Voss, D. Bauknecht, and R. Kemp, 31–56. Cheltenham: Edward Elgar.
- Beers, P. J., and F. A. Geerling-Eiff. 2013. "Networks as Policy Instruments for Innovation." *The Journal of Agricultural Education and Extension* 20 (4): 363–379. Routledge. doi:[10.1080/1389224X.2013.846870](https://doi.org/10.1080/1389224X.2013.846870).
- Beers, P. J., F. Hermans, T. Veldkamp, and J. Hinssen. 2014. "Social Learning Inside and Outside Transition Projects. Playing Free Jazz for a Heavy Metal Audience." *NJAS - Wageningen Journal of Life Sciences* 69: 5–13.
- Beers, P. J., and B. van Mierlo. 2017. "Reflexivity, Reflection and Learning in the Context of System Innovation: Prying Loose Entangled Concepts." *Published under a Creative Commons License*.
- Beers, P. J., B. Van Mierlo, and A. C. Hoes. 2016. "Toward an Integrative Perspective on Social Learning in System Innovation Initiatives." *Ecology & Society* 21 (1): 3.
- Biesta, G., M. Bouverne-De Bie, and D. Wildemeersch. 2014. *Civic Learning, Democratic Citizenship and the Public Sphere*. Dordrecht: Springer.
- Capra, F. 1996. *The Web of Life. A New Scientific Understanding of Living Systems*. New York: Anchor Books.
- Castells, M. 2000. "Materials for an Exploratory Theory of the Network Society." *British Journal of Sociology* 51 1: 5–24. London School of Economics.

- Chreim, S., B. E. Williams, L. Janz, and A. Dastmalchian. 2010. "Change Agency in a Primary Health Care Context: The Case of Distributed Leadership." In *Health Care Management*. Ropes, D. 2015. "Cultivating Responsiveness; Learning and Development in Complex Environments." In *Holland University of Applied Sciences*. Inaugural Speech.
- Cremers, P. H. M., A. E. J. Wals, R. Wesselink, and M. Mulder. 2016. "Utilization of Design Principles for Hybrid Learning Configurations by Interprofessional Design Teams." *Instructional Science* 45: 289–309. doi:10.1007/s11251-016-9398-5.
- Davies, R., and J. Dart. 2005. *The Most Significant Change Technique: A Guide to Its Use*. www.mande.co.uk.
- De Houwer, J., B.-H. Dermot, and A. Moors. 2013. "What is Learning? On the Nature and Merits of a Functional Definition of Learning." *Psychonomic Bulletin Review* 20: 631–642. doi:10.3758/s13423-013-0386-3.
- Flevoland Province. 2015. *Yearly Report Duurzaam Door*.
- Fook, J. 1999. "Reflexivity as Method." In T. Neil and J. Pascal. 2012. "Developing Critically Reflective Practice." *Reflective Practice: International and Multidisciplinary Perspectives* 13 (2): 311–325.
- Friedman, J. 1987. *Planning in the Public Domain. From Knowledge to Action*. Princeton, NJ: Princeton University Press.
- Grin, J. 2006. "Reflexive Modernisation as a Governance Issue or Designing and Shaping Restructuration." In *Reflexive Governance for Sustainable Development*, edited by J.-P. Voss, D. Bauknecht, and R. Kemp, 57–81. Cheltenham: Edward Elgar.
- Grin, J., J. Rotmans, J. Schot, F. Geels, and D. Loorbach. 2010. *Transitions to Sustainable Development, New Directions in the Study of Long Term Transformative Change*. New York: Routledge.
- Grin, J., J. Rotmans, and J. Schot. 2011. "On patterns and agency in transition dynamics: Some key insights from the KSI programme." *Environmental Innovations and Societal Transitions* 76–81.
- Groot, A. 2008. *Monitoring of Social Learning* [Monitoren van sociaal leren]. Het leerproces binnen het project 'Groene en Blauwe diensten' in de provincie Flevoland. Wageningen: Alterra-Wageningen UR.
- Guijt, I. M. 2008. "Seeking Surprise, Rethinking Monitoring for Collective Learning in Rural Resource Management." Doctoral Thesis, Wageningen University.
- Hajer, M., and W. Versteeg. 2005. "Performing Governance through Networks." *European Political Science* 4: 340–347.
- van den Heiligenberg, H. A. R. M., G. J. Heimeriks, M. P. Hekkert, and F. G. Oort. 2017. "A Habitat for Sustainability Experiments: Success Factors for Innovations in Their Local and Regional Contexts." *Journal of Cleaner Production*. Manuscript Draft.
- Illeris, K. 2014. "Transformative Learning Re-defined: As Changes in Elements of the Identity." *International Journal of Lifelong Education* 33 (5): 573–586. doi:10.1080/02601370.2014.917128.
- Ison, R., C. Blackmore, and B. L. Iaquinto. 2013. "Towards Systemic and Adaptive Governance: Exploring the Revealing and Concealing Aspects of Contemporary Social Learning Metaphors." *Ecological Economics* 87: 34–42.
- Johansson, J. 2004. "A Democratic, Learning and Communicative Leadership?" *Journal of Educational Administration* 42 (6): 697–707. doi:10.1108/09578230410563683.
- Joslin, R., and R. Müller. 2016. "Identifying Interesting Project Phenomena Using Philosophical and Methodological Triangulation." *International Journal of Project Management* 34: 10431056.
- Keen, M., V. A. Brown, and R. Dyball. 2005. *Social Learning in Environmental Management: Towards a Sustainable Future*. London: Earthscan.
- Kemp, R., D. Loorbach, and J. Rotmans. 2009. "Transition Management as a Model for Managing Processes of Co-evolution towards Sustainable Development." *International Journal of Sustainable Development & World Ecology* 14 (1): 78–91. doi:10.1080/13504500709469709.
- van Kersbergen, K., and F. van Waarden. 2004. "'Governance' as a Bridge between Disciplines: Cross-disciplinary Inspiration regarding Shifts in Governance and Problems of Governability, Accountability and Legitimacy." *European Journal of Political Research* 43 (2): 143–171.
- Klijin, E. H. 2008. "Governance and Governance Networks in Europe." *Public Management Review* 10 (4): 505–525. doi:10.1080/14719030802263954.
- Klijin, E. H. 2010. "The Impact of Network Management on Outcomes in Governance Networks." *Public Administration* 88 (4): 1063–1082. doi: 10.1111/j.14679299.2010.01826.x.
- Klijin, E. H., J. Edelenbos, and B. Steijn. 2010. "Trust in Governance Networks: Its impacts on Outcomes." *Administration and Society* 42 (2): 193–221. Sage.
- Klitkou, A., S. Bolwig, T. Hansen, and N. Wessberg. 2015. "The Role of Lock-in Mechanisms in Transition Processes: The Case of Energy for Road Transport." *Environmental Innovation and Societal Transitions* 16: 22–37.
- Leys, A. J., and J. K. Vancly. 2011. "Stakeholder Engagemnet in Social Learning to Resolve Controversies over Land-use Change to Controversies over Land-use Change to Plantation Forestry." *Regional Environmental Change* 11: 175–190. doi:10.1007/s10113-010-0132-6.
- Loorbach, D. 2010. "Transition Management for Sustainable Development: A Prescriptive, Complexity-based Governance Framework." *Governance: An International Journal of Policy, Administration and Institutions* 23 (1): 161–183.
- Loorbach, D., and J. Rotmans. 2010. "The Practice of Transition Management: Examples and Lessons from Four Distinct Cases." *Futures* 42: 237–246.
- Malthouse, R., J. Roffey-Barentsen, and M. Watts. 2014. "Reflectivity Reflexivity Situated Reflective Practice." *Professional Development in Education* 40:4: 597–609. doi: 10.1080/19415257.2014.907195.
- Marsden, T. 2013. "From Post-productionism to Reflexive Governance: Contested Transitions in Securing More Sustainable Food Futures." *Journal of Rural Studies* 29: 123–134.
- Mezirow, J. 1991. *Transformative Dimensions of Adult Learning*. San Francisco, CA: Jossey-Bass.

- Mezirow, J., and associates. 2000. *Learning as Transformation, Critical Perspectives on a Theory in Progress*. San Francisco, CA: Jossey-Bass.
- van Mierlo, B., M. C. Arkesteijn, and C. Leeuwis. 2010. "Enhancing the Reflexivity of System Innovation Projects with System Analyses." *American Journal of Evaluation* 31 (2): 143–161.
- van Mierlo, B. C., B. Regeer, M. van Amstel, M. C. M. Arkesteijn, V. Beekman, and C. Leeuwis. 2010. *Reflexive Monitoring in Action: A Guide for Monitoring System Innovation Projects*. Wageningen: Communication and Innovation Studies, WUR.
- Newig, J., D. Günther, and C. Pahl-Wostl. 2010. "Synapses in the Network, Learning in Governance Networks in the Context of Environmental Management." *Ecology and Society* 15 (4): 24.
- Oonk, C. 2016. "Learning and teaching in the Regional Learning Environment. Enabling Students and Teachers to Cross Boundaries in Multi-Stakeholder Practices." PhD thesis, Wageningen University & Research, Wageningen.
- Pearce, L. D. 2012. "Mixed Methods Inquiry in Sociology." *American Behavioural Scientist* 56 (6) 829–848. Sage. doi: 10.1177/0002764211433798.
- Peeman, T. 2009. *I trust U. Managing with trust*. Pearson Education Benelux, Amsterdam.
- Perez, O. 2014. "Courage, Regulatory Responsibility, and the Challenge of Higher Order Reflexivity." *Regulation and Governance* 8: 203–221.
- Pesch, U. 2015. "Tracing Discursive Space: Agency and Change in Sustainability Transitions." *Technological Forecasting & Social Change* 90: 379–388.
- Piaget, J. 1964. "Development and Learning." *Journal of Research in Science Teaching* 2: 176–186.
- Pugh, K. J. 2011. "Transformative Experience, an Integrative Construct in the Spirit of Deweyan Pragmatism." *Educational Psychologist* 46 (2): 107–121.
- Reed, M. S., A. C. Evelyn, G. Cundill, I. Fazey, Y. Glass, A. Laing, J. Newig, et al. 2010. "What is Social Learning?" *Ecology and Society* 15 (4): R1. doi:10.5751/ES-03564-150.4r01. [online].
- Regeer, B. J. 2010. *Making the Invisible Visible. Analysing the Development of Strategies and Changes in Knowledge Production to Deal with Persistent Problems in Sustainable Development*. Oisterwijk: Boxpress.
- Rittel, H. W. J., and M. W. Webber. 1973. "Dilemmas in General Theory of Planning." *Policy Sciences* 4: 155–169.
- Rodela, R. 2011. "Deconstructing the Social Learning Discourse: Currents Trends and Themes in Natural Resource Management Literature." For Project: Social Learning Processes in Natural Resource Management: The Role of Learning, Negotiation and Social Capital for More Sustainable Natural Resource Management. FP7-PEOPLE-Marie-Curie-Action IEF.
- Rotmans, J., and D. Loorbach. 2006. "Complexity and Transition Management." *Journal of Industrial Ecology* 13: 184–196.
- RVO, (Rijksdienst Voor Ondernemend Nederland). 2015a. *Yearly Report*. (Jaarverslag) Duurzaam Door, Ministry of Economic Affairs.
- RVO, (Rijksdienst Voor Ondernemend Nederland). 2015b. *Publiek Denken 'Public Thinking'*. Ministry of Economic Affairs.
- Schnäpke, N., M. Singer-Brodowski, F. Stelzer, M. Bergmann, and D. J. Lang. 2015. "Creating Space for Change: Real-world Laboratories for Sustainability Transitions. The Case of Baden-Württemberg." *GAIA* 24 (4): 281–283.
- Sol, J., P. J. Beers, and A. E. J. Wals. 2013. "Social Learning in Regional Innovation Networks: Trust, Commitment and Reframing as Emergent Properties of Interaction." *Journal of Cleaner Production* 49: 35–43. Elsevier Reed.
- Sol, J., and A. E. J. Wals. 2015. "Strengthening Ecological Mindfulness through Hybrid Learning in Vital Coalitions." *Cultural Studies of Science Education* 10 (1): 203–214.
- Sotarauta, M., and S. Srinivas. 2006. "Co-evolutionary Policy Processes; Understanding Innovative Economies and Future Resilience." *Futures* 38: 312–336.
- Termeer, J. A. M., and A. Dewulf. 2012. "Towards Theoretical Multiplicity for the Governance of Transitions: The Energy-producing Greenhouse Case." *International Journal of Sustainable Development* 15 (1/2): 37–53.
- Thompson, N., and J. Pascal. 2012. "Developing Critically Reflective Practice." *Reflective Practice, International and Multidisciplinary Perspectives* 13 (2): 311–325.
- Vicente, J. 2016. *Visual Toolbox for System Innovation. A Resource Book for Practitioners to Map, Analyse and Facilitate Sustainability Transitions*. Climate-KIC. #YourPathYourFuture, pioneers.climate-kic.org.
- Vinke-de Kruijf, J., and C. Pahl-Wostl. 2016. "A Multi-level Perspective on Learning about Climate Change Adaptation through International Cooperation." *Environmental Science & Policy* 66: 242–249.
- Vygotsky, L. S. 1978. "Interaction between Learning and Development." In *Mind and Society*, 79–91. Cambridge, MA: Harvard University Press.
- van der Wal, M. M. 2015. "The Role of Computer Models in Social Learning for Participatory Natural Resource Management." Doctoral Thesis, Open University, the Netherlands.
- Wals, A. E. J. 2007. "Learning in a Changing World and Changing in a Learning World: Reflexively Fumbling towards Sustainability." *Southern African Journal of Environmental Education* 24(1): 35–45.
- Wals, A. E. J., N. van der Hoeven, and H. Blanken. 2009. *The Acoustics of Social Learning: Designing Learning Processes That Contribute to a More Sustainable World*. Utrecht/Wageningen: Senter Novem/Wageningen Academic Publishing.
- Wenger, E. 1998. *Communities of Practice: Learning, Meaning and Identity*. Cambridge: Cambridge University Press.
- Wielinga, E., and F. A. Geerling-Eiff. 2009. "Networks with Free Actors: An Organic Approach to Innovation and Transition." In *Transitions towards Sustainable Agricultural and Food Chains in Peril-urban Areas*, edited by K. J. Poppe, K. Termeer, and M. Slingeland, 113–138. Wageningen: Wageningen Academic Publishers.

- Wildemeersch, D. 2009. "Social Learning Revisited: Lessons from North and South." In *Social Learning towards a Sustainable World*. Wageningen: Wageningen Academic Publishers.
- Zaalmink, W., C. T. Smit, H. E. Wielinga, F. A. Geerling-Eiff, and L. Hoogerwerf. 2007. *Network Tools for Free Actors. Methods and Techniques for the Successful Facilitation of Networks* ['Netwerkgereedschap Voor Vrije Actoren'. Methoden En Technieken Voor Het Succesvol Begeleiden Van Netwerken]. Wageningen: Wageningen UR.