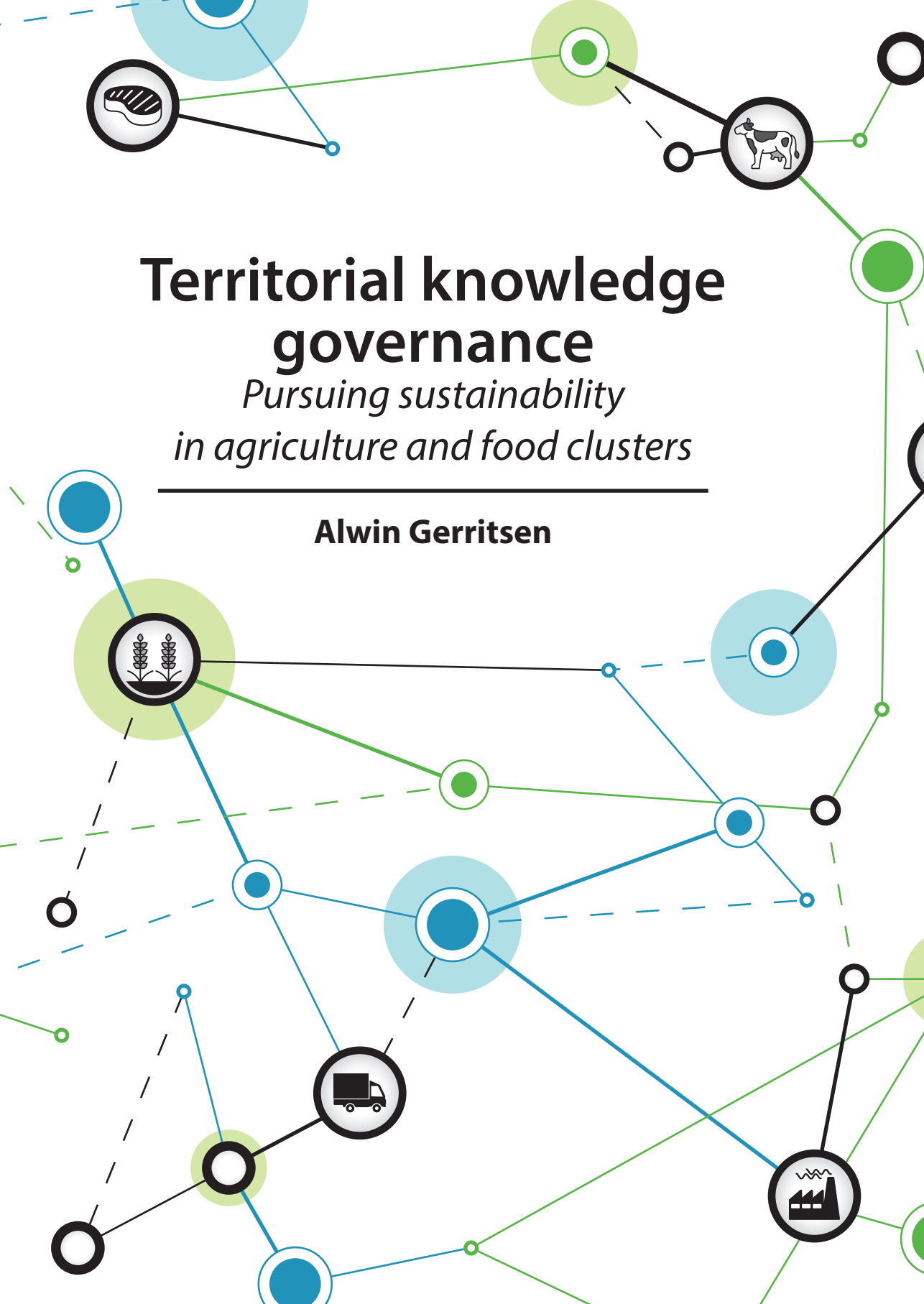

Territorial knowledge governance

Pursuing sustainability in agriculture and food clusters

Alwin Gerritsen

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This research was conducted under the auspices of the Graduate School Wageningen School of Social Sciences

Territorial Knowledge Governance: pursuing sustainability in agriculture and food clusters

Alwin L. Gerritsen

Thesis

submitted in fulfilment of the requirements for the degree of doctor
at Wageningen University
by the authority of the Rector Magnificus,
Prof. Dr A.P.J. Mol,
in presence of the
Thesis Committee appointed by the Academic Board
to be defended in public
on 18 October 2019
at 4 p.m. in the Aula.

Alwin L. Gerritsen
Territorial knowledge governance: pursuing sustainability in agriculture and food clusters
196 pages.

PhD thesis, Wageningen University, Wageningen, The Netherlands (2019)
With references, with summary in English

ISBN: 978-94-6395-113-5
DOI: https://doi.org/10.18174/499274

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Chapter 1

Introduction

1.1 The Northern Frisian Woodlands

Back in the early 1990s, public authorities and farmers were locked in stalemate over land use management in the region of the Northern Frisian Woodlands (or Noardlike Fryske Wâlden in Frisian) in the north of the Netherlands. The farmers were critical about the environmental regulations in the Netherlands and especially about what these would mean for agriculture in their region. Farmers felt hindered in their dairy farming and environmental preservation activities in which they were already engaged. They did not criticize the policy objectives as such, as they valued their landscape, but wanted to decide themselves how to achieve these. The farmers developed an approach for environmental measures, which they called the 'Alternative Trail' covering feed quality, soil health and landscape management. After a while, national government decided to provide the farmers with temporary room for experimentation to test and evaluate their strategies. A major event was the establishment steering committee of the Northern Frisian Woodlands in 2005. In this steering committee national government, regional stakeholders and a university committed themselves to support the Northern Frisian Woodlands Association in the execution of their ambitions as specified in a working program and a regional contract. Fourteen years later, their ideas on self-regulation have largely become mainstream as they have been at the core of the current system of collectives in agri-environmental management in the Netherlands. Various new activities are ongoing to advance new ideas on sustainable development, such as an area-wide renewable energy cooperation. Moreover, the Northern Frisian Woodlands Association has established itself as a partner for local, regional and national governments and even internationally.

Learning, experimentation and research played a key role in the pursuance of the sustainable development ideas of the farmers of the Northern Frisian Woodlands, even so much that the area and its farmers has been considered to be a field laboratory for scientific research on sustainable rural development. Few regions have been so well studied for e.g. environmental impacts of measures by farmers, as the Northern Frisian Woodlands. Farmers and scientists have since the early 1990s cooperated in the development and implementation of innovations in sustainable rural development and the scientific challenges these entail. Scientific research played an important role in the consolidation and the development of the various strategies developed by the farmers. Farmers developed and circulated knowledge in study groups on the Alternative Trail. They even established a research council to coordinate activities.

Since then, the cooperation between science and the farmers has evolved and transformed. First, as part of a national innovation program, then as a set of pilot projects with little participation of scientific researchers. Very recently (2018-2019), this collaboration is renewed as part of a regional covenant, a new area-based cooperation process in North-Eastern Frisia and a field lab programme.

This example from the Northern Frisian Woodlands shows that knowledge-driven activities such as experimentation and research can be a way to break out of a situation of conflict. A twist in this manner can enable individuals and communities to pursue their own agenda on sustainable development in agriculture and food, while gathering support for its development and implementation. Hence, the central role for knowledge in advancing sustainable development was chosen as the core issue to explore in this thesis.

1.2 Why study knowledge, governance and the advancement of sustainable development in agriculture and food?

Sustainable development is a major societal, economic and policy issue, which receives much attention and traction, especially since the publication of the Sustainable Development Goals (United Nations, 2015), that are part of the UN '2030 Agenda'. These SDGs cover social and economic development issues, including ending poverty and hunger, improving health and education, making cities more sustainable, combating climate change, and protecting oceans, forests and other terrestrial ecosystems (United Nations, 2014).

The Food and Agriculture Organisation of the United Nations has defined the main challenges for sustainable agriculture and food systems (FAO, 2017): First, overall demand for food will continue to increase, and will do so in the context of increasing scarcity of natural resources. Therefore, the challenge is to enhance both food security and resource use efficiency and to increase the resilience of food systems. Secondly, natural disasters are increasing in number and intensity and strategies have to be implemented to cope with them. The third challenge is to find ways to include everyone in rural development (especially in low-income countries) and thereby ensuring the eradication of extreme poverty, malnutrition and inequality and improve rural prosperity. The fourth challenge is to develop effective national and international governance systems and evidence-based and targeted policy responses to the rapid changes and transitions in food systems.

In response to these sustainable development challenges in agriculture and food, a multitude of innovative activities and approaches to sustainability has emerged in agriculture and food systems. For instance, farmers are experimenting with ways to decrease the usage of fertilizers, energy or plant protection and to increase resource efficiency. Moreover, some farmers tolerate, embrace or use biodiversity and natural processes on their farms and aim to improve soil health and water quality. Upstream in the value chain, the sourcing of sustainably produced protein crops and wood is an issue. Downstream the value chain, food processers and retail firms develop schemes to guarantee the sustainability of their products to consumers, non-governmental organisations, public authorities and other businesses. Notwithstanding the many initiatives in sustainable development, it is not yet within reach and current usage of natural resources is far from sustainable and contributing to climate change (FAO, 2018).

Sustainable development has been described as one of the 'grand challenges' of our time. Grand challenges are '… open-ended missions that require a mix of technological and social innovation, open up for contestation, both with respect to policy aims and means, and involve new actor constellations that include a larger variety of actors, and consider new roles for traditional actors' (Coenen et al., 2015: 484). In addition, it is approached by many as a 'transition process', as a set of emerging practices that, when brought to its fulfilment, will fundamentally change existing systems (Markard et al., 2012; Geels, 2002; Loorbach & Rotmans, 2006; Kemp et al., 2007). A prevailing issue in the literature is that such transitions, despite strong and persistent commitments, are very hard to achieve (Schuitmaker, 2012), because it '... requires structural changes in social-technical systems and wider societal change, in beliefs, values and governance' (Kemp et al., 2007: 78). Moreover, those who are involved in the transition often have to cope with wicked (Termeer et al., 2013a; Churchman,

1967, Rittel & Webber, 1973) and unstructured (Hisschemöller & Hoppe, 1996) problems that are very complex and cannot easily be solved (Termeer & Dewulf, 2018). Moreover, the governance of transitions co-evolves with the changes in the technical aspects of the food chain and other agricultural chains (Kemp et al., 2007; Van Assche, Beunen & Duineveld, 2013). Governance and institutions play a crucial role in these kinds of evolutionary processes of innovation and systemic transformations (Loorbach, 2007).

Directing such a systemic transition in a desired direction is a highly complex activity in which existing institutions and practices have to make way for the desired activity (Geels, 2002; Loorbach & Rotmans, 2006; Rotmans et al., 2001; Kemp et al., 2007). The complexities associated with sustainable development make it very difficult to predict what governance practices could support its advancement, especially in relation to finding ways to achieve impact (Termeer & Dewulf, 2018; Termeer et al., 2013a). Accordingly, many sustainable development practices focus on knowledge development and learning, e.g. by collecting data, providing information to practice, the inclusion of stakeholders in research activities, engaging in social learning, and/or innovation projects (Van Kerkhoff, 2013; Wals, 2007; Leeuwis & Pyburn, 2002; Van Buuren & Eshuis, 2010; Huitema et al., 2009; Bulkeley & Mol, 2003; Reed et al., 2010; Pahl-Wostl 2006; Nooteboom, 2006; Turnhout, Dewulf & Hulme, 2016; Soma et al., 2016).

These activities are part of sustainability governance, in which governance refers to a process '…of social organization and social coordination' (Bevir, 2012: 3) that are managed by '… the rules, the patterns of coordination and the complex structures of hierarchies, networks and markets' (Kjaer, 2004: 48-49). The knowledge and learning aspects of sustainability governance have been studied extensively, especially regarding social learning and the use of scientific knowledge for pursuing sustainable development (e.g. Soma et al, 2016, Brunet et al., 2018; Bracken, Bulkeley & Whitman, 2015; Van Kerkhoff, 2013; Wals, 2007; Pahl-Wostl, 2006). This literature has largely neglected to study knowledge and learning on a more fundamental level, addressing the coordinative mechanisms of governance that lead to transformative change. Accordingly, the knowledge- and learning-based approach to governance has not been well integrated in literature on modes of governance. Especially the coordinative and transformative aspects of knowledge and learning have been somewhat overlooked. These tend to be seen as part of network governance, but network governance is mainly about relations between actors and not so much about cognitive change (Meuleman, 2010). This is a key knowledge gap, because empirically there are many examples of knowledge and learning processes that do establish coordination, such as innovation projects and programmes. Moreover, there are situations in which neither hierarchy, nor market, nor network can solve the problems at hand (Van Buuren & Eshuis, 2010).

The second knowledge gap this thesis addresses, is a lack of a territorial-economic approach in the governance of sustainable development transitions, and especially regarding knowledge and learning. In economics and economic geography there has been much attention to knowledge and learning that lead to economic development through innovation (e.g. Loasby, 2014; Lundvall, 2016; Stiglitz & Greenwald, 2015; Jensen et al., 2007). This body of literature has studied the institutional embeddedness of sustainable development initiatives within specific territorial spaces (Coenen, Benneworth & Truffer, 2012), the spatial configurations and dynamics of the networks within which transitions

evolve (Coenen et al., 2012) and territorial development processes (Kebir et al., 2017). The mode of governance framework can build on this body of knowledge in exploring knowledge and learning processes as governance. Nonetheless, this literature has not developed a governance framework that really surpasses the firm and transactions (Ebbekink & Lagendijk, 2013; De Propris and Wei, 2007). When attention is paid to governance issues, involving public authorities or civil society, this is often limited to simple normative assertions about governance (Flanagan & Uyarra, 2016), whereas the complexity of policy-making dynamics involving multiple levels and actors tends to be underestimated (Flanagan et al., 2011). Therefore, it would be beneficial to territorial-economic (from now on described as territorial) thinking as well, to connect it with a modes of governance framework. This constitutes the third knowledge gap that this thesis addresses.

Hence, this thesis focusses on two aspects of the role of knowledge and learning in the governance of sustainable development transitions in agriculture and food systems: 1) the coordinative role of knowledge and learning and 2) the territorial dimensions of the knowledge and learning processes are organised to advance sustainable development transitions. Because, as will be argued, both are necessary to understand how knowledge and learning can enhance sustainability transitions in agriculture and systems, both are explored and integrated in this thesis.

This thesis aims to improve the theoretical understanding of how knowledge processes achieve coordination in advancing sustainable development in agriculture and food clusters, or 'territorial knowledge governance'. Particularly the proposition that knowledge governance should be considered a distinct mode of governance with its own coordinative principles was explored, approaching it with both a public administration as a territorial-economic perspective. First, knowledge will be discussed, then governance and thirdly, knowledge governance. It will be clarified what the approach of this thesis is towards these central concepts. After this, the territorial approach to the transformative aspects of knowledge and learning are discussed, with specific attention to sustainable development missions in agriculture and food clusters. Finally, the analytical framework of this thesis will be summarised. After this theoretical section, the research objective and questions, the research design and the structure of the thesis will be elaborated.

1.3 Theoretical concepts

1.3.1 Knowledge

The development of knowledge is widely seen as a major force in advancing economies, societies and politics. In scientific and public discourse, there is much attention to the increasing centrality of knowledge to society, government and business and this argument has been made with different concepts by various academics from different background. Examples are, 'knowledge democracy' (In 't Veld, 2010), 'knowledge society' (Grundmann & Stehr, 2003), 'knowledge economy' (Drucker, 1969; Powell & Snellman, 2004; Toffler, 1970; Bell, 1974; Caruso, 2016), an 'age of knowledge' (Dzisah & Etzkowitz, 2011), and 'learning society' (Stiglitz & Greenwald, 2015).

A characteristic of these and other discussions of knowledge is the wide-ranging meanings that are attached to it. Knowledge sometimes means that it equals scientific knowledge, sometimes information, sometimes input to (technical) innovation processes, and sometimes a capacity to act (Adolf & Stehr, 2014). Knowledge is also seen as being instrumental to enable '… people to achieve social ends and values', especially when it is 'contextually valid' (Leeuwis, 203: 5). Knowledge is seen as a scarce resource, but also as a public good that has non-rivalry in consumption and is non-excludable (Eggertsson, 2008). Moreover, knowledge can be both mobile and coded as embedded and tacit (Polanyi, 1967). Moreover, some authors stress the normative and power connotations of knowledge (e.g. Foucault, 1966; Haas, 1992; Cross, 2013; Toke, 1999), meaning that knowledge cannot be separated from political processes and cannot be seen as being value-free. These varying meanings of knowledge, makes it a hard to grasp concept.

Because knowledge is such a difficult concept, it is imperative to make clear what interpretation will be used in this thesis. The interest of this thesis primarily lies in its transformative functioning. This implies that knowledge always will have a tacit component and that a focus on explicit scientific knowledge (or data) cannot be proficient to understand how knowledge processes contribute to the pursuance of sustainable development. Therefore, this thesis focussed on notions of actionable and transdisciplinary knowledge. Transdisciplinary knowledge combines different types of knowledge and knowledge holders, typically explicit scientific knowledge from differing disciplines and knowledge from practice to create new knowledge that would be crucial to establish systemic change in practice (Thompson-Klein et al., 2001; Nowotny et al., 2001). Actionable knowledge is knowledge that actors can effectively use to implement their intentions (Argyris, 2005; Brunet et al., 2018). This is very close to the interpretation of knowledge as a capacity to act (Adolf & Stehr, 2014). Therefore, when the word knowledge is used in this thesis, its meaning is not primarily about scientific knowledge or knowledge as developed at universities and research institutes, although this type of knowledge does have a place and role in the pursuance of sustainable development of agriculture and food clusters.

1.3.2 Governance

The concept of governance has at least two meanings: 1) 'governance as managing self-organising networks' and 2) 'governance as a broader process of managing the rules, the patterns of coordination and the complex structures of hierarchies, networks and markets' (Kjaer, 2004: 48-49). This thesis follows the second interpretation, especially concerning the patterns of coordination through which sustainable development is achieved. Moreover, this thesis aims to expand on a classical typology in political and economic science between three fundamentally different ideal type coordinative principles in governance, namely, 'hierarchy', 'market' and 'network' (Dixon & Dogan, 2002; Meuleman, 2010; Van Buuren & Eshuis, 2010). These constitute different modes of how coordination is established. While the political sciences have mostly addressed new modes of governance in addition to government, economists have used this typology for analysing whether transactions in economic systems function by competition between firms, by a centralised organisation, or by alliances of firms. For this thesis, both interpretations are relevant, as in principle, any

type of actor can apply any mode of governance, including business and governmental actors.

This typology of modes of governance has been criticised for not being refined enough (Van Buuren & Eshuis, 2010; Considine & Lewis, 2003), but attempts to improve the set of modes of governance are mostly only refinements and no real alternative has been developed (Van Buuren & Eshuis, 2010). Hence, it was concluded that these ideal types are still relevant. They are particularly relevant for analytical purposes and to highlight different coordinative principles. Hence, this typology is the starting point for the attempt to elaborate a fourth mode of governance that works through knowledge processes.

What do these modes of governance entail? Hierarchy is based on authority, a clear division of tasks, rules, rationality and objectivity (Meuleman, 2010). Moreover, hierarchies are characterised by vertical (power) relations and command and control (Cowling & Sugden 1998). Market governance is based on competition, pricing and financial incentives (Meuleman, 2010; Lane, 2000; Osborne & Gaebler, 1993; Coase, 1937). Network governance makes use of the potentials of actor networks, and their ability to combine multiple agendas and responsibilities and to distribute gains in order to arrive at policy outcomes. Reciprocity and collaboration are coordinative principles in network governance (Meuleman, 2010). Other coordinative principles are interdependency, trust and empathy (Kickert, Klijn & Koppenjan, 1997; Rhodes, 1997; Koppenjan & Klijn, 2004; Sørensen & Torfing, 2009; Sacchetti & Sugden, 2009; Jessop, 1998; Jessop, 2011; Jones et al., 1997). The coordinative principles in each mode of governance are summarized in table 1.1.

Table 1.1 Summary of the coordinative principles of modes of governance

	Hierarchy	Market	Network
Coordinative principles	- Authority - Vertical power relations - Division of tasks - Command and control - Rules - Rationality - Objectivity	- Competition - Pricing - Financial incentives	- Reciprocity - Interdependency - Trust - Empathy - Collaboration - Equality between actors

None of the three modes of governance explicitly addresses knowledge and learning as coordinative principles. Governance concepts that were developed for specific purposes do address knowledge and learning, as they combine different modes of governance. Examples of these concepts are 'reflexive governance' (Voß, Bauknecht & Kemp, 2006; Voß et al., 2009), 'adaptive governance' (Chaffin, Gosnell, & Cosens, 2014; Folke et al., 2005; Huitema et al., 2009), and 'mental proximity governance' (Sacchetti & Sugden, 2009). Reflexive governance is concerned with achieving reflexivity to enable a change of existing governance, adaptive governance is concerned with being adaptive to change as actor networks, and informational governance identifies the increasing role of information in policymaking and the governance-changing potential of information. These governance

concepts approach knowledge in a mostly instrumental manner to achieve specific targets, such as policy change, mental proximity or resilience of policy networks and not as a more fundamental mode of governance. Mostly, these concepts do not operationalize the workings of knowledge and learning explicitly or – in the case of adaptive governance – are focussed on specific issues, such as developing resilience to sudden change.

Hence, in this thesis, these governance concepts are not considered as modes of governance, but as types of governance interventions. They all cover relevant aspects of the mode of governance that will be elaborated in this thesis, but it is also necessary to address knowledge and learning on a more fundamental level. The concept of 'informational governance' constitutes an attempt to do so, but is focussed at information and leaves out other types of knowledge (Soma et al., 2016; Mol, 2006). For the same reason, the huge literature that exists on knowledge management (Easterby-Smith & Lyles, 2011), is of limited value to this thesis. Concepts such as the 'triple helix' (Etzkowitz & Leydesdorff, 2000; Uyarra, 2010; Benneworth et al, 2009; Charles, 2006) of universities, firms and public authorities, 'epistemic networks' (Haas, 1992; Cross, 2013; Dunlop, 2014, Toke, 1999), or the 'knowledge policy interface' (Görg et al., 2016; Hoppe, 2010), all cover crucial issues – notably how to organise knowledge development and dissemination – but this is again not approached in a more fundamental manner.

1.3.3 Knowledge governance

A proposal for a mode of governance, based on knowledge and learning, has been made and was labelled as 'knowledge governance'. Knowledge governance has been defined as '...purposefully organising the development of knowledge in order to deal with societal problems. Knowledge governance is aimed at creating new insights, and innovative solutions which tempt actors to leave traditional insights and practices and get away from inert interaction patterns, stalemate negotiations, and interest conflicts.' (Van Buuren, & Eshuis, 2010: 284). This still leaves much unclear, especially regarding how knowledge governance achieves these promises.

The term knowledge governance has attracted some traction. In organisational economics for instance, knowledge governance is also a debated concept, but mainly with its meaning of governing of knowledge (Michailova & Foss, 2010), which is still an instrumental approach to knowledge governance. It has also been mentioned as a promising concept in sustainability science literature (Van Kerkhoff, 2013). A central concern of sustainability science has been to overcome the perceived 'gap' between knowledge and action (Clark & Dickson, 2003; Van Kerkhoff, 2013; Cash et al., 2003), and knowledge governance is proposed as a possible way to close this gap. Again, this is primarily about the governance of knowledge and not so much about knowledge that establishes coordination in actions of actors. Therefore, although knowledge governance is a much-needed concept to grasp the workings of knowledge and learning-based governance for sustainable development, much is unclear about its coordinative principles, how knowledge governance arrangements are set up and managed, and on what can be expected of it for sustainability clusters. These things are explored in this thesis.

1.3.4 Territorial knowledge governance: sustainability clusters

Concerning the roles of knowledge in advancing sustainable development from a territorial perspective, territorial innovations milieu thinking is highly relevant. In this approach, knowledge is seen as part of innovation processes that accelerate the economic performance of companies and territories (Lundvall, et al., 2002; Moulaert & Sekia, 2003; Morgan, 1997; Crevoisier & Jeannerat, 2009). One of the most persistent of these territorial innovation milieu concepts is that of 'clusters' (Lagendijk, 2006). Clusters have been defined as: 'geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions in particular fields that sometimes compete but also cooperate' (He & Fallah, 2011: 945). In cluster thinking companies benefit from the co-location of other firms in the same industry (Porter, 1998) because together they can achieve a higher productivity and quality (Lambooy & Van Oort, 2005) and because of varying externalities and possibilities for innovation, learning and institution building (Asheim et al., 2006). Economic development would be enabled by knowledge spillovers (Owen-Smith & Powell, 2004). Classic examples of such clusters are Silicon Valley in the USA for communication and information technology, Cambridge in the United Kingdom for biotechnology and the Westland area in the Netherlands for horticulture. A focus on a sole territorial unit is a too limited approach to clusters, because corporations are connected with global value chains by global pipelines (Bathelt et al., 2004; Bathelt & Cohendet, 2014; Maskell, Bathelt & Malmberg, 2006) and inter-territorial knowledge dynamics (Crevoisier & Jeannerat, 2009). Hence, clusters are more about territoriality than about territory.

Building on cluster thinking, this thesis focuses on 'sustainability clusters' in agriculture and food as the empirical object for territorial knowledge governance. In sustainability clusters, groups of related companies aim to increase the sustainability of their firms, value chains and territories, supported by stakeholders from public authorities, science, society and business. While, there is very little theoretical literature on sustainability clusters, empirically, there is a strong interest in this development, as expressed through various initiatives, for example, around industrial symbiosis (Ashton, 2008; Deutz & Gibbs, 2008; Gibbs, 2009; Verguts et al., 2016) and Metropolitan Food clusters (Smeets, 2011; Gerritsen, Giesen, & Chakravarthy, 2011; Hoes, Regeer, & Zweekhorst, 2012). In these examples, corporations and actors from the public sector, science, society and business aim to develop linkages between co-located firms that may lead to a more efficient, valuable use and re-use and up-cycle of resources that minimise their environmental impact and enable new business opportunities. This would increase the sustainability of their firms, value chains and territories and therewith their competitiveness.

1.3.5 Pursuing missions

Cluster policies have been criticised extensively, mainly because of a too strong focus on public sector ambitions and too little on realistic possibilities of territories and associated actor networks (e.g. Wolfe & Gertler, 2004; Ebbekink & Lagendijk, 2013). In this critical view, the governance of clusters needs to build less on 'cluster building' and more on 'policy leverage' in which policy innovations and policy entrepreneurship are important activities (Ebbekink & Lagendijk, 2013). This involves the defining of 'a deliberate plan adopted by a group, institution

or government to guide decisions and actions and achieve desired objectives' (Crone, 2009: 3) and includes '... a multilateral/-level process of negotiated power, a co-creating partnership between a wide range of cluster stakeholders' (Ebbekink, 2016: 624). This collective strategy decision making is supported by intelligence gathering by which an in-depth knowledge of the cluster and the situation it finds itself in is established. This kind of intelligence is constituted by an ongoing dialogue between cluster actors that would '... ensure that policies are chosen and designed on the basis of a well-founded and collectively shared understanding of a territory's strategic needs and priorities' (Ebbekink & Lagendijk, 2013: 749). This implies that shared missions are of great importance to the governance of sustainability clusters. This type of governance is characterised by networking and by knowledge processes, and without negating the importance of hierarchies and markets in this type of governance, this seems very close to knowledge governance, although these ideas are not well incorporated in the mode of governance thinking. That is a challenge this thesis has taken up.

1.4 Theoretical framework

The discussion so far can be summarised with a simple heuristic framework (figure 1.1). This framework focusses on territorial knowledge governance, which is the prime concept and was developed in this thesis. The heuristic framework is constituted by the three 'corners' of knowledge, governance and sustainable development missions of agriculture and food clusters. Clusters are constituted by related companies. They can for instance include farmers, food companies, producers of seeds, and research and development firms. Moreover, public authorities, interest groups, applied research institutes and universities can also be part of these clusters. The prime interest lies in clusters in agriculture and food that collaboratively aim to increase the sustainability of their firms, value chains and territories (the mission) supported by stakeholders at public authorities, science, society and business. The sustainable development concept and these sustainability clusters in agriculture and food are treated as empirical objects that are open to many different operationalisations. In other words, an 'actually existing sustainability' approach is used, which takes as sustainable, what its adherers claim (Fischer et al., 2007; Kebir et al., 2017). This thesis therefore, does not pursue to answer the question whether sustainability clusters are sustainable or achieve sustainable development. That is a task for environmental scientists and a different research altogether.

As discussed in paragraph 1.3.1, knowledge is in this thesis primarily understood as transdisciplinary and actionable knowledge (Thompson-Klein et al., 2001; Nowotny et al., 2001; Argyris, 2005; Brunet et al., 2018), which is the result of knowledge activities of different cluster actors in relation to the pursuit of sustainable development. Knowledge has also a relation with learning and innovation, because these are processes in which knowledge is produced and reproduced. Governance is understood as interventions that establish coordination (Kjaer, 2004), notably through hierarchy, networks, markets and, especially knowledge. Not only establishes territorial knowledge governance a connection between knowledge and governance processes, but also between knowledge and sustainable development missions and between governance and sustainable development missions.

While this heuristic model does provide an overview of the most important concepts, it does not provide much guidance for further research to territorial knowledge governance practices. This is why an analytical framework needs to be developed.

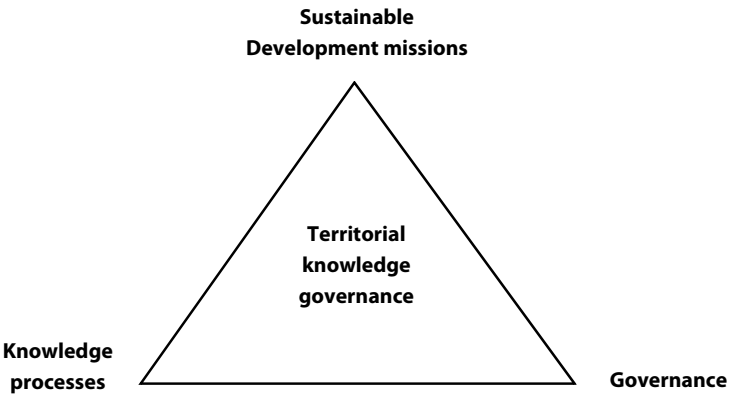

Figure 1.1 Heuristic framework of territorial knowledge governance.

1.5 Research objective and questions

The main objective of this thesis is to elaborate a conceptual framework for studying sustainability-driven territorial knowledge governance. Therefore, the scientific contribution is mainly theoretical. This analytical framework is meant to be of use to explore the practices by which knowledge processes in agriculture and food clusters coordinate the establishment of sustainable development. It is also used as such in the case studies of territorial knowledge governance in this thesis. These case studies are the main empirical contribution of this thesis. The central research question is:

Through which principles and to what extent do knowledge and learning establish coordination in the pursuance of the sustainable development of agriculture and food clusters?

To answer this question, the following sub-questions need to be answered:

1. *What are the coordinative principles of territorial knowledge governance in the pursuance of sustainable development of agriculture and food clusters?*
2. *What are the constraints and enablers of territorial knowledge governance for pursuing sustainable development in agriculture and food clusters?*
3. *What type of results are produced by territorial knowledge governance?*

1.6 Research design

1.6.1 Research approach

This thesis aims to improve the understanding of the workings of knowledge governance of agriculture and food clusters that pursue sustainable development. The research activities started with searching for theoretical concepts that could assist in understanding under which conditions knowledge is able to coordinate actions by cluster actors in pursuing sustainability in agriculture and food. The coordinative principles of territorial knowledge governance were identified from literature, but were also used and tested by analysing and comparing knowledge governance in a systematic manner in case studies of sustainable agriculture and food clusters. In these cases, the knowledge governance practices of sustainability clusters in agriculture and food were explored and compared. These case studies were not so much meant to test whether these concepts were true, but mostly to explore how the identified principles, constraints and enablers of knowledge governance would manifest themselves in praxis and to enrich the theoretical understanding of territorial knowledge governance. Therefore, it was aimed to both 'practice theory as theorize from practice' (Feldman & Orlikowski, 2011). Although, while the thesis focussed on grasping knowledge governance practices (in case studies), it cannot be considered a full-fledged practice theory (e.g. Nicolini, 2012; Ortner, 2006) approach. For this, the focus on theory and theoretical concepts is too strong, because the analytical framework that is constructed in this thesis is primarily derived from theory.

The research design mostly made use of qualitative analysis (Mauthner, 2003; Srivastava & Hopwood, 2009). Qualitative research is associated with inductive analysis that '… means that the patterns, themes and categories of analysis come from the data; they emerge out of the data rather than being imposed on them prior to data collection and analysis' (Patton, 1980: 306). Although the research approach is a qualitative one, it is not a perfect example of an inductive approach. It followed an iteration of deductive and inductive reasoning in which the specific research approach was adjusted and was therefore self-reflexive.

The research design can best be considered an iterative one, as it was developed through a series of stages. The analytical framework that this thesis produced started from generic and theoretical concepts and was used and tested in a first case study and then again more in-depth in a comparative case study. This led to the identification of different empirical types of knowledge governance and to the recognition of the need to include territorial development theory in the analytical framework. Then the search for territorial knowledge governance started. Again, first by exploring theory and adapting the framework and then by testing it out in case studies. After this it was decided that there is a need to adopt a less managerial approach to knowledge governance – as in knowledge management and knowledge governance as governing knowledge – and to explore the institutional and path dependent aspects of knowledge governance and to devise an analytical framework for that purpose, which was again used and tested in case studies. Therefore, the research approach was not only iterative in the use of inductive and deductive approaches, but also in the use of bodies of literature and the selection of case studies.

Accordingly, the case studies were not so much meant to test whether these concepts were true, but mostly to enrich the framework and to identify issues and angles that would be needed to grasp territorial knowledge governance for sustainable development missions in agriculture and food and thereby feed the argumentative exploration in this thesis. Moreover, much attention was given to make use of different bodies of literature to achieve a rich exploration to develop a solid analytical framework.

1.6.2 Validity

The validity of the research design can be found in its argumentative and conceptual value, and not so much in the gathering of proof that territorial knowledge governance actually exists or works in a specific manner. The focus on theory to identify coordinative principles of knowledge governance can of course prevent that these are recognised by practitioners. That is why also case studies are included in the research design. Part of the case studies made use of action research (Reason & Bradbury, 2007) as will be discussed in the methodology section of this chapter. Through action research, in-depth knowledge of practices can be achieved. It provided ways to identify the relevant knowledge governance processes and to reveal the activities of the actors involved (Erlandson et al, 1993). Additionally, the information about the cases was derived from qualitative techniques, such as interviews and observations. This made it possible to include the knowledge and experiences of stakeholders in these cases in this thesis. Still, the thesis followed an interpretative, conceptual and qualitative approach. This approach is suited to capture contextual knowledge that enriches the insights of social complexity and can thus be used for theory development (Yanow, 2000; Miles and Hubeman, 2013).

A special issue for the validity of the research design is the combination of theories from different scientific disciplines, such as public administration, sociology, management studies, economics, economic geography, environmental sciences and innovation studies. Each discipline has its own path dependencies and different focusses, and therefore the question is justified whether you can or should combine those. This approach was chosen because it was deemed necessary, as no discipline alone could answer the research questions. Moreover, the research design limited itself to comparable issues, such as governance and knowledge and did not aim for a more encompassing integration. The focus on the core concept of knowledge governance, applied for sustainability clusters in agriculture and food provided the means to focus the thesis and not get lost in the enormous body of scientific literature. Lastly, all theories are from the domain of social science and are largely comparable in ontological and epistemological assumptions.

1.6.3 Data collection and analysis

The data collection and analysis had two pillars:

1. A literature research on theories of modes of governance, knowledge, learning, innovation, and territorial development, to define coordinative principles of territorial knowledge governance and to discuss constraints, enablers and impacts for sustainability clusters in agriculture and food;

2. A case study analysis that was used to illustrate, test and expand on the theoretically grounded coordinative principles of knowledge governance and to discuss constraints, enablers and impacts for sustainability clusters in agriculture and food.

Literature study

In this thesis, literature has been explored on modes of governance, knowledge, learning, innovation and territorial development. The chapter by Van Buuren & Eshuis (2010) on knowledge governance in the book 'Knowledge Democracy' (In 't Veld, 2010) was an important inspirational starting point of the literature study as the authors originally proposed to treat knowledge as a distinct mode of governance. Although some first guidance on what characterises knowledge governance was given, it was not a very tangible concept yet and it was not specifically related to sustainable development in agriculture and food clusters. A snowball method was applied in which new literature was derived from studying papers, from feedback of reviewers and other publications and from self-evaluations on what body of literature would be required to expand the conceptual explorations.

The literature study took place in two stages. In the first stage, literature on modes of governance, on knowledge and (social) learning, on transdisciplinary research and more specifically on governance in complex systems was studied. This first stage extended into 2015, with some additions in the end of the thesis in 2017 and 2018. This led in 2013 to the first accepted article and a set of theoretically grounded principles of knowledge governance that was used and adjusted in the following research activities. The second stage of the literature review started in 2014 with the conclusion that the literature study as executed needed to be expanded in scope to grasp the novel concept of knowledge governance. The case studies that were used – as will be explained in the next section – were about territorial development, but the territorial literature as such was not explored yet. Moreover, in institutional, political and evolutionary economy, knowledge and governance were studied extensively. This literature enabled the thesis to develop an understanding of knowledge governance by sustainability clusters from a territorial and partially economic background.

Case study

The second research method was a case study. A comparative multiple case study approach has been used to gain further understanding of the knowledge governance of sustainability clusters. The case study approach was selected, because the thesis aimed to explore the how and the why of cluster governance in sustainability clusters and the boundaries between this phenomenon and its context (Yin, 2003). The case study had an explorative character and was not meant to test predefined hypotheses.

Cases were studied both as single case studies and as comparative case studies in which they were compared with other cases as part of the iterative research approach as was discussed above. In the case studies, the theoretically derived principles of knowledge governance were used as analytical framework, with the objective to identify additional and more in-depth principles from practice, to identify constraints and enablers of knowledge governance and implications for the impacts of knowledge governance on sustainable development in agriculture and food clusters. This produced case information on the

knowledge governance practices and enabled the thesis to identify specific issues such as variety in practices, main challenges, restrictions and potential impacts. The confrontation of case information and the analytical frameworks in this thesis was also used to reflect on the principles of knowledge governance by sustainability clusters. It was discussed whether the principles are of importance in practice, whether there are different ways in which they manifest themselves and what needs to be clarified for understanding knowledge governance by sustainability clusters.

The core selection criterion for the cases was that they are examples of agriculture and food clusters that pursue sustainable development and for that objective would employ knowledge activities in the form of research, innovation, design activities or social learning as its main strategy. The cases were partly found in direct and indirect relation to the Dutch innovation programme TransForum. This programme aimed at a transition towards sustainable agriculture, especially by engaging in so-called innovative practice projects. These were aimed at the regional scale and at networks of businesses – together with actors from government and knowledge or education – that aimed to pursue an innovative idea for sustainable development. These projects were well-documented and often engaged in self-evaluation activities or reflexive monitoring in action (Arkesteijn et al., 2015). It was judged that this type of innovation project was close to what was meant with knowledge governance and was directly relevant to the domain of sustainable agriculture and food in clusters. Other potential trajectories such as applied research and other innovation programmes did not fit so nicely with the aim of this thesis. Interestingly, TransForum did not only aim to support sustainability innovations in the Netherlands, but also internationally, for instance in China and India. This was of particular interest to this thesis because it was decided that a selection of cases from the Netherlands only would be too limited in scope. Notwithstanding the relevance of the TransForum programme, additionally some cases that were not part of the TransForum programme were considered and selected, but these were largely similar in topic and approach.

1.6.4 The cases

Two types of case studies were conducted (see table 1.2): 1) in-depth explorative case studies (see table 1.3) and 2) cases for comparative analysis of cases (see table 1.4 and 1.5). The first category is constituted by two case studies: Sustainable dairy farming in the Northern Frisian Woodlands and Sustainable development of greenhouse horticulture in the Netherlands. Both cases were selected because they are both examples of (emerging) sustainability clusters in agriculture and food, taking horticulture as part of agriculture and because they each tell a story about knowledge processes in relation to advancing the cluster mission, albeit the second case is primarily focussed at the national level and not at a regional one. This enabled the thesis to incorporate clusters at different scales. Although, clusters are often defined at a regional scale, there is also a tradition of national cluster analysis and national cluster policies (e.g. Ketels, 2013).

The Northern Frisian Woodlands case focusses on the TransForum 'innovative practice project' Self-governance and Profit in the Northern Frisian Woodlands (2008-2010), which is located in the north of the Netherlands. The case not only discusses this

project, but also its historical context and partly what happened after the project. In this case, farmers, researchers and policymakers explored and implemented new approaches to the management of nature, environment, and cultural heritage and a new institutional arrangement with government. The case provides information on principles, enablers, constraints and impacts of territorial knowledge governance. This case was also used for a comparative case study.

Table 1.2 Types of cases in this thesis

In-depth explorative cases	Comparative cases	
	Major comparative cases	Minor comparative cases
- Northern Frisian Woodlands - Greenhouse horticulture in the Netherlands	- Northern Frisian Woodlands - Food Cluster Mexico - Sea weed farming in the North Sea - Greenport Venlo - Greenport Nellore	- Spatial Knowledge Castilla y León - Éupolis Lombardia - Brussels Studies Institute - Policy entrepreneurship Scotland - Policy tourism in the Netherlands

Table 1.3 In-depth case studies

Case	Content	Chapter
1. Northern Frisian Woodlands	The case focusses on the TransForum 'innovative practice project' Self-governance and Profit in the Northern Frisian Woodlands (2008-2010), which is located in the north of the Netherlands. The case not only discusses this project, but also its historical context and partly what happened after the project. In this case, farmers, researchers and policymakers explored and implemented new approaches to the management of nature, environment, and cultural heritage and a new institutional arrangement with government. The case provides information on principles, enablers, constraints and impacts of knowledge governance. This case was also used for a comparative case study.	2, 3 & 4
2. Greenhouse horticulture in the Netherlands	In this case, it was researched how actors from greenhouse horticulture worked at increasing the sustainability of horticulture and most notably on the role of knowledge and innovation activities. The focus on sustainability is a relatively new one for the sector that was preceded by a focus on competitiveness by cost price reduction. The changing institutional settings in greenhouse horticulture has also led to a changing role of knowledge activities in governance. The case provides information on principles, enablers, constraints and impacts of territorial knowledge governance.	6

Table 1.4 Comparative case studies (excluding the case of the Northern Frisian Woodlands)

Case	Content	Chapter
3. Food Cluster Mexico	In the case 'Food Cluster Mexico', Mexican public authorities, an investment fund, business actors, academics and consultants aimed to reinvigorate the agri-business system in Mexico through the exploration and implementation of the proposition of 'Metropolitan Food Clusters'. The case studies a series of contract projects (2011-2014) that explored the feasibility, drafted generic master plans and facilitated cluster actors in innovation activities. The case provides information on empirical variations of the territorial knowledge governance principles, enablers, constraints and impacts of territorial knowledge governance.	3, 4 & 5
4. Seaweed farming in the North Sea	In the case 'Seaweed farming in the North Sea' (2011-2014), entrepreneurs, academics and policymakers explored setting up seaweed farms and multi-functional offshore wind energy sites in the North Sea. These activities were partly focussed on improving the scientific foundations of this proposition, but also on building a network and setting the policy and business agenda. The case provides information on empirical variations of the territorial knowledge governance principles, enablers, constraints and impacts of territorial knowledge governance.	3 & 4
5. Greenport Venlo	The case 'Greenport Venlo' focussed on the four-year TransForum innovative practice project 'Streamlining Greenport Venlo' (2007-2010). In this project, cluster stakeholders developed a sustainability mission that was to lead to a more focussed territorial development of the agriculture and food clusters (horticulture and livestock), also in relation to its Greenport status and the Floriade world horticulture exposition 2012. The case focussed on exploring new concepts for sustainable cluster development and conducted many activities for social learning and innovation. The case also pays attention to what happened before and after this project. The case provides information on empirical variations of the territorial knowledge governance principles, enablers, constraints and impacts of territorial knowledge governance.	5
6. Greenport Nellore	In this case, the development (2007-2011) of a general master plan and the first steps towards its implementation of Metropolitan Food Clusters in the south of India and specifically at a site near the city of Nellore and surrounding rural areas have been studied. The drafting of this masterplan was done by academics and consultants in collaboration with cluster actors. A process monitoring organised to capture the process was meant to be used for interventions in the masterplan project. The case provides information on empirical variations of the territorial knowledge governance principles, enablers, constraints and impacts of territorial knowledge governance.	5

Table 1.5 Minor comparative case studies (building on table 18.1 of Gerritsen & Dotti, 2018)

Case	Content
7. Spatial knowledge for Castilla y León	The Instituto Universitario de Urbanistica of the university of Valladolid in Spain collaborated with the regional council of Castilla y León in Spain in the politically sensitive process of re-thinking the administrative structure and setting up new forms of governance. Specifically, they created an alternative map on the inter-municipal scale.
8. Éupolis Lombardia	The goal of the Éupolis Lombardia research institute of the regional government of Lombardia (Italy). Its goal is to support (economic) policy learning of the regional administration as well as municipalities and provincial administrations through research, monitoring and evaluation, statistics and training of regional civil servants. The institution brings together a number of specialist elements into one organisation while managing the different knowledge functions for various end-users.
9. Brussels Studies Institute	The 'Brussels Studies Institute' was set up as a network of university departments to increase the knowledge of and for Brussels and to produce multi-perspective, accessible and critical overviews of urban societal challenges, crossing disciplinary and linguistic boundaries. Specific functions of the BSI are networking, brokerage, multi-actor research, knowledge dissemination and education.
10. Policy entrepreneurship in Scotland	The case focuses on the non-hierarchical interactions between public, professional, academic, civic and private bodies that define mutually agreed baselines, indicators and targets that are based on data. The density of policy actors and the presence of exclusive and autonomous institutions, such as the Improvement Service, What Works Scotland, the Scottish Cities Alliance and the Town Centre Partnership, facilitate the creation of an environment prone to policy entrepreneurship.
11. Policy tourism in the Netherlands	The case is concerned with the visits of policy actors in urban planning to the Netherlands to view and discuss best practices to be transferred to their home country. These visits mostly do not result in concrete actions or hard outcomes at home, because of contextual differences that limit the extent to which Dutch planning approaches can be employed elsewhere.

The case of Sustainable development of greenhouse horticulture in the Netherlands, researched how actors from greenhouse horticulture worked at increasing the sustainability of horticulture and most notably on the role of knowledge and innovation activities. The focus on sustainability is a relatively new one for the sector that was preceded by a focus on competitiveness by cost price reduction. The changing institutional settings in greenhouse horticulture has also led to a changing role of knowledge activities in the governance of sustainable development. The case provides information on principles, enablers and constraints and impacts of territorial knowledge governance.

The two cases vary in the specific research approach. The research method in the case of the Northern Frisian Woodlands included action research, because much information was derived from having been the knowledge coordinator in the innovation project that is central to this case study. Also more traditional research activities have been conducted, such as document analysis, interviews (17), study of communications and (participatory) observations of meetings and workshops. These have been captured in notes and logs. To prevent perception bias, the analyses were done in collaboration with researchers who were not so directly involved in the innovation project in this case study. The case Sustainable development of greenhouse horticulture in the Netherlands was studied with a more traditional research approach, with interviews (12) being conducted. In addition, a desk study was implemented, in which literature on the development of greenhouse horticulture was studied, including a search for quantitative data on the development of this sector. This enabled the thesis to assess potential results of territorial knowledge governance.

In the second type of case studies that were used for comparative analysis, a secondary analysis of available information was implemented. These cases are examples of action research in which the gathered information underwent a secondary analysis. In the case of Greenport Nellore (India), this amounted to 40 interview transcripts, reports on participatory observations in workshops and excursions, and study of documents (such as technical reports) and correspondence. These were partly derived from distanced research and partly from the facilitation of learning for participants to the actual development of Greenport Nellore. In addition, the other cases of this type, rested mostly on action research a secondary analysis of notes, logs, interview data and especially the technical reports. Additionally, some additional interviews were conducted. In all these cases, participatory observation in workshops, knowledge-based interventions, workshops and interviews have been conducted that were used for drawing up these technical reports. The in-depth case study of the Northern Frisian Woodlands also has been used as a comparative case study and that is the reason why it is incorporated in multiple chapters.

The comparative case study category included a sub-category of minor cases, that consisted of five cases that were described in the book 'Knowledge, policymaking and learning for European Cities and Regions' (Dotti, 2018): 1) Spatial information of Castilla y Leon, 2) Policy entrepreneurship Scotland, 3) Policy tourism in urban planning in the Netherlands, 4) Éupolis Lombardia, 5) Brussels Studies Institute. These cases are exclusively used in chapter 4 and are compared with case 1, 3 and 4 (in table 1.1 and 1.2). These minor case studies are relevant for territorial knowledge governance as they deal with knowledge production for devising improved policies, and partly also for territorial knowledge governance by sustainability clusters, because they discuss knowledge related institutions for territorial economies. Moreover, because they are all part of the same book, they have much in common. Specifically, they are all focussed on knowledge production, learning and governance in European cities and regions, which is very much relevant to this thesis. The information is derived from the text in the relevant chapters of the book of Dotti (2018). Some factual additions have been provided through an internet search.

1.7 Structure of the thesis

1.7.1 Structure of the thesis in short

In chapter 2, a set of coordinative principles of knowledge governance is developed and applied to the case of the Northern Frisian Woodland. In chapter 3, this framework is applied to a comparative study of three cases of sustainability clusters to explore how they vary in how these principles manifest themselves in concrete practices. In chapter 4, the set of principles is expanded with one territorial principle to tune knowledge governance with knowledge-based territorial development. By again comparing multiple case studies of sustainability clusters, three challenges to the future expansion of the understanding of territorial knowledge governance of sustainability clusters are defined. In chapter 5, mission-driven territorial development is explored, building on a distinction in substantive and significant knowledge. This again leads to a set of coordinative principles that is now fully territorial. This framework is applied to the case study of three cases of Metropolitan Food Clusters, a specific type of sustainability clusters. In chapter 6, the focus shifts to changes in the wider economic system and the changing roles of knowledge. In chapter 7, conclusions will be formulated and discussed and reflections on the research design and its outcomes will be given. Not all chapters deliver answers to each research question. Table 1.6 explains what chapters are relevant to which research question.

1.7.2 Structure of the thesis by chapter

For each chapter, its content and contribution to the thesis is described below. In table 1.6, it is presented what chapters are relevant to which research questions.

Chapter 2 Knowledge governance: an exploration of principles, impact, and barriers

Published as: Gerritsen, A. L., Stuiver, M., Termeer, C. J. A. M. (2013). Knowledge governance: An exploration of principles, impact, and barriers. *Science and Public Policy*, 40(5), 604–615. doi: 10.1093/scipol/sct012

In chapter 2, the concept of knowledge governance is elaborated as a promising approach to achieve societal change by enabling policy change through the purposeful production and dissemination of knowledge. Knowledge governance has the potential to open new pathways for collective action and is especially suited for solving complex societal problems. This chapter analyses knowledge governance in two ways. First, it presents an overview of the literature with a particular focus on the principles of knowledge governance: self-organisation, transdisciplinary knowledge production and dissemination, social learning, reflexivity and boundary management. Second, it presents the results of a case study of a sustainability cluster in the Northern Frisian Woodlands region of the Netherlands, where a group of dairy farmers, policymakers, and scholars engaged in knowledge governance. It was found that a limited ability and willingness of participants to commit themselves to the different principles is a major barrier to the functioning of knowledge governance. Furthermore, especially boundary management and the openness of organisations to learn about and change policies are crucial to realise sustainability impact.

Chapter 3 Knowledge governance in sustainable development

Published as: Published as: Gerritsen, A.L. Stuiver, M. & Termeer, C.J.A.M. (2018). Knowledge governance in sustainable development. In: Dotti, N.F. (Ed). *Knowledge, policymaking and learning for European Cities and Regions: From research to practice*. Cheltenham: Edward Elgar Publishers, pp. 135–149.

Chapter 3 aims to expand the understanding of knowledge governance as has been described in chapter 2. For this objective, it was explored whether different types of knowledge governance can be identified in a comparative case study of three sustainability clusters: Northern Frisian Woodlands, Mexican Food Cluster and Seaweed Farming in the North Sea. For each case, its emergence, structuring and contributions to solving policy problems have been described. Moreover, the five knowledge governance principles have been used to compare the knowledge governance practices. Based on the analysis, two types of knowledge governance are distinguished.

Chapter 4 Knowledge governance: theoretical and empirical reflections on territorial innovation policy

Published as: Gerritsen, A.L. & Dotti, N.F. (2018). Knowledge governance and policy: theoretical reflections. In: Dotti, N.F. (Ed). *Knowledge, policymaking and learning for European Cities and Regions: From research to practice*. Cheltenham: Edward Elgar Publishers, pp. 244–258.

Chapter 4 explores the workings of knowledge and governance in innovation-based territorial development and elaborates a knowledge, learning and adaptation-oriented approach to explore the characteristics of territorial innovation policies that are based on a realistic understanding of policy and governance. This provides an alternative to existing ideas about science 'speaking truth to power' or 'evidence-based policy-making' in territorial innovation policies. In this chapter, a territorial principle is added to the framework, by which a first analytical framework of territorial knowledge governance is achieved. This framework is applied to analyse, present and compare the three cases of chapter 3 and to five other cases that were derived from the book 'Knowledge, policymaking and learning for European cities and regions' (Dotti, 2018).

Chapter 5 Beyond the blind spot of knowledge-based territorial development: the mission of Metropolitan Food Clusters

Published as: Gerritsen, A.L., Kranendonk, R.P., Cofino, M., Lagendijk, A., (2018) Beyond the blind spot of knowledge-based territorial development: the mission of Metropolitan Food Clusters. *European Planning Studies*, 72(1), 1–20. doi: 10.1080/09654313.2018.1538325.

Chapter 5 starts with the assessment that the rise of knowledge-based territorial development has been fuelled primarily by aspirations of competitiveness and wealth creation, mostly makes use of substantive knowledge and has largely neglected the role of missions and significant knowledge. An upcoming issue in territorial development in which this manifests itself is that of sustainability, not only as an accompanying goal but

also as a core mission, driving territorial initiatives such as clusters development. The chapter describes the development of an integrated analytical framework for territorial knowledge governance that is fully territorial. This framework is applied to three cases of 'Metropolitan Food Clusters' (Greenport Venlo, Greenport Nellore and MFC Mexico. The chapter formulates enablers and constraints of territorial knowledge governance.

Chapter 6 Changing economic governance: the case of sustainable development of greenhouse horticulture in the Netherlands

Published as: Gerritsen, A.L., Lagendijk, A, Groot, A.E., Nieuwenhuizen, W. (to be submitted). *Changing economic governance: the case of sustainable development of greenhouse horticulture in the Netherlands*.

Chapter 6 starts from the constantly changing nature of capitalism through history, partly in response to its own deficiencies, and partly due to the rise of new technological, organisational and institutional capabilities. Two shifts are particularly pertinent here. The first one is the transition from industrial capitalism to knowledge capitalism (Caruso, 2016). The second shift is the alternation between market and institutional logics. The two dimensions result in a matrix in which four basic types of economic governance are distinguished. While these types are archetypical, they can be recognised in dominant forms of economic governance as evolved over the last century. These are applied to the case of sustainable development in greenhouse horticulture in the Netherlands.

Chapter 7 Conclusions & Discussion

In chapter 7, the results of the research will be summarized and conclusions will be formulated in relation to the research questions. Moreover, the research results and conclusions are discussed and a reflection on the research and its implications for knowledge processes and organisations is given.

Table 1.6 Role of the chapters in answering the research questions (marked in grey means that the chapter is relevant to the research question)

Research questions	Chapters				
	2	3	4	5	6
1. What are the coordinative principles of territorial knowledge governance in the pursuance of sustainable development of agriculture and food clusters?	■	■	■	■	
2. What are the constraints and enablers of territorial knowledge governance for pursuing sustainable development in agriculture and food clusters?	■	■	■	■	■
3. What type of results are produced by territorial knowledge governance?	■	■		■	■

Chapter 2

Knowledge governance: an exploration of principles, impact, and barriers

Abstract

Knowledge governance opens new pathways for collective action and is especially suited for solving complex societal problems. This chapter analyses knowledge governance in two ways. First, it presents an overview of the literature on this topic with a particular focus on the principles of knowledge governance: self-organisation, transdisciplinary knowledge production and dissemination, social learning, reflexivity and boundary management. Secondly, it presents the results of a case study to investigate the impact of, and the barriers to, knowledge governance. The case study is of the Dutch Northern Frisian Woodlands region, where a group of farmers, policy-makers, and scholars engaged in knowledge governance. It was found that a limited ability and willingness of participants to commit themselves to the different principles was a major barrier to the functioning of knowledge governance. Furthermore, boundary management and the openness of organisations to learn about and change policies are crucial to gaining impact with knowledge governance.

Published as: Gerritsen, A. L., Stuiver, M., Termeer, C. J. A. M. (2013). Knowledge governance: An exploration of principles, impact, and barriers. *Science and Public Policy*, 40(5), 604–615.

2.1 Introduction

Since the 1990s scholars like Rhodes (1997), Stoker (1998), Pierre & Peters (2000), and Kooiman (1993; 2003) note the emergence of new types of governance in addition to more centralistic and hierarchical types of governance whose potential to produce societal change in a complex society was criticized. Much has been written on *network governance* (Kickert et al., 1997; Rhodes, 1997; Koppenjan & Klijn, 2004; Sørensen & Torfing, 2007) that makes use of the potentials of actor networks in order to arrive at better policy outcomes. Strategies focus on improving the process within the network, for instance by organising interactions between actors, by seeking the convergence of contrasting viewpoints, by creating temporary organisational arrangements or by making trade-offs between contradictory demands. The next type of governance is *self-governance*: it refers to the capacity of societal entities to govern themselves autonomously (Kooiman, 2003: 79). Self-governance can vary from the development of ethical rules of conduct by professionals up to the community management of natural resources (Ostrom, 1990). Self-governance can rely on societal actors and on market actors. The last type of governance is *reflexive governance*, which incorporates the critical examination and alteration of existing policies (Voβ et al., 2006; Voβ et al., 2009). Reflexive governance is governance, which alters the governance strategy itself (Voß & Kemp, 2006). It refers to '… the problem of shaping societal development in the light of the reflexivity of steering strategies –the phenomenon that thinking and acting with respect to an object or steering also affects the subject and its ability to steer' (Voß & Kemp 2006: 4). Voß & Kemp (2006) draw on the concept of reflexive modernization (Beck et al., 1994).

To date, only reflexive governance has explicitly addressed the need for learning in the governance of complex societal issues. However, it does not operationalize explicitly how this functions and how this can be organised. This thesis concludes that more insight into this issue is needed, because many scholars (e.g. Hisschemöller & Hoppe, 1996; Pahl-Wostl, 2006; Nooteboom, 2006; Michailova & Foss, 2010) have suggested that knowledge is a key element in the governance of complex issues. Scholars also report on the emergence of a knowledge society (Grundmann & Stehr, 2003) or a knowledge democracy (In 't Veld, 2010) in which knowledge is an important force that shapes society and therefore can be used as a type of governance. These concepts make clear that knowledge is important for shaping societal change, but do not make tangible exactly how this works and what actors should do to solve complex societal problems. In this chapter, knowledge governance is defined as the intentional achievement of societal and policy change through the purposeful production and dissemination of knowledge (Van Buuren & Eshuis, 2010). In other words, knowledge governance aims to deliver new and innovative insights and solutions, which enable actors to leave traditional insights and practices behind and '… move away from inert interaction patterns, stalemate negotiations and interest conflicts' (Van Buuren & Eshuis, 2010: 284). In the concept of knowledge governance the coordinative power is learning, which is made possible by knowledge production and dissemination of shared ideas in social networks. In order to achieve its challenging ambitions, knowledge governance may take advantage of knowledge management activities, such as constructing a research agenda, organising stakeholder platforms, making sense of what is happening in society and producing definitions of problems.

Knowledge governance needs to be set apart from other types of governance. Firstly, in common with network governance, it seems that they both involve individuals from different organisations. Nonetheless, it is stated here that knowledge governance is not a form of network governance, because its basic principles are fundamentally different. While network governance is about establishing communications channels, reciprocity and consensus, knowledge governance is about innovating, creativity, letting loose the existing policies, and most of all about learning what problems entail and how they can be solved. Secondly, knowledge governance is more than the governance of knowledge management (Michailova and Foss, 2010; Stehr, 2005). Whereas knowledge management focuses on the management of the specific processes of knowledge production, like making knowledge questions explicit, organising funding or sharing knowledge in workshops, knowledge governance is about engaging actors in innovative ways of solving societal issues. Knowledge governance entails innovation and learning. Especially when there is uncertainty and ignorance about possibilities and futures, knowledge governance can animate actors to leave existing routines and ideas (Van Buuren & Eshuis, 2010). Thirdly, the concept of knowledge politics also stresses the society changing potential of knowledge, but is primarily aimed at regulating the development and use of new scientific and technical knowledge (Stehr, 2005). The concept of knowledge governance adds how knowledge production and dissemination enables actors to change their policies. Fourthly, in the definition in this chapter, knowledge governance makes reflexivity much more concrete because it adds reflexive learning (Voβ et al., 2009; Voβ et al., 2006) and deliberate policy adaptation through knowledge dissemination.

The concept of knowledge governance can be a promising concept, which is well suited to understanding the role of knowledge and learning in the governance of complex societal issues. Although the concept has some normative connotations because it is framed as a governance concept, which promises to be better suited to solving complex societal problems than the existing ones, knowledge governance is here primarily understood as an analytical concept, which helps us to understand the governance of complex societal problems. For this purpose, it is needed to come to a better understanding of what knowledge governance is. Therefore, the following questions are addressed in this chapter:

1. What are the main principles underlying knowledge governance?
2. What is its impact on the realization of societal objectives?
3. What barriers to its functioning can be revealed?

First, an additional literature review was conducted to come up with a preliminary set of principles of knowledge governance. In what follows, the results of this review will be presented. To examine the other questions and to make the concept of knowledge governance more tangible and concrete, an in-depth case study was used: The Northern Frisian Woodlands, which are in the north of the Netherlands. The farmers, researchers and policymakers of this region have been exploring and implementing new approaches to the management of nature, environment, and cultural heritage. The case study is considered an experiment of knowledge governance '*avant la lettre*'.

2.2 The principles of knowledge governance

To discover the underlying principles of knowledge governance a literature study was conducted. The objective of this was to operationalize the concept of knowledge governance in a first set of principles, which would provide a means to understand knowledge governance practices in reality and which could be built upon in case studies. Together these principles form the building blocks of knowledge governance and should also be suitable for use as the conditions for the design of knowledge governance initiatives. This latter application is not, however, the objective in this chapter. Particularly literature on knowledge and learning was studied, with a focus on governance and management, because these are the central themes in knowledge governance. In addition, the literature on complexity governance in complex system was studied, because as stated in the introduction, knowledge governance was expected to be suited for complex societal issues. A full overview on these fields of knowledge is not provided, but primarily the literature is used to discover the principles of knowledge governance.

2.2.1 Complexity theory and self-organisation

Complexity theory originated in the studies of scholars who were attempting to understand the complexity of nature, and increasingly discovered that linear models are ineffective in capturing the complex and emergent nature of phenomena (Holland, 1995; Kauffman, 1995; Prigogine, 1997). Later, complexity theory was also used in social sciences. Systems in complexity theory all have two characteristics in common. First, they are self-organising and secondly, they have a set of order generating rules (Burnes, 2005). Self-organisation happens by initiatives from flexible basis units, which are termed flexible structures or semi-structures (Brown & Eisenhardt, 1997). The order generating rules are not so much rules in the bureaucratic sense, but rather are self-established rules, or norms and values. When tackling complexity, the activities are not so much characterized by control and hierarchical structures and managers (Burnes, 2005; Morgan, 1997), but by experimentation, divergent views, innovative thinking, operating in new patterns, open and quick information exchange, cultural clashes, conflict and even rule breaking should be allowed and perhaps even be encouraged (Burnes, 2005; Stacey, 1995). This leads to define self-organisation as the first principle.

2.2.2 Theories of knowledge and transdisciplinary knowledge production and dissemination

Knowledge can be defined as 'information that is meaningful to knowledgeable agents' (Fleck, 1997: 384). It also represents a capacity to act (Stehr, 2005). Knowledge can be of a formal and explicit nature, as scientific knowledge, but it can also be tacit in character, meaning that is more informal and fluid (Polanyi, 1967). Knowledge can be seen as an object, but also as something that is generated in a particular context as a situated process of translation and co-production (Berkes, 2009; Ross et al., 2009). From all the types of knowledge, collaborative knowledge production (Reason & Bradbury, 2006; Van Paassen et al., 2010) seems to be of special interest for knowledge governance because it involves the production of knowledge among actors. Collaborative knowledge production generates

outcomes that are grounded in the perspectives and interests of the stakeholders concerned, and is credited with the advantages of providing context-specific knowledge, enabling joint exploration of future development options, valued or acceptable to the local stakeholders involved and therefore directly contributing to social change (Van Paassen et al., 2010). The word 'collaborative' seems to suggest though that stakeholders are collaborating with the research of scholars. *Transdisciplinary knowledge production* (Thompson-Klein et al., 2001; Weingart, 1997; Fry, 2001; Gibbons et al., 1994; Nowotny et al., 2001; Regeer, 2010) is a type of collaborative research, which is of special interest to knowledge governance. Transdisciplinary knowledge production involves '... co-operation between different parts of society and science in order to meet complex challenges of society. Transdisciplinary research starts from tangible, real-world problems. Solutions are devised in collaboration with multiple stakeholders' (Thompson-Klein et al., 2001: 7). By cooperating and by engaging in collaboration new knowledge is developed in transdisciplinary knowledge production (Regeer, 2010). Transdisciplinary knowledge production and dissemination is the second principle.

2.2.3 Theories of learning and social learning, reflexivity, and boundary management

Learning '… is a process in which actors try to improve their activities by using knowledge, experience and insight' (Bekkers, 2007: 330). As Schön (1975: 6) stated, the effectiveness of organisations depends '… on their continuing redesign in response to changing values and a changing context for action'. By learning from knowledge development and dissemination, one therefore can alter existing governance practices and improve the ability to select new ones. Learning is generally a contextual process rooted in local practices and actor networks (Brown & Duguid, 2000). In general, social learning is the most effective means to learn for humans (Gibbons et al., 1994; Nowotny et al., 2001; Regeer, 2010) and is an essential part of transdisciplinary knowledge production. Social learning can be organised in a social environment (Kolb & Kolb, 2005), which are called learning communities in this chapter, which would be the flexible base units, mentioned in the section on complexity. The concept of *communities of practice* (Wenger, 1998) teaches us how these communities function. In communities of practice, participants produce and share knowledge, attain meanings, conduct practices, and develop and maintain a shared identity (Wenger, 1998; 2000). In addition, when research is conducted, the learning community is the social space where key decisions are made, where the results are discussed, and meanings are attached. These communities develop a shared identity where participants can belong which makes it possible for them to function (Wenger, 1998). Grandori (2009) concludes that only those communities, which are open, internally diversified, and mobile groups are suited for knowledge governance.

Third- and second-loop learning (Argyris & Schön, 1978) are useful concepts to understand the mechanisms of social learning more in-depth. Individuals, or organisations, learn second-loop when they alter underlying principles, values, rules, and assumptions about oneself and the communities of practice one is engaged in (Argyris & Schön, 1978). During triple-loop learning the actors look at the processes of 'learning how to learn'; the actors negotiate and reflect on the different epistemologies and claims to knowledge that

are included in the process. It was assumed that social learning especially involves second- and third-loop learning, because knowledge governance aims for innovations, which can solve problems that previously could not be solved. Therefore, *reflexivity* (Grin & Loeber, 2007) seems especially suited to knowledge governance. Reflexivity involves challenging and changing the presumptions, current practices, routines, ideas, and the underlying institutions (Grin, et al., 2004; Van Mierlo et al., 2010; Voβ et al., 2006; Voβ et al., 2009). These innovations do not only lead to third-order change (Hall, 1993), which leads to wholesale changes in policies, but also to changes in instrument settings (first-order change) or the instruments itself (second-order change).

Knowledge governance needs reflexivity too to implement the developed knowledge: 'knowledge governance can result in some form of self-organised order and coordinated action. However, knowledge governance does not provide the necessary means to enforce such an emerging equilibrium. It relies on the voluntary dedication of actors to learn and to adjust their behaviour' (Van Buuren & Eshuis, 2010: 297). This means that individuals outside of the learning community also need to learn, so that the produced knowledge can be incorporated in policies. This means that policy learning and political learning (Hall, 1993; May, 1992; Sabatier, 1988; Raedelli, 2009; Biegelbauer, 2007) are also important in knowledge governance. This could need reflexive and social learning too (Biegelbauer, 2007). Individuals outside of the learning community generally are not able to fully understand what happens inside (Wenger, 2000). They filter and manipulate information they receive because of the value system they adhere to (Argyris & Schön, 1978). When knowledge does not fit in with what actors and individuals believe deeply, their belief systems (Sabatier, 1988), then learning does not really take place. Termeer et al. (2010), for instance, have shown this convincingly for the mega stables case in the Netherlands. The more knowledge was produced the more actors appeared to become entrenched in their positions. Van Buuren & Edelenbos (2004) explain this by mentioning the occurrence of 'knowledge fights' in which each advocacy coalition conducts its own research, supporting its case, but without convincing the actors who they want to convince. Van Eeten (1999) calls the interaction between advocacy coalitions a 'dialogue of the deaf'. When no one is listening, no learning can take place.

Boundary management is needed to facilitate the dissemination of the knowledge produced to the world outside the learning communities. Boundary management facilitates the interaction between advocacy coalitions (Guston, 1996). 'Boundary work' is a concept, which is much used in the debate on the relation between science and policy (e.g. Jasanoff, 1990; Hoppe, 2010; Turnhout, 2009; Klerkx & Leeuwis, 2009). Boundary workers support communication and coordination across the fences that separate communities and their different social worlds (Keulartz, 2009). Robinson & Wallington (2012) claim that the quality of institutionalized relationships is a key condition for the successful facilitation of knowledge engagement, mediation, and exchange across the boundary. The concept of policy entrepreneurs in agenda settings (Kingdon, 1984) is also relevant. When attention for problems and solutions is dependent on agenda setting, then someone has to put them forward. Nooteboom (2006) discovered the existence of learning communities in policy networks, which he called 'adaptive networks', and saw that in those networks it is very important to keep the 'power network' at bay, but to include participants who can relate to

those networks, have an influential position in them and know how to engage in agenda setting and policy-making. These individuals function as boundary workers. According to Lemos & Morehouse (2005), collaborative and two-way communication arrangements are the most successful.

Based on learning theory and associated governance literature three additional principles have been formulated: social learning, reflexivity, and boundary management.

2.3 Preliminary understanding of the principles of knowledge governance

Knowledge governance involves the governance of knowledge production and dissemination by individuals and organisations who purposefully engage in the collaborative production of innovative and shared ideas. Knowledge governance entails the formation of practice-oriented and self-organising learning communities in which knowledge is produced socially, and transdisciplinary, and during which participants engage in reflexive practices including second- and third learning loops. These communities are open, internally diversified, mobile, and form a shared identity. Boundary management communicates and translates the produced knowledge to the outside governance systems, facilitates social and policy learning and therefore makes it possible for actors to use the knowledge to adjust policies or engage in new ones for which they can use governance types such as hierarchic governance, self-governance, and network governance. The functioning of knowledge governance can be summarized with the following principles: self-organisation, transdisciplinary knowledge production and dissemination, social learning, reflexivity and boundary management.

Now a preliminary understanding of the principles of knowledge governance has been established, it becomes necessary to explore how it functions in practice. A case study approach was chosen in which the principles were illustrated and tested. Its impacts were also analysed: that is the realization of societal objectives and review it for barriers to its functioning, which are principles, which should not be present for functioning knowledge governance or a strategy should be developed to cope with them. The research questions used in the case study were: 1) How do the principles of knowledge governance function in practice, 2) what is its impact on the realization of societal and policy objectives, and 3) what barriers to its functioning can be revealed?

2.4 The Northern Frisian Woodlands

2.4.1 Case description

The Northern Frisian Woodlands is a region in the north of the Netherlands where actors are exploring and implementing new approaches to rural development, the management of nature, environment, and cultural heritage in combination with dairy farming. During the 1990s, farmer associations were established, which merged into the Northern Frisian Woodlands Association in 2001 with about 850 members who together manage almost 100,000 acres of land. The farmers were very critical of the generic environmental regulation

in the Netherlands. Farmers felt hindered in their dairy farming and environmental preservation activities (Renting & Van der Ploeg, 2001; Stuiver, Van der Ploeg & Leeuwis, 2003). The farmers developed an approach for environmental governance, which they called the 'Alternative trail' with their own strategies. This entailed closed nutrient cycles in which the quality of fodder and the soil formed the central principles (Stuiver, 2008). A scheme for the farmer-driven management of the green cultural heritage was also developed. National government at that time provided the Association with temporary room for experimentation to test and evaluate their strategies. Research results showed that the farm strategies had the same environmental impact as the national policies (Sonneveld et al., 2010). However, a final agreement was not reached. A major event was the establishment of the Northern Frisian Woodlands Steering Committee in 2005, in which national government, regional stakeholders and a university committed themselves to support the Northern Frisian Woodlands Association in the execution of their ambitions as specified in a working programme and a regional contract. This was a major step in the embedding of the Association in existing governance structures.

The Northern Frisian Woodlands also was framed as a field laboratory (Stuiver 2008) in which farmers and scholars collaborated in knowledge production and new innovations for sustainable rural development (Renting and Van der Ploeg, 2001). Farmers developed and circulated knowledge in study groups, which focussed on the 'Alternative trail' (Renting & Van der Ploeg, 2001; Stuiver, 2008 & 2010). Wiskerke et al. (2003) showed that scientific research played an important role in the consolidation, and the development of the various strategies developed by the farmers. This entire process can be considered an experiment with knowledge governance 'avant la lettre', because the farmers and scientists deliberately experimented with knowledge development and dissemination as a governance strategy (see also Hessels et al., 2011). Therefore, it is a good region to learn about the principles, barriers and impact of knowledge governance. For the purpose of this chapter particularly the so-called initiative 'Self-governance and Profit in the Northern Frisian Woodlands' was analysed, and specifically the period September 2007 to December 2010. The province of Frisia, the farmers' association, the innovation research programme TransForum, five municipalities, three universities and societal organisations started a collaborative project to realize both sustainable and profitable business cases and the acquisition of self-governance in the management of the nature, environment and green cultural heritage of the Northern Frisian Woodlands.

2.4.2 Research Method

The analysis in this chapter is based upon several forms of data. First, data were gathered through participative observation in the knowledge project 'Self-governance and Profit in the Northern Frisian Woodlands' and especially by participating in the steering committee of the Northern Frisian Woodlands, in its preparatory committee, and in the core team of the initiative by coordinating the activities of scholars and consultants. Many meetings were attended, e.g. strategic discussions in small groups, and large workshops. Meetings were organised to present findings to the core team and the steering committee. Moreover, the core team was assisted by advising them on their interventions in the project and in the communication

with stakeholders. This was especially helpful for revealing barriers of knowledge governance. Secondly, 17 key persons were interviewed to explore how actors perceived the process, its challenges and uncertainties, the dynamics of the network, the strategies, which should be followed, and the role of knowledge development and dissemination. Thirdly, several policy documents and research reports that were produced over the years were studied. The data were documented in notes, a log and reports and used to analyse the process from a knowledge governance perspective. This variety of activities provided the research with an abundance of qualitative material (i.e. notes, transcripts) for analysis. The qualitative data was analysed for the occurrence of and reference to knowledge activities, their principles, impact, and the barriers to the functioning of knowledge governance.

2.5 Knowledge governance in the Northern Frisian Woodlands

Individuals from the Northern Frisian Woodlands Association, universities, an innovation programme and regional stakeholders started to discuss the establishment of a knowledge development and dissemination initiative. This was a strategy to realize the objectives of the regional covenant of the Northern Frisian Woodlands, and to provide economic benefits for entrepreneurs and other actors who maintained and improved the valuable landscape of the area. Regional actors had also been somewhat disappointed by the impact of previous and existing governance initiatives. In response to an invitation from TransForum and the Northern Frisian Woodlands Steering Committee, a team of individuals of the Northern Frisian Woodlands Association, Projects Agriculture and Horticulture Organisation North, Wageningen University and Research Centre, the Free University of Amsterdam, and the University of Groningen collaboratively wrote a project proposal and submitted this to TransForum and the Northern Frisian Woodlands Steering Committee for approval and funding. This proposal was received at the end of 2007. The Northern Frisian Woodlands Association was the leading participant in the project and was responsible for the project management. A core team was established in which the initiators and a representative of the province of Frisia participated.

The knowledge project started with a research phase in which the groundwork would be done for the implementation phase. In the spring of 2008 an interview round was conducted with key stakeholders about their opinions on the most promising and urgent issues that the project would need to focus on and under what conditions this should be done. Scholars, in agreement with regional stakeholders, also researched whether the conditions needed for successful self-governance arrangements were in place. They used lessons from existing examples of sustainable rural development in Europe, the socio-economic characteristics of the Northern Frisian Woodlands and the developments in the European Common Agricultural Policy. They also looked at the opportunities the provincial environmental plans provided for self-governance of the area and the needed socio-economic development. Workshops, presentations, and discussions were organised with regional stakeholders to discuss the research results and to assess which actors wanted to engage in the diverse proposed activities for the implementation phase. Based on the results of the research activities and on the ambitions of the stakeholders, scholars and regional

participants proposed issues for the development of the Northern Frisian Woodland region and for the implementation phase of the initiative. In this so-called second phase (2009-10), the implementation plans for selected product market combinations were developed by regional stakeholders, with the involvement of scholars. In addition to research, other kinds of knowledge activities were planned, such as the development of implementation plans, the organisation of discussions and workshops, and the execution of pilot projects, the explication of concepts, and the creation of process strategies to realize the ambitions of the actors in the Northern Frisian Woodlands. Over time, the role of scholars generally became a more supportive one, and regional actors were envisaged to take the primary initiative. Individuals who were not so intensively involved in the first phase were to be engaged more intensively in the second phase. The core team remained in place and was expanded with a process manager and a communication coordinator.

The initial ambitions of the farmers' cooperatives included issues such as environmental management and the management of hedges and alder trees. However, the project also focused on the socio-economic development of the region and on improving profits from landscape management by exploring new business opportunities. This had received less attention in the activities of the Northern Frisian Woodlands Association in the beginning and new knowledge had to be incorporated and developed. The central assumption was that the product market combinations together would create better incomes out of sustainable rural development and a more effective and efficient governance of the Northern Frisian Woodlands. Therefore, it would also contribute to the sustainable management of biodiversity, environment, and cultural heritage.

The members of the core team of the project shared the daily management practices of the project and stimulated the knowledge activities and innovative potential of the learning community. Each individual had different responsibilities and a different background. Especially in phase one and at the start and end of phase two, the core team was the platform where many decisions were taken on what knowledge activities would be executed and its members were involved in safeguarding the timely deliverance of deliverables and would communicate results to the outside world, including the Northern Frisian Woodlands Steering Committee and the board of TransForum. The core team members build an identity by sharing knowledge, visions and ideas and by cooperating in the execution of tasks. Occasionally other individuals were invited at meetings of the core team and communication with researchers and interested individuals was organised. The core team organised itself so that its members would learn together about how to intervene in the project, about governance strategies, about knowledge management, and about sustainable rural development strategies. Process monitors and facilitators organised social learning in the core team and the wider network of participants in the project. The learning process concerned not only project management issues, but also the development of an innovation friendly environment in the project, and the role of the process monitoring in the activities of the core team.

During phase one, the existing structures of the steering committee and its working groups were in line with network governance. This altered during phase two, where, from the beginning, a new structure was designed which would be suited to innovation. In these groups, farmers, civil servants, researchers, members of non-governmental organisations,

consultants and entrepreneurs participated in knowledge activities concerning the selected product market combinations. In phase two, participants in the groups played a more central role in the learning community than the members of the core team, which altered its role into the stimulation and facilitation of other individuals into taking up an active role in these groups. The core team selected the members of the various groups based on their commitment, capabilities and creativity and on their positions in the organisations, which were involved. Funding was made available for scholars and consultants. The core team provided the groups with a format in which they should report the business case and also communicated to its participants and the members of the Northern Frisian Woodlands Steering Committee how participants were expected to behave to establish the needed amount of (social) learning potential in the learning community. Members of the Steering Committee were explicitly asked to support their employees in the innovative work.

The groups and core team functioned as a learning network, where core participants from the product market combination groups and the core team could discuss with participants of other groups where their activities overlapped, and what that meant for them. For these objectives, workshops were organised by the core team, designed to stimulate social learning. These meetings proved to be rather safe environments for the participants to share some of their knowledge and ideas. During workshops, participants would share information and use this for their own plans and activities. Next to single- and some double-loop learning, also triple-loop learning took place in this overarching learning community. For instance, in one workshop in March 2010, one participant said: 'I see now that what we are doing is directly related to what all the other groups are doing. It should be organised that we know what happens in the other groups and are able to cooperate when needed'. In some of the thematic working groups, the participation of scholars was not easily accepted. Farmers and regional stakeholders were used to collaboration, but scholars and consultants normally did not participate in these processes. Extra efforts were made to introduce scholars to the group members and in most cases, these individuals were accepted rapidly after that.

The results of the project were communicated with the members of the steering committee and in other networks, by means of presentations, discussions, workshops, brochures, newsletters, website information, and background reports. In phase two of the project, participants were selected for their capabilities and knowledge, but also for their position in networks and organisations. Excluding most of the scholars and consultants, most participants were also active in the working groups, which belonged to the structure of the Northern Frisian Woodlands Steering Committee. Knowledge that was developed in the project was used as input for their regular tasks. Some of the leading individuals in the product market combination groups also were project managers for municipalities or other organisations. Therefore, they were in the position to use the knowledge obtained in the policy-making processes of their organisations. One could even argue that sometimes the boundary between the groups and the existing policy networks could barely be distinguished. Partly this was caused by a decision of the core team, to position the product market combinations closely to what potential participants were already working on, because it was envisaged that otherwise it would not be possible to get them to engage themselves and because it was perceived a sound strategy to solve real-life problems.

2.6 Characteristics of the knowledge governance arrangement

Now that an overview of the knowledge governance arrangement of the Self-Governance and Profit in the Northern Frisian Woodlands initiative has been provided, the principles are used for its characterization and are presented in table 2.1.

Table 2.1 The Principles of knowledge governance

Principles of knowledge governance	In the case Northern Frisian Woodlands
Self-organisation	- The initiative was started because the Northern Frisian Woodlands Association and regional organisations wanted to tackle some complex issues concerning sustainable rural development, dairy farming and farmer self- governance. - The working groups were mostly composed of individuals who were already involved in the subjects on which the initiative focussed. They looked for opportunities to strengthen their tasks and ambitions and therefore participated in the initiative. However, some individuals were new to each other. - It proved difficult to find willing participants and for scholars to become accepted members of some of the groups. - Because many participants already knew each other and were used to collaborate in networks, some of the order generating rules were already in place. The project management team also introduced and pursued new rules, with regard to innovation and learning.
Transdisciplinary knowledge production and dissemination	- The initiative focused on both science and practice: the sustainable development of the Northern Frisian Woodlands. - The initiators and supporters of the initiative aimed to include scholars, as well as governments, entrepreneurs and societal organisations in the knowledge network activities. - Knowledge activities were formulated collaboratively, and different actors collaborated in their execution. Activities such as interviews and data analysis were programmed collaboratively.
Social learning	- Multi-actor working groups were established in order to develop business cases which would be a learning environment and would clear the way to achieve the actual implementation of the visions of the participants. The management team of the project actively facilitated social learning by organising workshops, communication, and excursions. - Some of the groups were composed of diverse stakeholder domains, including scholars and practitioners from various backgrounds; some consisted mainly of farmers. - The groups were rather open to new participants and participants did in fact join and leave the groups, indicating a certain openness and mobility of the groups.

Table 2.1 continues on next page

Table 2.1 ***Continued***

Principles of knowledge governance	In the case Northern Frisian Woodlands
Reflexivity	- The initiative focussed on implementing existing and new ideas, which needed adaptation by alteration of policies. There was willingness to explore and adapt new strategies. The willingness to explore options, which were in conflict with provincial policies, was limited. - The initiative experimented with collaboration between science and practice, and between regional organisations, based on the development and sharing of knowledge. New options for scientific research were developed.
Boundary management	- The management team tried to mobilize participants who also had influential positions in decision-making networks and could communicate insights to their board members and therefore transform them into policy inputs. - Some of the working groups were intentionally positioned close to formal policy networks. Therefore, a close link between innovation and implementation was established. - The knowledge network engaged in communication activities towards decision-makers, who also wanted to be informed in order to decide whether to support the initiative, and to decide what governance interventions they would want to undertake, based on the results of the project. The decision-makers also committed themselves to the initiative and its objectives.

2.7 The impact of knowledge governance in the Northern Frisian Woodlands

The various groups, concerned with the development of business plans for the selected product market combinations, each produced knowledge, which was relevant to the real-life issues in the Northern Frisian Woodlands. For example, the knowledge that was produced by the group on the marketing of the region to tourists led to the actual implementation of a regional logo by regional actors who had cooperated in order to stimulate recreation and tourism in the Northern Frisian Woodlands. The group 'Energy from Timber' produced a product which could be used for energy production, but which needed to be developed further to achieve better results in terms of energy production. This group also produced a strategy to organise the various existing streams of waste timber, which was tested by the farmers. This was a tangible result. The group 'More with Milk' produced scenarios for which business cases can be developed. Instruments were produced with which farmers could measure their water quality and which could potentially be used in the planning of water quality improvement measures. Concerning 'Landscape and Agriculture' actors learned about measures for the enlargement of dairy production businesses in harmony with the natural and cultural values of this landscape. Participants shared up-to-date information and discussed its meaning in terms of spatial planning regulations, the potential acceptability

of the 'Control from a Distance' scheme by the European Commission and the conditions under which this could be obtained, and on various types of commissions which can be used in spatial developments. The 'Circular Agriculture' group studied and communicated what circular agriculture entails and what this requires of various actors, information which was used in negotiations with national government.

The initiative did not directly lead to financial investments in business cases and to formal agreements on self-governance during the project. However, it did produce additional and much needed building blocks, but no definitive impact to solve societal problems have been found. These building blocks were used in the further implementation of the ambitions of the actors from the Northern Frisian Woodlands after the project, and were incorporated into a new provincial regional economic development strategy. The knowledge that was produced also led to new scientific and knowledge initiatives. For example, the definitions and strategies of circular agriculture found their way onto a pilot for the future finance by European funds for rural areas and are part of a strategy to experiment with circular agriculture and the alteration of legislation for making its implementation possible. A new knowledge project was also formulated by the steering committee concerning 'Energy from Timber'.

2.8 Barriers to knowledge governance in the Northern Frisian Woodlands

In the case of the Northern Frisian Woodlands, it was noticed that problems arose with the level of commitment of the participants. One group of participants was very motivated and committed themselves to the project by spending a large amount of time and energy on it. Not everyone was as committed though. For example, during the start-up of phase two some of the coordinators of the product market combination groups were reluctant to present themselves as the figure heads of these groups and sometimes distanced themselves from the project. The limited commitment especially involved employees of the province and the municipalities, and entrepreneurs, although there were also examples concerning researchers, farmer representatives and consultants.

A major barrier could be found in the willingness to explore new possibilities and directions, to find unexpected solutions and to leave existing routines and ideas. At the start of the initiative, for example, there seemed to be a general willingness to consider more self-governance for the farmers by national government and the province of Frisia and somewhat at the level of the municipalities. A devolution of tasks to market parties, like the farmers, was perceived to be an interesting option. Nevertheless, some doubts existed about the capacities of the Northern Frisian Woodlands Association and the associated farmers' cooperatives to fulfil the responsibilities they wanted to obtain. For example, some interviewed persons doubted the willingness of the farmer organisations to impose penalties on their colleagues, when required. Members of the Northern Frisian Woodlands Association on the other hand were very active in engaging in new initiatives. Even so, some council members and civil servants from municipalities that were involved felt that their autonomy was being threatened. Moreover, the ambitions with the application of circular agriculture were contested and met a lot of resistance from some scholars. Therefore,

the willingness of all involved actors to really consider self-governance in environmental management, proved limited. In addition, existing habits were not easily left behind, such as pushing municipalities into activities they did not want to engage in. This put pressure on the relations between actors, and threatened trust and shared identities in the project.

Part of the explanation for the above-mentioned barriers can be found in the weak boundary between the knowledge initiative and other governance initiatives, which caused confusions and uncertainties about the code of conduct used in the project. Changes in personnel complicated this, which made it harder to maintain the commitment of the steering committee, and left little space for a more intensive involvement. This probably was a result of the decision taken in the project to keep board members at a distance from the knowledge activities, so as not to disrupt learning processes that were taking place. It was still possible to intervene hierarchically in the learning community. An example of this is that the province of Frisia intervened by stating that the product market combination 'Living in the Countryside' was not in line with their policies. The product market combination was selected for phase two for its potential beneficial impact on economic development with respect for the environment, but after this intervention, hardly any willingness to participate in it remained.

2.9 Conclusions and discussion

It was found that knowledge governance involves knowledge production and dissemination by purposefully engaging in the collaborative production of innovative and shared ideas by individuals and organisations. Knowledge governance entails the formation of learning communities in which transdisciplinary and social knowledge is produced and during which reflexivity turns out to be an important principle. These communities are open, internally diversified and mobile, and have a shared identity.

How did the principles function in the case of the Northern Frisian Woodlands? The knowledge was produced in a transdisciplinary way, because there was collaboration between scholars and regional actors in the formulation of knowledge questions and in the execution of activities, and because of the focus on real-life issues, although there was some resistance to involving scholars in the working groups. In the case study, social learning took place and was organised in working groups, which partly functioned as learning communities. The amount of self-organisation in the learning communities had its limitations, because for some activities there was little commitment and willingness to actively engage in them and to adhere to the rules of participation which had been communicated to them by the core team. Nonetheless, the participants did learn together, although mostly in an incremental way with much single-loop learning, although in fact new routes were also explored (double-loop learning) and the way to produce and share knowledge was also debated and adjusted (triple-loop learning). Boundary management was present in the selection of boundary workers who communicated the knowledge that was produced to individuals outside of the learning community. Boundary workers, such as participants that work in local government or businesses, were active to translate the knowledge produced to the outside policy world and therefore made it possible for actors to use the knowledge to adjust policies or engage in new ones.

To understand the impact of knowledge governance: much of the produced knowledge was used for the development of plans and strategies which could be implemented by network- and self-governance, so there was indeed an impact. The incorporation of the project in the activities of the steering committee, and the involvement of boundary workers made it likely that some of the developed plans will be implemented, after they have indeed found their way to new network governance and knowledge governance initiatives. Existing policies were not radically altered, but new plans were incorporated into these policies. The original objectives to realize the self-governing ambitions were not realized, but important steps were taken in the process towards self-governance. Knowledge governance also did lead to new knowledge governance initiatives. The assigners of the project were very satisfied with its result. Therefore it can be concluded that the case of the project 'Self-governance and Profit in the Northern Frisian Woodlands' had a positive impact. Another conclusion is that knowledge governance is a promising type of governance, which can be successful where other modes of governance are not, but the expectations should remain moderate. There appear to be no easy solutions for complex societal problems and also, engaging in knowledge governance is very complex in itself.

The last concerns are the barriers to knowledge governance. Two major barriers to knowledge governance can be distinguished: a lack of willingness and ability to consider new ideas and the alteration of existing routines. This was at least partly caused by some limitations in the boundary arrangement, which caused a limited openness, which limited the ability of the learning community to engage in social learning. These barriers lead to a lack of willingness to participate in the knowledge processes and a lack of enduring commitment and a limited internal variety in the learning community. More insight is needed in how these barriers to knowledge governance can be overcome. Special attention should be paid to the design of boundary management in knowledge governance, and especially to the openness of organisations to policy learning.

Chapter 3

Knowledge governance in sustainable development

Abstract

In knowledge, governance actors purposefully create and disseminate knowledge to devise solutions for complex policy problems. This chapter unravels this knowledge governance empirically by analysing three cases of knowledge governance in sustainable development: how they emerged, how they were structured and how they contributed to solving policy problems. Additionally, the cases are compared by using a set of theoretical knowledge governance characteristics. The cases are: 'Sustainable Dairy Farming in the Northern Frisian Woodlands', 'Seaweed Farming in the North Sea', and 'Metropolitan Food Cluster Mexico'. The chapter identifies two types of knowledge governance that differ in the governance challenges they face.

Published as: Gerritsen, A.L. Stuiver, M. & Termeer, C.J.A.M. (2018). Knowledge governance in sustainable development. In: Dotti, N.F. (Ed). *Knowledge, policymaking and learning for European Cities and Regions: From research to practice*. Cheltenham: Edward Elgar Publishers, pp. 135-149.

3.1 Introduction

In recent decades, the appreciation of knowledge as a driving force in the governance of complex policy problems has increased. This is especially relevant to sustainability problems, for which simple solutions do not work because they ask for transformative change (Kemp et al., 2007). The emerging concept of 'knowledge governance' (Gerritsen et al., 2013) positions the organisation of knowledge and learning as a new mode of governance, in addition to other modes such as hierarchical, market or network governance. Knowledge governance has been defined as 'purposefully organising the development of knowledge in order to deal with societal problems' (Van Buuren and Eshuis, 2010: 284). Knowledge governance aims at 'creating new insights, and innovative solutions which tempt actors to leave traditional insights and practices and get away from inert interaction patterns, stalemate negotiations, and interest conflicts' (van Buuren & Eshuis, 2010: 284). In knowledge, governance actors deliberately engage in a self-organising, and reflexive social learning process centred on transdisciplinary knowledge development and dissemination, the results of which are communicated to individuals outside the learning communities through established boundary arrangements (Gerritsen et al., 2013). This enables actors to discover and adopt innovative ideas. The characteristics of knowledge governance are shown in Table 3.1.

Table 3.1 The characteristics of knowledge governance arrangements

	Characteristics of knowledge governance
1.	'Transdisciplinary knowledge production and dissemination' is concerned with 'co-operation between different parts of society and science in order to meet complex challenges of society [. . .] and starts from tangible, real-world problems' (Thompson-Klein et al., 2001: 7). By cooperating and by engaging in collaboration new knowledge is developed (Regeer, 2010).
2.	'Social learning'. Learning is a contextual process rooted in local practices and actor networks (Brown & Duguid, 2000). In general, learning is most effective when it functions through social interaction (Nowotny et al., 2001; Regeer, 2009). Social learning can be enabled by learning communities. In these communities, participants produce and share knowledge, attain meanings, conduct practices, and develop and maintain a shared identity (Wenger, 2000).
3.	'Self-organisation' is concerned with the complex and emergent nature of phenomena (e.g. Holland, 1995; Kauffman, 1995). Self-organisation is grounded in flexible structures (Brown & Eisenhardt, 1997) that function independently and develop their own order generating rules (Burnes, 2005).
4.	'Reflexivity' is concerned with leaving existing routines, policies and ideas by learning about altering underlying principles, values, rules and assumptions. Reflexivity involves challenging and changing the presumptions, current practices, routines, ideas and the underlying institutions (Grin et al., 2004; van Mierlo et al., 2010; Voß et al., 2006).
5.	'Boundary arrangements'. Boundary work supports communication and coordination across the fences that separate communities and their different social worlds (Keulartz, 2009). The quality of an institutionalised relationship or arrangement is of great importance for knowledge engagement across boundaries (Robinson & Wallington, 2012).

The understanding of the characteristics of knowledge governance is still limited and almost exclusively theoretical. Therefore, this chapter aims to expand this understanding. The chapter aims to allow for context variation and situated agency (Bevir, 2004). For this objective, it was explored whether different types of knowledge governance can be identified by studying knowledge governance practice. The chapter explores how knowledge governance arrangements emerge, how they are structured and how they contribute to solving complex societal problems. A comparative case study was selected as research method. The case study includes a structured analysis and comparison of the manifestations of the theoretical characteristics of knowledge governance (transdisciplinarity, social learning, self-organisation, reflexivity and boundary arrangements). The case study is based on a secondary analysis of interview manuscripts, logs, technical reports and articles that were produced in previous research and innovation projects where the authors were involved in or otherwise had access to the required information.

As presented above, knowledge governance is of particular relevance to sustainable development. Moreover, sustainable development initiatives often make use of knowledge and learning processes (Van Kerkhoff, 2013). Therefore, the three selected cases are all from the domain of sustainable development. Since they are all concerned with food production, they are comparable, but because they are situated in diverse territories and have different backgrounds, they are also different from one another. The selected cases are examples of knowledge governance because they rely on knowledge development and learning to increase the sustainability of food. The cases are (1) 'Sustainable Dairy Farming in the Northern Frisian Woodlands'; (2) 'Seaweed Farming in the North Sea'; and (3) 'Metropolitan Food Cluster Mexico'. The cases are introduced in the next section. First, it will be described how these examples of knowledge governance emerged, how they were structured and how they contributed to solving policy problems. Then an in-depth comparison with the help of the five characteristics of knowledge governance will be reported on. These are primarily relevant to the emergence and structuring of the cases and to understanding their impact.

3.2 Sustainable dairy farming in the Northern Frisian Woodlands

3.2.1 Emergence

In the early 1990s, dairy farmers in the Northern Frisian Woodlands region of the Netherlands opposed a new national environmental policy that they felt would make agriculture impossible in the region. Moreover, they felt the environment and the regional economy would both strongly benefit from the continued management of the land by dairy farmers. This conflict was the start of continuing attempts of the dairy farmers together with scientists and other actors to develop their own options for environmental protection measures, such as low nutrient input management and the restoration and maintenance of hedgerows, ponds and alder trees. Halfway through the 2000s, disappointments were increasingly articulated. Key parts of the farmers' plans had still not been adopted by public authorities and faced strong resistance from environmental and livestock scientists (Stuiver, 2008). Farmers and public authorities concluded that the activities were too dominated by academics and by advancing science instead of supporting the farmers and the regional

development. They felt it was time to work towards implementing the farmer agenda as laid down in a working programme. In 2007 an 'innovative practical' project was set up and funded under the national innovation programme 'TransForum' by the Northern Frisian Woodlands Association, the province of Frisia and Wageningen University & Research, all members of the Steering Committee Northern Frisian Woodlands. Where previously a research agenda in which farmer representatives proposed the issues for academic research was central to the initiative (Stuiver, 2008), now this project coordinated the knowledge and learning processes.

3.2.2 Structuring

The project can be divided in two stages that were structured differently. In the first stage, the key opportunities for the farmer agenda were identified in a quick and focused inventory and discussion of scientific insights and stakeholder perceptions. Although this activity was mostly executed by academics, it was programmed by the project's management team, and the conclusions were discussed and approved by the management team and the steering committee. Stage 1 led to the selection of eight topics, which would be explored and operationalised as options in established working groups in stage 2 of the project. This was envisaged as the preparation for the implementation of the options shortly after the project.

In stage 2, working group leaders, knowledge coordinators and process monitors were appointed to support this. These groups were grounded in existing working groups in which the participants were already partly working on these topics as part of policy processes. The identified topic of 'rural housing' was terminated soon because it was not in line with existing provincial policies and especially because it had too little active support. The collaboration between actors in the various groups differed. Although in all groups different types of actors interacted with one another, some of the working groups were dominated by farmers, some were dominated by civil servants, and one was dominated by scientists. The working groups were supported by the organisation and facilitation of specific learning workshops by the management team of the project, within and between the identified topics. The management team also organised the communication with the Steering Committee Northern Frisian Woodlands.

3.2.3 Contributions to solving problems

The results of the project found their way to policies: the developed option of self-regulation in environmental management became part of the explorations for the national implementation strategy of the EU Common Agricultural Policy in the Netherlands and of the new national agro-environmental subsidy programme that was based on a central role of farmer collectives. The project accelerated the implementation of existing ideas and activities and enabled participants to acquire new ideas and implement them. The project also led to new initiatives, such as a feasibility study for the possibilities of using regional biomass for energy. The project laid crucial foundations for the implementation of the farmer agenda.

3.3 Sea weed farming in the North Sea

3.3.1 Emergence

From 2000 onwards, entrepreneurs and scientists supported by public authorities, initiated activities that aimed to develop and implement business cases for the cultivation of seaweed in the North Sea. Seaweed would have different purposes, such as for use in animal feed and human nutrition, and as an ingredient for pharmaceuticals and the bio-economy. In the opinion of its proponents, seaweed farming in the North Sea would be a type of sustainable agriculture that diminishes pressures on terrestrial environments in North-Western Europe and on the current aquatic production environments in East Asia. The national government promoted new economic activities at sea and also funded innovation projects that aimed at cultivation and usage of seaweed and encouraged commercial parties to take the lead (Stuiver et al., 2016). The formulation of the EU 'Blue Growth' strategy (EU Commission, 2012) was perceived as a window of opportunity.

3.3.2 Structuring

The initiative included research projects on optimal growth conditions, on competitive seaweed varieties and on production systems as specially constructed platforms or in combination with offshore wind energy facilities. Test facilities were set up by scientists, with funding from public authorities to experiment with production and post-harvest methods. These pilot facilities were located near the island of Texel in the north-west and the Eastern Scheldt Estuary in the south-west of the Netherlands. The pilot facilities functioned as anchor points for research and analyses in laboratories. At the same time, entrepreneurs started with experimenting and establishing commercial activities, among which was the actual cultivation of seaweed in the Eastern Scheldt Estuary.

Although there was much collaboration, contact and discussion, including a series of meetings between companies from the Dutch seaweed chain and researchers, no formalised coordination of activities was achieved, and the network participants were sometimes even competitors. Therefore, the network was a loose one. Nevertheless, its participants did learn by sharing knowledge and by engaging in discussions, and individuals collaborated when feasible. The actor network increasingly collaborated and aligned its activities with the aquatic research community in the Netherlands (Groenendijk et al., 2016). The participants also worked together with international stakeholders to share their vision and knowledge on how to develop seaweed production in the North Sea (van den Burg et al., 2016) and received funding from the European Horizon 2020 programme.

Conferences, workshops and activities such as harvest feasts were used to discuss and disseminate the results with the professional network and to communicate the promises of locally grown seaweed. Although public authorities were not at the forefront of the initiative, they were connected to it, funded research and innovation projects, participated in knowledge networks of entrepreneurs, committed themselves to removing legal and other obstacles if needed and communicated the importance of the proposition and associated explorations (Van den Burg et al., 2015).

3.3.3 Contributions to solving problems

Gradually a network formed of entrepreneurs and scientists working to establish a seaweed chain. The 'Noordzee Boerderij' foundation was established, which hosts a seaweed stakeholder platform, a Maritime Campus was set up for the Northwest of the Netherlands, higher education programmes were set up, a new seaweed test facility was established near The Hague and government showed its support by signing a 'green deal'. Although at least one commercial production site was established on Dutch waters, the proposition is still novel, and many research and innovation projects will be required to pursue its implementation and make the multiple use platforms at sea competitive. The addition of seaweed farming to offshore wind energy sites remained complicated. Legislation did not allow it yet and the energy sector did not yet see the urgency and its benefits. Moreover, trust had to increase between them and the aquaculture chain (Van den Burg et al., 2015). Still, linkages did establish between institutions in these related chains.

3.4 Metropolitan Food Cluster Mexico

3.4.1 Emergence

In the early 2010s, a Mexican public investment agency aimed to increase the added value generated by agriculture and agri-business in Mexico and the sustainability of production, especially with regard to battling drought problems. The agency identified the concept of 'Metropolitan Food Clusters' (MFCs) as a promising route to implement this agenda. The MFC concept envisages the development of a highly productive, sustainable, high-tech and resource-efficient agro and food system that vertically and horizontally integrates activities such as production, processing, trade, logistics and Research & D, and recycles waste flows into resources (Gerritsen et al., 2011; Smeets, 2011). This concept was developed by a network of academics and consultants in various countries over the world. The State of Aguascalientes also recognised MFC as an opportunity and, together with the investment agency and a group of academics and consultants, took the lead in developing an MFC in Mexico.

3.4.2 Structuring

The participants in the initiative started with clarifying what an MFC would entail and how it could be implemented in the Mexican context. A project was set up that hosted feasibility studies and the design of a generic masterplan. As part of these activities, the participants engaged in an interactive process in which discussion workshops were organised with entrepreneurs, public authorities, societal organisations and academics, separately and finally together. Joint fact-finding missions were organised by dedicated experts to examples of good practices in the Netherlands to enhance the inspiration of Mexican stakeholders and increase their enthusiasm, and to identify business opportunities. In these workshops and missions, actors established a shared vision. Although the project was started by public actors and high-level officials were directly involved in the initiative, the role of agri-business entrepreneurs was perceived as essential because it was envisaged that they would be the actors who would actually develop the various components of an MFC. Therefore, much

attention was given to discussing with private firms whether and on what condition it would be feasible for them to become part of the initiative. Moreover, matchmaking sessions were organised where entrepreneurs from different chains (such as 'crops' and 'meat') could explore opportunities for collaboration in business. These discussions were mostly separated from discussions with public actors, who were primarily focussed on administrative issues concerning the public–private set-up of the envisioned agri-production park.

3.4.3 Contributions to solving problems

In 2014, a generic master plan was finalised, which provided stakeholders with a framework for the development of the MFC in which the ambitions and schemes of the participants were incorporated. Moreover, potential sites were explored to develop agro-parks, logistical business parks and rural transformation centres. Accordingly, the state of Aguascalientes purchased land for the development of an agropark, with the aim of selling it to a public–private body that would develop the site. Since the start, other initiatives have been set up in other Mexican states such as Chiapas and Nayarit. The federal government even embraced MFCs as a cornerstone of its national food policy by designating a 'National System of Agroparks'. Nonetheless, the actual implementation in Aguascalientes is yet to take off. Administrative issues associated with the public–private cooperation required a lot of effort and in the meantime, the established network lost some of its coherence. Therefore, the challenge remains to revive the network and to implement the developed proposition.

3.5 Characterising the cases

Now that the cases have been introduced, it will be explicated how the knowledge governance characteristics were manifest, which will enable a structured comparison. Table 3.2 provides an overview of the three cases. After the overview of the knowledge governance characteristics of the cases, they will be compared.

3.5.1 Transdisciplinarity

In all three of the cases, the aim of the participants was the development and implementation of propositions for sustainable development and related changes in policies. Actors from different actor domains collaborated in knowledge development, dissemination and learning, and used both expert and practical knowledge. In that sense, they all had a transdisciplinary approach to the knowledge processes. In the execution of activities, one group of actors tended to dominate. Moreover, the cases differ somewhat in how closely public authorities were involved in the knowledge and learning trajectories. In the Mexico case, they were the initiating actor, in the Northern Frisian Woodlands they participated, as one of the actors, and in the seaweed case, the role of public authorities primarily was that of a stakeholder and supporter.

Table 3.2 Knowledge governance characteristics in the cases

Case	Trans-disciplinarity	Social learning	Self-organisation	Reflexivity	Boundary arrangements
Sustainable dairy Farming in the Northern Frisian Woodlands	A multi-actor network, collaboratively formulated knowledge activities to support the farmer agenda. The execution of these activities was sometimes dominated by one type of actor.	Key issues and options for action were discussed collaboratively, and actions were taken to implement them.	The participants used the initiative to strengthen activities they already worked on. Working group leaders, knowledge coordinators and process facilitators were appointed by the management team.	The focus lay primarily on implementing an existing agenda.	The creation and implementation of the vision for action was partly in the same hands. Choices and results were discussed with the steering committee.
Seaweed farming in the North Sea	A network of entrepreneurs, supported by academics and public authorities aimed to advance the seaweed proposition. The knowledge was developed around commercial and test facilities at sea as well as in laboratories.	Results of pilot studies were shared and discussed. Collaboration was on an ad hoc basis without excluding competition.	The participants initiated new activities and cooperated when necessary. The collaboration was structured 'along the way'.	The seaweed proposition was pushed in the initiative. Most optimal solutions were explored to enable implementation.	The knowledge development was framed as in line with government policy and business strategy and was supported by the government. Conferences, workshops and other events enabled policy and business learning.
Metropolitan Food Cluster Mexico	Mexican actors together with international academics and consultants engaged in a project to make Mexican agri-business more competitive and sustainable. Some processes within the initiative were dominated by public authorities.	The MFC vision and its possibilities were discussed in workshops and site visits. Discussions mostly took place between actors with the same background.	The initiative aimed to enable and empower business actors and public authorities to implement the identified opportunities.	The participants focussed on radically changing the agri-business systems, as envisaged by the MFC concept.	Decision-makers from public authorities and businesses participated in the initiative.

3.5.2 Social learning

In the Mexico and Northern Frisian Woodlands cases, social learning was purposefully enabled through structures such as working groups, workshops and site visits. Moreover, specific individuals were assigned with the task of facilitating learning. In Seaweed Farming in the North Sea, the social learning method was mostly implicit, but discussion and interactions were also organised. The cases also differed in the foundations of social learning communities Where the Northern Frisian Woodlands case built on previously developed networks and identities, the other two cases had to develop new learning communities.

3.5.3 Self-organisation

In the Seaweed case, a network of self-organising scholars and entrepreneurs was set up and called for support from stakeholders. The Northern Frisian Woodlands and the MFC Mexico cases are mixed examples in which the initiative was also pushed from and controlled by decision-making networks and by a core group. Nevertheless, also in these cases, there were many individuals who willingly participated in the initiatives because it would advance their own agendas. Moreover, also in the seaweed case decision-makers had an influence on the actions within the initiatives.

3.5.4 Reflexivity

In all three the cases actors aimed for a change in current practices and policies to increase sustainability. In the Northern Frisian Woodlands and MFC Mexico cases, a core team purposefully stimulated learning that was to surpass existing assumptions and habits. The participants in the initiatives generally acted as advocates of the sustainability propositions and aimed to strengthen them and to convince and enable stakeholders to change existing policies and business strategies. They were not exploring other options.

3.5.5 Boundary arrangements

The cases differed in how the knowledge governance initiative was related to existing governance networks and governance processes. In the Seaweed case, the boundary work was constituted by organising communication events between the knowledge governance arrangements and decision-makers. This also occurred in the Mexico and Northern Frisian Woodlands cases, but there decision-makers and other key individuals also participated in the knowledge and learning activities themselves to ensure a smooth implementation.

3.6 Conclusion

For each knowledge governance case its emergence, structuring and contributions to solving policy problems have been described. Moreover, the five knowledge governance characteristics have been used to structurally compare the knowledge governance practices. In this section, it will be concluded whether different types of knowledge governance can be derived from these practices. Of the five characteristics 'self-organisation' was the least distinctive, because they all were 'self-organising' to some extent and they also all had to

relate to policy and policymakers. Moreover, they all used the incentives of authorities to enable the knowledge governance activities. Most distinctive was the positioning of the initiatives towards decision-making networks and whether they aimed to implement the results at short notice. Where in the Seaweed case the knowledge and learning activities were largely separated from policy and business networks and communication was organised in distinct environments, in the Northern Frisian Woodlands and MFC Mexico cases, they were part of the activities. This also manifested itself in a different focus on implementing the results of the knowledge governance activities. In the Seaweed case, the focus lay on the development of the proposition and the connected network; in the other cases stakeholders expected that the activities would lead to the actual implementation of the sustainability proposition. These two issues seem to have determined how the characteristics of reflexivity, transdisciplinarity, self-organisation and social learning manifested themselves.

Based on this analysis and the information of the knowledge governance characteristics in the cases, two types of knowledge governance have been distinguished that ultimately both have the objective to implement the proposition they advocate, but follow different pathways. The first type is called 'Advocacy Knowledge Governance' and is constituted by innovative entrepreneurs, academics and consultants who are advocates of a proposition, participate in a loose and pragmatic learning network, produce and disseminate knowledge, and actively lobby for the adjustment of policies and business strategies. The learning environment is developed as the process unravels itself, but is primarily directed towards convincing decision-makers and the public of the merits of their proposition. The contributions to solving policy problems of this type can be primarily assessed by the established support of public authorities and firms. The main challenge is to strengthen the network and collaboration to enable the development of the proposition to make it credible for decision-makers. This type is represented by the Seaweed case.

In the second type, called 'Implementation-oriented Knowledge Governance', a learning community is established a by a formal decision of public authorities, businesses organisations and universities. Accordingly, a knowledge, learning and implementation project is set up with the aim of implementing the shared proposition. The implementation of this type of knowledge governance is positioned close to policy processes, and policy actors are directly involved in its activities. The contribution to solving policy problems of formalised knowledge governance in principle should be more direct than that of advocacy knowledge governance, because of its close connection with decision-makers and alignment with policies, although this could also hinder its policy changing potential. This type of knowledge governance requires the support of decision-makers but faces the challenge of energising participants. This type is represented by the MFC Mexico and the Northern Frisian Woodlands cases.

These two types of knowledge governance are the result of a first attempt to explore different knowledge governance practices. There is a clear need to carry out further exploration and to establish a typology of knowledge governance practices.

Chapter 4

Knowledge governance: theoretical and empirical reflections on territorial innovation policy

Abstract

While innovation has become a major issue in territorial policy, the scientific debate in this field has focused very little on issues such as knowledge for policymaking, learning and adaptation. This chapter explores the emerging notion of 'knowledge governance' and the challenges imposed by assuming a territorial perspective, due to the intrinsic limits of local learning communities and the need to anchor trans-territorial knowledge. The derived territorial knowledge governance framework will be explored by discussing eight case studies, leading to reflections on the need for identifying realistic and situated knowledge governance arrangements.

Published as: Gerritsen, A.L. & Dotti, N.F. (2018). Knowledge governance and policy: theoretical reflections. In: Dotti, N.F. (Ed). *Knowledge, policymaking and learning for European Cities and Regions: From research to practice*. Cheltenham: Edward Elgar Publishers, pp. 244-258.

4.1 Territorial innovation policy

In his seminal contribution, Schumpeter (1976) stressed the creative/destructive forces associated with 'innovation' and how these would eventually lead to the demise of the capitalist system. Based on his contribution, both policymakers and scientists have focused on the positive effects of technological innovation for the efficiency and dynamism of firms and economic development. In this perspective, innovation has become a focal point to provide firms with a temporary monopoly against competitors by introducing new products, services or processes. More recently, the notion of innovation has been further extended to address various societal challenges, such as mitigation and adaptation to climate change or maintaining societal cohesion in an age of globalisation and migration. Moreover, the notion of 'social innovation' (Howaldt & Schwarz, 2010) has been introduced, making a fundamental distinction with the mainstream definition of innovation, mainly oriented to technological and business-oriented innovations (as first framed by Schumpeter).

Innovation is a territorial issue because it tends to be spatially concentrated (Cooke et al., 1997; Jensen et al., 2007; Krugman, 1991). Geographers, innovation scholars and economists have developed several territorial innovation models (Moulaert and Sekia, 2003), such as 'clusters of innovation' (Porter, 1998; Saxenian, 1996), 'learning regions' (Boekema et al., 2000; Morgan, 1997), national and regional 'innovation systems' (Asheim et al., 2011; Cooke et al., 1997; Doloreux & Gomez, 2017), and 'innovative milieus' (Crevoisier & Camagni, 2000). A specific subfield of research is the role of universities in territorial innovation (e.g. Benneworth et al., 2009; Charles, 2006; Pinto et al., 2015; Uyarra, 2010) leading to the notion of 'Triple Helix' (Etzkowitz & Leydesdorff, 2000) to emphasise the importance of cooperation among firms, universities and governments.

Somehow ironically, this literature has largely discussed 'innovation policy' with very little attention to the innovation challenges of policymaking, i.e. the conceptualisation of policy seems particularly weak. The lack of attention to the policy dimension of territorial innovation is a serious shortcoming in the debate on innovation-based territorial development (Uyarra & Flanagan, 2010). When reference to a policy is made, this is often limited to normative assertions about policy interventions that often include hidden assumptions about policymaking, whereas the complexity of policymaking dynamics involving multiple levels and actors tends to be underestimated (Flanagan & Uyarra, 2016; Flanagan et al., 2011). Against this, simplistic approach, policymaking is better understood by treating it as an emergent evolutionary process rather than as a rational process in which the best policy mix is selected to achieve certain objectives (Dotti, 2016; Hall, 1993; John, 2003; Slembeck, 1997; Flanagan & Uyarra, 2016). Along this argument, knowledge, learning and adaptation play a particularly important role for territorial innovation policies.

This chapter will explore such a knowledge, learning and adaptation-oriented approach to territorial innovation policy to establish a more realistic understanding of governance, policy and policy change. For this purpose, the emerging notion of 'knowledge governance' will be discussed and used as the central theoretical lens to reflect on territorial innovation policy. Knowledge governance is a 'mode of governance' that purposefully develops knowledge to enable change in complex settings (Gerritsen et al., 2013; Van Buuren

& Eshuis, 2010; Van Kerkhoff, 2013). This concept will be used to explore the relationship between innovation and policymaking in territorial development.

The chapter is structured as follows. Firstly, it will be discussed how policy learning and knowledge are understood. Secondly, the notion of knowledge governance, its characteristics and the relationship to territorial innovation policy are discussed. Thirdly, eight cases of territorial knowledge governance will be analysed with these notions. The chapter ends with reflections on territorial innovation policy.

4.2 Policy learning and knowledge

The first step to understanding the contributions and characteristics of knowledge governance in territorial innovation policies refers to the notion of 'policy learning'. Policy learning is generally understood as the updating of policy beliefs and preferences (Dunlop & Radaelli, 2013) and involves the acquisition, translation and dissemination of new understandings of collective issues (Heikkila & Gerlak, 2013). Policy learning can be a deliberate attempt to adjust policy in response to past experience and new information (Hall, 1993). Therefore, policy learning is concerned with policy change, whether the learning is of an implicit and uncodified or of an explicit and planned nature. Furthermore, policy learning is a social process (Hall, 1993) that reflects the interactions of various advocacy coalitions (Sabatier, 1987) or 'epistemic communities' (Dunlop, 2013; Haas, 1992). These communities are groups of like-minded individuals unified by a belief system (and often a common interest) that is composed of 'a shared set of normative and principled beliefs; shared causal beliefs; shared notions of validity; and a common policy enterprise' (Haas, 1992: 3). This normative or even political aspect of policy learning implies that the relationship between policy change and learning is neither linear nor automatic; on the contrary, policy learning requires much effort and time and does not always achieve fundamental policy change (Sabatier & Jenkins-Smith, 1993).

Although knowledge receives much attention, it tends to be unclear how it plays a central role in territorial innovation policy. Moreover, knowledge is often reduced to information that can be owned, shared and traded as a commodity and can be transferred with relative ease and little cost. However, in practice knowledge is often very hard to acquire (Adolf & Stehr, 2014). To overcome this problem, knowledge should be re-defined as a 'capacity to act' (Stehr, 2005) that enables us to 'set something in motion or prevent something from occurring' (Adolf & Stehr, 2014: 22). In this sense, knowledge is not so much a model 'of' reality, but a model 'for' reality (Stehr, 2005) that enables or prevents change. This type of knowledge involves skills and expertise to elaborate information and is of a 'tacit' nature (Polanyi, 1967). The tacit nature of knowledge implies that it is context-specific, and then difficult to share with external individuals. Tacit knowledge, therefore, has characteristics of public or collective goods because ownership cannot easily be attributed, is non-rival and hardly excludable. This knowledge benefits from the so-called 'comedy of commons' (Foray, 2004): the more knowledge is used and shared, the more it increases.

A 'capacity-to-act'-based approach to knowledge combines both tacit and explicit knowledge. Yet, such a combination of types of knowledge is a highly complex activity.

The main reason being that knowledge is also related to power (Foucault, 1966), politics (Brown, 2009; Turnhout, 2016; Weingart, 1999) and normative agendas (Haas, 1992). The presence of epistemic communities is associated to 'policy paradigms' (Hall, 1993) facilitating circulation of knowledge within communities but limits the capacity to absorb knowledge from external sources. Knowledge from other epistemic communities will be seen as of limited value and therefore will not be considered for decision-making (Hall, 1993: 993), analogously with Kuhn's (1962) scientific paradigm. This (partially) explains certain inertia in policymaking since policymakers will tend to reject 'deviant' knowledge. Dissemination and usage of knowledge is therefore often difficult or even impossible and statements that knowledge should be useful to society, policy or economy, fail to understand the complexities of knowledge and learning processes.

4.3 Knowledge governance: an emerging perspective

The concept of 'knowledge governance' elaborates what a knowledge, learning and adaptation-oriented approach to policy entails. In the literature, knowledge governance is used in two manners: first, as 'the governing of knowledge' (Foss, 2011; Van Kerkhoff, 2013) and, second, as a distinct 'mode of governance' (Gerritsen et al., 2013; Van Buuren & Eshuis 2010). While the former is often associated with more 'managerialist approaches', in the latter, the governing of knowledge has the purpose of learning to enable policy change (Capano & Howlett, 2009). The second type that is concerned with 'purposefully organising the development of knowledge in order to deal with societal problems (Van Buuren & Eshuis, 2010: 284) will be discussed. Moreover, knowledge governance aims at 'creating new insights and innovative solutions which tempt actors to leave traditional insights and practices and get away from inert interaction patterns, stalemate negotiations and interest conflicts. Knowledge governance is also used to raise awareness and deliver suggestions that give actors a perspective on purposeful action' (Van Buuren & Eshuis, 2010: 284). Such an interpretation of knowledge governance implies that the concept is an addition to more generally used modes of governance such as 'hierarchy', 'market' and 'network', which function by respectively relying on hierarchy, on competition and pricing, and on collaboration and reciprocity (Van Buuren & Eshuis, 2010; Polanyi, 1944). These modes of governance are ideal types, suitable for analytical purposes, though, in reality, they co-exist. Knowledge governance has been discussed by Gerritsen et al. (2013) as a reinterpretation and repositioning of the concept of 'reflexive governance' that focuses on feedback loops of policy interventions to the original policy and has also a focus on learning (Voß & Bornemann, 2011; Voß et al., 2006), but pays less attention to organising knowledge creation and dissemination.

Knowledge governance is a relatively new concept and needs further concretisation. For this objective, Gerritsen et al. (2013) identified five characteristics of knowledge governance. The first characteristic is 'transdisciplinary knowledge production'. This starts from tangible, real-world problems and builds on the collaboration of multiple stakeholders (Thompson-Klein et al., 2001). The second characteristic is 'social learning' in which learning takes place in social interaction (Armitage 2007; Armitage et al., 2008;

Lorenzen, 2007; Pahl-Wostl, 2009) in learning communities in which individuals together produce and share knowledge and attain meanings (Wenger, 2000). These communities are comparable to the epistemic communities that were discussed. Especially when these communities are open, internally diversified, and mobile (Grandori, 2009) and when a shared identity is developed (Wenger 2000), they enable social learning. The social learning has a 'reflexive' character when it is able to achieve change in complex situations (Voß et al. 2006). This third characteristic is concerned with leaving existing routines and ideas by learning about altering underlying principles, values, rules, and assumptions of oneself and the communities one is engaged in. This includes what constitutes learning and knowledge. These transdisciplinary and reflexive knowledge and social learning processes are 'self-organising' (Holland 1995; Kauffman 1995), the fourth characteristic of knowledge governance. This means that the participants establish the learning communities by their own initiative. To enable individuals outside of the learning community and the knowledge process to understand the meanings of its work and to learn from its lessons, the fifth characteristic is constituted by the 'boundary arrangements' that enable communication and coordination across the fences that separate epistemic communities (Keulartz 2009).

4.4 Towards a territorial perspective on knowledge governance

Knowledge governance is relevant to any kind of knowledge for the policy learning process. Nevertheless, policy changes or innovations require the introduction of a territorial perspective imposing three challenges, often neglected in the literature. The first challenge is constituted by the intrinsic limits of local learning communities. Not all territories have access to the knowledge and capacities that are required for the specific innovations that they aim to develop. This is especially challenging for communities in peripheral territories (Lagendijk & Lorentzen, 2007) and, even more, when complex and specific expertise is needed. The territorial scale is a double-edged sword: while it can be expected to facilitate the establishment of networks to exchange knowledge as well as potentially enabling transdisciplinarity, it can also determine lock-in, lack of essential knowledge and rejection of innovative approaches because of the absence of a reflexive attitude. In the long run, a small territorial scale can also lead to long-term mistrust in case of multiple failures.

The second challenge is constituted by the importance of trans-territorial knowledge networks (Bathelt et al., 2004; Benneworth & Hospers, 2007). While tacit knowledge is context-specific, the different territorial scales raise the issue from where it is possible to access relevant knowledge when it is not available locally. The importance of recombining existing knowledge across territories is a strategic capacity to pursue market-oriented innovation, yet it requires resources to scan for knowledge available elsewhere. Therefore, the boundary arrangement needs to cross geographic scales as well as function within a territory. This requires the services of knowledge workers or 'agents of learning' and a self-organising learning community. These actors can access these multiple scales, from the local up to the European/global scale.

The third issue is constituted by the context-specific knowledge that can be activated through the knowledge and learning processes on multiple scales. This is not only a matter

of acquiring and transporting knowledge but of making it context-specific by 'anchoring' it in the concrete territorial innovation and policy practices (Crevoisier & Jeannerat, 2009). Furthermore, this requires widening territorial actor networks by using the knowledge in boundary arrangements. This anchoring of knowledge to the territory can be strengthened by an exogenous actor, but it has to be grounded in the actions of actors in the territory.

These three challenges to territorial knowledge governance lead to the identification of the sixth characteristic of knowledge governance: the 'anchoring of trans-territorial knowledge'.

4.5 Case studies discussion

The framework of the six territorial knowledge governance characteristics is of a theoretical nature and is in need of empirical reflection and illustration. Therefore, eight case studies (table 4.1) that were presented in the book 'Knowledge, Policymaking and learning for European Cities and Regions' (Dotti, 2018), will be analysed with this framework. The cases are from different European countries (namely Belgium, Italy, Netherlands, Scotland and Spain), with one exception (namely Mexico). Although these cases do not all explicitly state they focus on innovation, they all are examples of how knowledge and policy learning is organised to foster territorial development and context-specific policies, so at least implicitly they do. Based on the information that was provided in the book chapters, all cases were analysed in a structured manner by using the six characteristics of territorial knowledge governance: transdisciplinarity, social learning, reflexivity, self-organisation, boundary management, and anchoring of trans-territorial knowledge. The aim is to identify critical issues for territorial knowledge governance.

4.6 Case study results

4.6.1 Transdisciplinarity

In all the cases, knowledge and learning processes were organised to support territorial development policies and practices. The activities in the cases aimed at improving public policies (cf. cases a, b, d and e in Table 4.1), changing research practice (case c) and achieving actual implementation of innovations on the short to medium term (cases f, g, h).

Most cases were distinctly multi-actor in approach, notably with academics and public authorities, or public authorities and entrepreneurs. Only the policy tourism case (e) focussed on one type of actor: urban planners, while the Scottish case (d) presents a more general framework. In cases g and h, it was found that although a wide variety of actors was involved, they, in fact, participated in separate processes and struggled to combine the results of these processes. Cases f and h were also examples of conflicts between actors about which actor and what knowledge was in the lead. In the case of Scotland (case d), the density of policy actors is considered as a fundamental factor to explain intra-regional policy entrepreneurship, often in competition with an external/upper policy community (i.e. the UK policy arena); in the Northern Frisian Woodlands case (f) there was a shifting balance

Table 4.1 Description of cases

Case		Description	Source
a.	Spatial knowledge for Castilla y León	The Instituto Universitario de Urbanistica of the university of Valladolid in Spain collaborated with the regional council of Castilla y León in Spain in the politically sensitive process of re-thinking the administrative structure and setting up new forms of governance. Specifically, they created an alternative map on an inter-municipal scale.	Paris & Rivaz Sans, 2018
b.	Éupolis Lombardia	Éupolis Lombardia is the research institute of the regional government of Lombardia (Italy). Its goal is to support policy learning of the regional administration as well as municipalities and provincial administrations through research, monitoring and evaluation, statistics and training of regional civil servants. The institution brings together a number of specialist elements into one organisation while managing the different knowledge functions for various end-users.	Bandera & Cattaneo, 2018
c.	Brussels Studies Institute	The Brussels Studies Institute (BSI) was set up as network of university departments to increase the knowledge of and for Brussels. The BSI was to produce multi-perspective, accessible and critical overviews of urban societal challenges, crossing disciplinary and linguistic boundaries. Specific functions of the BSI are networking, brokerage, multi-actor research, knowledge dissemination and education. Although the potential for research on Brussels is not fully used, the distinction between academic knowledge and non-academic knowledge does not seem to form an important obstacle. More important, obstacles are funding capabilities and lacking procedural information and competencies.	Vaesen & Wayens, 2018
d.	Policy entrepreneur-ship in Scotland	The government of Scotland has an outcome-oriented and managerialist approach to its administration. In this approach, there is a focus on non-hierarchical interactions between public, professional, academic, civic and private bodies that define mutually agreed baselines, indicators and targets that are based on data. The density of policy actors and the presence of exclusive and autonomous institutions, such as the Improvement Service, What Works Scotland, the Scottish Cities Alliance and the Town Centre Partnership, facilitate the creation of an environment prone to policy entrepreneurship.	Pazos-Vidal, 2018

e.	Policy tourism in the Netherlands	Because of the reputation of the Netherlands in urban planning, policy actors often visit the Netherlands to view and discuss best practices to be transferred to their home country. These visits mostly do not result in concrete actions or hard outcomes at home, because of contextual differences that limit the extent to which Dutch planning approaches can be employed elsewhere.	Stead & Pojani, 2018
f.	Sustainable dairy farming in the Northern Frisian Woodlands	In the Northern Frisian Woodlands region of the Netherlands, dairy farmers, academics, a national innovation programme and policymakers explored new approaches to the management of nature and landscape to revive the sustainable development of the region by cooperating in collaborative research and multi actor learning. This resulted in new ideas and concepts that became part of public policies and implementation projects, although a partial lack of willingness and ability to deviate from existing provincial policies and existing ideas proved to be an obstacle.	Gerritsen et al., 2018; chapter 3 in this thesis
g.	Seaweed farming in the North Sea'	Entrepreneurs, academics, and policymakers explored setting up seaweed farms and multi-functional offshore wind energy sites in the North Sea. Pilot seaweed farms were developed. The addition of seaweed farming to offshore wind energy sites proved difficult – legislation did not yet allow this. Economic interest and trust between energy companies and aquaculture farms needed to improve to make this happen.	Gerritsen et al., 2018 chapter 3 in this thesis
h.	Mexican Food Cluster	Mexican public authorities, an investment fund, business actors, academics and consultants aimed to reinvigorate the agri-business system in Mexico through the exploration and implementation of the proposition of 'Metropolitan Food Clusters'. Although multi-actor learning and coordination was a major challenge, the activities led to the adoption of new ideas in policy plans and concrete activities to set up agri-business parks.	Gerritsen et al., 2018 chapter 3 in this thesis

between the farmers, the academics, the innovation programme or public authorities being in the lead. This was a source of conflict, but it was also functional because it enabled the use of the different capabilities of actors.

The type of knowledge that was dominant varied between the cases. Only in one case (case e) was tacit knowledge the primary knowledge source. In all other cases, information and data also played important roles by functioning as evidence for the normative agendas and solutions they explored. In these cases, there was also much attention given to tacit knowledge, for instance by engaging in training (case b), in education (case c), and in creative workshops (cases f, g and h).

4.6.2 Social learning, reflexivity, self-organisation

Social learning was organised in all cases, although somewhat implicitly in cases a, d and g. Cases f and h describe science-based methodologies. This social learning took place both within and between actor networks. Although in all cases actors pursued change, the learning in most cases seems to be primarily incremental because existing frameworks and institutions were not broken down and renewed, although some cases explicitly aimed to do so (cases f, g and h) or did not think this was necessary (case e). For cases f, g and h it was found that actors united around a shared vision of change, but did not maintain a very open attitude towards other visions. The usage of scientific and policy concepts by key actors and the attempts to keep control of the process by existing actors and actor networks was an issue in multiple cases. On the contrary, in the case of Brussels (case c) the BSI is explicitly working to establish a fully-fledged learning community by engaging in (self) organised reflexive learning in different policy fields. By setting up formal organisations (case b and c) or by funding projects and programmes (cases f, g and h) actors also took actions that enabled self-organised learning by making individuals responsible for this.

4.6.3 Boundary arrangements

The cases provide a distinction between three types of boundary arrangements: institutions formalised in different ways (cases b, c and d), programmes or projects (cases a, f, g and h) or site visit events (case e). Most cases aimed to make a connection between actors that up to then would hardly work with one another. In cases a, b, c, and d there were formalised cooperation between scientists and public authorities and policy learning through more or less structured processes, while the case of Scotland (d) shows the contextual elements facilitating these interactions. In case e, urban planners travelled to learn in the Netherlands what they could improve in their own territories. Implementing the lessons from these activities in policies, leading to actual change or learning proved very difficult, and the results were mixed. In case f, case g and case h it was explicitly attempted to change existing policies and enable new ones. In all the cases, arrangements for communication were established. Nonetheless, the cases were not necessarily successful in having a short-term impact in terms of policy change, although there were some incremental changes, notably in cases d, f, g and h. The different actors mostly remained in their own networks and the process managers and facilitators struggled to enable synergies to emerge that would enable policy change (cases c, e, f, g and h), whereas case d showed that the way

the Scottish Government is structured and internally organised is a relevant variable to facilitate these dynamics.

4.6.4 Anchoring of trans-territorial knowledge

In all cases, knowledge from outside the territories became part of the territorial knowledge and learning processes. The anchoring of trans-territorial knowledge was explicitly present in cases f, g and h in which concepts and visions were introduced, workshops were organised, and policy recommendations and frameworks were developed. Trans-territorial knowledge was also partly anchored in cases a and c, in which scientists worked with actors from practice because the scientific community itself surpasses individual territories, while, in case e, the scientific community organises to engage locally. Although in case e individuals across territories exchange and discuss lessons learned, the participants in the policy tourism case mostly were not able to anchor the acquired knowledge 'at home'. In the other cases, some trans-territorial knowledge found its way to territorial development practice, but this did not fundamentally change existing practices and policies because the anchoring activities did not lead to a profound change in the culture of territorial development and territorial innovation policies.

4.7 Reflections

In this chapter, a knowledge, learning and adaptation-oriented approach was introduced to explore the characteristics of territorial innovation that are based on a more realistic understanding of policy and governance, and on how policy change can (partly) be based on knowledge and learning. This provides an alternative to existing ideas about science 'speaking truth to power' (a common misinterpretation of Wildavsky, 1979; see Dotti & Colombino, 2018 for further discussion) or 'evidence-based policy-making' (Bambra, 2013; Solesbury, 2001), which are of limited use to understanding policy learning in territorial innovation because they oversimplify the relation between knowledge and learning as well as between science and policy.

Based on the case studies, it is concluded that the concept of knowledge governance is useful as a theoretical lens for understanding policymaking challenges, specifically because it provides a framework for understanding how knowledge and learning relate to policy change. Nevertheless, the 'territorial knowledge governance' approach is only a theoretical framework, not yet an explicit policy practice. Actors in the studied cases did not explicitly adopt this new mode of governance, though many elements are implicitly in common. The knowledge governance characteristics that were derived from theory were relevant and applicable; especially the characteristics of transdisciplinarity and 'self-organisation and reflexivity' were at best only partially implemented in the cases.

This raises the question of whether they are too ideal-type to be realistic, considering the complexities involved in changing existing habits, cultures, practices and attitudes of policymaking, and because of the need to include the situated agency (Bevir, 2004) and path dependencies of knowledge governance practice with the implication that a 'one-size-fits-all' approach is not realistic. The first step towards an empirically grounded knowledge

governance is to identify the pathways to collectively acting in a reflexive, transdisciplinary and self-organising manner by which trans-territorial knowledge is anchored in territorial innovation policy and policy learning. For this purpose, a fundamental variable to be further explored is time. The articulation of territorial knowledge governance over time is an open issue for further reflection. For the time being, it seems clear that territorial knowledge governance cannot be limited to single events in time (e.g. a research project, a policy consultancy, a single event), but should be articulated in multiple steps such as articulated research-policy programmes.

The last issue that was derived from the case studies is the temporary or formalised institutions that govern and enable knowledge and learning processes. Implementing and managing such institutions is very complex and challenging, and it is known that many territories do not have the resources and capabilities to do so. Incorporating linkages to trans-territorial knowledge and anchoring the knowledge in projects, programmes and policies make it even more complex because it is developed in other contexts that are not necessarily meaningful to a specific territorial innovation process. Therefore, a better understanding of specific and situated knowledge governance arrangements is required to enable the emergence of such a knowledge, learning and adaptation-oriented approach to territorial innovation policy.

Chapter 5

Beyond the blind spot of knowledge-based territorial development: the mission of metropolitan food clusters

Abstract

The rise of knowledge-based territorial development has been fuelled primarily by aspirations of competitiveness and wealth creation. Another upcoming ambition is that of sustainability, not only as an accompanying goal but also as a core mission driving territorial initiatives such as clusters development. This chapter explores mission-driven clustering along theoretical and empirical lines. The chapter starts by discussing a basic heuristic model intersecting the three concepts of 'mission', 'knowledge' (distinguishing 'substantive' and 'significant' knowledge) and 'governance'. This leads to an analytical framework for territorial development focusing on 1) mission formulation, 2) production and exchange of knowledge in supportive milieus, 3) embedding of substantive knowledge, 4) anchoring of significant knowledge, and 5) feeding of significant knowledge into the (re) design of institutions and strategies of policy design and implementation. This framework is applied to three cases of 'Metropolitan Food Clusters' to illustrate and test the framework. The chapter shows how especially the continuous anchoring of significant knowledge poses major challenges to knowledge-based territorial development and should be a central issue in future research and policy.

Published as: Gerritsen, A.L., Kranendonk, R.P., Cofino, M., Lagendijk, A., (2018) Beyond the blind spot of knowledge-based territorial development: the mission of Metropolitan Food Clusters. *European Planning Studies*, 72(1), 1-20.

5.1 The rise of knowledge-based territorial development

The economy increasingly has become knowledge-based (Caruso, 2016; Powell & Snellman, 2004; Moulier-Boutang, 2011). This knowledge-based economy is defined by 'the systematic and permanent mobilization of knowledge in order to analyse the result of actions and to design new actions to be undertaken' (Crevoisier & Jeannerat, 2009: 1223). Moreover, in knowledge-based economies '… the design and implementation of new technical solutions and/or new products/services are not intermittent or occasional as is the case in traditional industry, but are ongoing processes' (Crevoisier & Jeannerat, 2009: 1223). Productivity gains are propelled increasingly by 'economies of learning' in an 'economy of variety' rather than economies of scale (Moulier-Boutang, 2011). This implies that work, everyday life and politics are knowledge-based and that knowledge is more important to economic systems than other factors, such as labour or capital (Adolf & Stehr, 2014). This development coincided with the rapid emergence of knowledge management practices and knowledge networks, aiming to facilitate learning and innovation within and between organisations (e.g. Easterby-Smith, 2011). Moreover, in territorial development studies, knowledge became recognised as fundamental for territorial development (Moulaert & Sekia, 2003) and various models of knowledge-based territorial development were developed in which territory functions as a supportive milieu for innovation (Moulaert & Sekia, 2003; Lagendijk, 2006), e.g. clusters, learning regions and innovation systems.

This chapter explores the roles of knowledge in territorial development, going beyond the conventional focus on innovation and competitiveness. In light of global challenges, territorial development is also seen as a core vehicle towards sustainability (Hansen & Coenen, 2015). While sustainability often accompanies primary goals of competitiveness and wealth creation, it is gaining more emphasis, tuning into a mission of territorial development initiatives. Such an orientation, as will be argued, has important consequences for the conception of knowledge. Especially in more epochal accounts embracing notions such as the 'knowledge economy' (Powell & Snellman, 2004) and the 'knowledge society' (Stehr, 1994; Castells, 1996), knowledge seems to emerge as a kind of 'magic fuel' boosting economic development (Dankbaar, 2003). While this thesis would not like to underrate the importance of knowledge, it would take some issue with the rather forceful, singular view of knowledge expressed through such accounts. Knowledge presents a rather multifaceted item, of a heterogeneous kind, imbued with values and intentions, in context-dependent manners. This particularly applies when knowledge is connected to major societal transitions, such as the move to sustainable food production, on which this chapter will focus. Knowledge does not really flow as fuel, but travels through constant translations and manipulations. At each step, human agency plays a role, in the consideration of significance, options and values, in choosing means and ends of knowledge conversion (e.g. Loasby, 2014; Bathelt & Glückler, 2014). Therefore, it is aimed to introduce and discuss various conceptualisations that may help to sharpen the understanding of how knowledge processes occur and how they shape territorial development in light of broader societal needs and ambitions.

Because of the specific role of agency and motives in knowledge processes, it is highly relevant how knowledge processes relate to governmental or governance processes by (networks) of public authorities, businesses, and other actors in relation to

territorial development. Public authorities engage in research, innovation and industrial policies, entrepreneurs cooperate with one another in sharing knowledge and developing information, NGOs pressure public authorities and businesses, and research organisations communicate benchmarks for change and support initiatives of other actors with information. More generally, aspirations to meet broader needs and ambitions – such as sustainability – result in the drafting and enacting of more or less explicit missions of territorial development involving all these stakeholders. Therefore, this chapter will also focus on governance aspects of knowledge-based and mission-driven territorial development.

The broad aim here, therefore, is to expand the understanding of how knowledge and governance processes intersect in a setting of mission-driven territorial development. More specifically, the goal is to highlight which challenges knowledge development faces within a context of sustainable development, zooming in onto sustainable food clusters. To do so, the core nexus between the three core aspects of mission, knowledge and governance (Figure 5.1) will first be explored and an analytical framework will be elaborated. The latter will be applied to three cases of sustainable food cluster developments in India, Mexico and the Netherlands.

Figure 5.1 Heuristic framework of mission-driven territorial development.

5.2 Mission-orientation: sustainable territorial development

In the 1990s, scholars in organisation studies (e.g. Collins & Porras, 1994) noted that organisations formulated missions to develop strategies for their development. Initially, policy and innovation literature dealt with this approach to missions in which missions were '...largely framed in technical terms' (Coenen, Hansen & Rekers, 2015: 484). More recently, a new 'wave' of mission-oriented innovation policy has emerged that interprets missions as 'grand challenges' (Gassler et al., 2008). These challenges '... refer to open-ended missions that require a mix of technological and social innovation, open up for contestation, both

with respect to policy aims and means, and involve new actor constellations that include a larger variety of actors, and consider new roles for traditional actors' (Coenen et al., 2015: 484). These grand challenges '... include problems associated with ageing societies, pandemics, public health, security, global warming and the increasingly difficult access to sources of energy, water and food' (Coenen et al., 2015: 483). This approach to missions has increasingly become the focus of policymakers at various levels (Cagnin et al., 2012), in particular to national and EU innovation policies and to regional development policies.

Many of the grand challenges in this new wave of mission-oriented innovation policies are concerned with sustainable development, 'balanced' with the pursuit of 'competitiveness'. The grand challenges have primarily been associated with structural aspects of innovation systems – such as infrastructure, capabilities, networks and institutions (Coenen et al., 2015). There has been less emphasis on transformative aspects, although some attention has been paid to directionality failures of innovation systems, or the ability to steer innovations towards transitional change (Weber & Rohracher, 2012). A literature does exist in which sustainability is explored from a transition perspective (Coenen et al., 2012: Hansen & Coenen, 2015; Markard et al., 2012). A prevailing conclusion from this literature is that sustainable development, despite strong and persistent commitments, is hard to achieve (Schuitmaker, 2012), because it '... requires structural changes in social-technical systems and wider societal change, in beliefs, values and governance' (Kemp et al., 2007: 78). Directing such a systemic evolution or transition in a desired direction is a highly complex activity in which existing structures or institutions have to make way for the desired activity (Geels, 2002; Loorbach & Rotmans, 2006; Kemp et al., 2007).

While the literature on such transformations in relation to mission-driven territorial development is scarce, the research in this chapter came across different manifestations of mission-driven sustainable development focusing on knowledge in what in this thesis is called 'sustainability clusters'. In these clusters, groups of related companies aim to increase the sustainability of their firms, value chains and territories supported by stakeholders at public authorities, science, society and business. Moreover, knowledge and governance co-evolve with the changes in technical aspects of the relevant sustainability missions (Kemp et al., 2007; Van Assche et al., 2013). Empirically, there is a strong interest in sustainability clusters, as expressed through initiatives to develop the circular economy, in various case studies of industrial symbiosis (Verguts et al., 2016) and Metropolitan Food Clusters (MFCs) (Smeets, 2011; Gerritsen, et al., 2011; Hoes, Regeer, & Zweekhorst, 2012). In these examples of sustainability clusters from these studies, much emphasis is put on knowledge gathering, knowledge sharing, learning and innovation. Therefore, sustainability clusters, as elaborated here, can help to gain insight into how knowledge and governance processes are organised to advance and utilise sustainability missions.

5.3 Knowledge in territorial development

The literature on territorial development employs the concept of knowledge in two basic ways. First, as a production factor, boosted by the emergence of a knowledge-based economy, and, second, as a relational territorial development process, associated with

localised, intensive forms of interaction and coordination (Storper, 1997). In the first meaning, knowledge is often reduced to information or codified knowledge that can be owned, shared and traded as a commodity and can be transferred with relative ease and little cost (Bathelt, et al., 2004; Adolf & Stehr, 2015), thus approximating the notion of 'fuel'. Knowledge as territorial development process stresses the tacit (Polanyi, 1967) and relational (Bathelt, Feldman & Kogler, 2011; Faulconbridge, 2017; Brown & Duguid, 2000) nature of knowledge.

The second interpretation of knowledge as tacit and relational, is particularly relevant for actual practices and processes of transformation. What counts is the epistemic nature of knowledge development, as knowledge is often developed by epistemic networks (Haas, 1992; Cohendet et al., 2014; Dunlop, 2013). Epistemic networks are characterised by a shared mission, stemming from 'a shared set of normative and principled beliefs; shared causal beliefs; shared notions of validity'; and 'a common policy enterprise' (Haas 1992: 3). These epistemic networks rely on established institutions, which will enable them both to strengthen the community as to exploit and commercialise their knowledge (Cohendet et al., 2014).

Tacit knowledge has often been perceived as equal to local knowledge (Cohendet et al., 2014) or local buzz (Bathelt, et al., 2004) that can be diffused because of the geographic proximity of economic actors, enabling knowledge spill-overs and inducing economic development, especially in metropolitan areas (Cohendet et al., 2014). This focus on local tacit and non-local codified knowledge has been criticised because territorial development in fact draws heavily on pipelines to global networks (Bathelt, et al., 2004), both for tacit as for codified knowledge. Moreover, the local knowledge building and global knowledge accessing practices are intrinsically interwoven (Bathelt & Cohendet, 2014), although these dynamics have changed profoundly the last decades, with the buzz often taking a virtual shape in addition to face to face contact (Bathelt & Turi, 2011).

Crevoisier & Jeannerat (2009) have elaborated the complex geographical manifestation of knowledge processes by focussing on the importance of supportive milieus that are both locally autonomous and capable of existing within distant interactions. According to Crevoisier & Jeannerat (2009), the challenge is to connect knowledge from outside the territory and anchor it in local contexts, practices, projects and actor-networks. Embedding is concerned with a movement from the context where it is generated – and embedded – towards a 'new' context (Crevoisier & Jeannerat, 2009). Anchoring is the way 'in which this new knowledge interacts – or not – with its new context' (Crevoisier & Jeannerat, 2009: 1236).

To expand these distinctions, this chapter draws on a recent classification by Crevoisier (2016), which pays specific attention to the way knowledge forms part of territorially embedded systems of meaning. Knowledge, according to Crevoisier (2016), is 'in the air', not only to support local economic activities and improvements, but also as a shared understanding of what is at stake, how to meet pressing challenges and where to go. Central to this notion is a basic distinction between 'substantive' and 'significant' knowledge (Table 5.1). Whereas substantive knowledge is content- and transaction-based, significant knowledge serves to deal with less technical, more politically and personally sensitive issues. Substantive knowledge generally becomes de-contextualized and traded (or protected from trading); it can be disentangled from the organisation or actor controlling or owning

it. Significant knowledge is subject to (re)interpretation and (re)contextualisation within a specific organisational setting, to which it tends to be anchored. Substantive knowledge is spatially embedded through its link to localised owners, activities, capital goods, etc. Significant knowledge is spatially anchored through its connection with communities, systems of meaning and localised processes of identity and strategy making.

Table 5.1 Substantive and significant knowledge. Adapted from Crevoisier (2016)

	Substantive knowledge; (controlled, owned)	**Significant knowledge; (shared, authored)**
Properties	Stabilized, finite, identified, convergent; embodied in functional devices	Evolving, open, divergent; embedded in systems of meaning.
Economic value	Based on the content of the knowledge and its valorisation on different markets (exploitation); based on exclusivity.	Linked to people, communities and/or contexts; based on sharing, diffusion and adaptability.
Concrete forms	Embodied in capital goods (machinery, software, reports, etc.) but also in individuals under the control of firms (salaried experts, for example).	Embedded in personal interaction as well as in objects (papers, scientific articles, books, statutes, exhibitions, etc.).
Evolution	On demand, through investment, specialisation and de-contextualisation.	Continuously transcended through differing interpretations and contextualisation (goal searching).
Actors	Identifiable owner that controls the knowledge	Author (authority), peer or institution that is recognized as a source of knowledge; diffusion towards stakeholders/citizens.
Mobility	Through contractual exchange and quality standards.	Through sharing and subject to the rules (reference points) of the community.

5.4 Governance

Governance bears in multiple ways on mission-driven territorial development practice. Public authorities engage in regional development and technology and innovation policies, such as cluster policies, research policies and – in the European Union – smart specialisation policies. The private sector also engages in governance, by collaborating in innovation trajectories or by innovating alone to establish a competitive advantage. In between, there is much collaboration by universities, companies and public authorities and societal actors collaborate and coordinate all kinds of knowledge-based territorial development processes (Uyarra, 2010; Benneworth et al., 2009; Charles, 2006).

Governance clearly is an aspect of territorial development (e.g. Bathelt & Glückler, 2014). This chapter shares the interpretation of 'governance as a broader process of managing the rules, the patterns of coordination and the complex structures of hierarchies, networks and markets' (Kjaer, 2004: 48-49). Therefore, governance is approached here as a versatile mode of coordination of interdependent activities, involving exchange, organisational hierarchy and self-organising 'heterarchy' (Jessop, 1998). This thesis does not adhere to governance as a synonym for self-governing networks or as a substitute to government (Kjaer, 2004; Driessen et al., 2012). A problem is, however, that the conceptualisation of governance has received little attention in the literature on knowledge-driven territorial development (Ebbekink & Lagendijk, 2013; De Propris and Wei, 2007). When attention is paid to governance issues, this is often limited to simple normative assertions about interventions often at odds with a dynamic approach to innovation. In the words of Flanagan & Uyarra (2016: 178): '...it rarely considers policy emergence and change, the agency of actors in relation to policy and outcomes, and their influence on institutionalisation processes'.

Nevertheless, attention to the governance of knowledge-based and mission-driven territorial development can be found in work on 'cluster governance' (Ebbekink, 2016; Berthinier-Poncet, 2014; Crone, 2009; Bell et al., 2009). Cluster governance has been defined as 'a deliberate plan adopted by a group, institution or government to guide decisions and actions and achieve desired objectives' (Crone, 2009: 3). Cluster governance is conceived of as '... a multi-lateral/-level process of negotiated power, a co-creating partnership between a wide range of cluster stakeholders' (Ebbekink, 2016: 624). Cluster governance thus enables the effective pursuing of missions by interaction, collaboration and collective action (Ebbekink, 2016). Crucially, cluster governance is driven by significant knowledge, articulated, shared and used by cluster-specific epistemic networks through which a shared set of beliefs, notions of validity and a common enterprise are developed (Ebbekink, 2016). Therefore, cluster governance relies on high levels of mental proximity (Sacchetti & Sugden, 2009) between cluster actors.

Cluster governance provides us with an idea of the type of governance activities in mission-driven territorial development. Yet it lacks an explicit approach to what mode of governance it relates to. It is proposed here to see cluster governance as a type of knowledge governance (Gerritsen et al., 2013; Van Buuren & Eshuis, 2010). Central to knowledge governance is the understanding that engaging in knowledge processes and knowledge management activities is a means for coordinative action and societal change (Michailova & Foss, 2009; Stehr, 2005). Knowledge governance takes this a step further and stresses the creation of '…new insights, and innovative solutions which tempt actors to leave traditional insights and practices and get away from inert interaction patterns, stalemate negotiations, and interest conflicts' (Van Buuren & Eshuis, 2010: 284). In knowledge, governance actors deliberately engage in a largely self-organising and reflexive social learning process centred on transdisciplinary knowledge development (Gerritsen et al., 2013). Obviously, this may result in certain more 'established' organisational forms. By setting up tailor-made institutions or boundary arrangements that enable feedback of the produced knowledge to decision makers (Gerritsen et al., 2013). This expands the set of possible actions to decision makers they can consider when taking decisions, potentially achieving a breakthrough in advancing the mission they pursue. Accordingly, knowledge governance draws on

significant knowledge and helps to set in motion activities that produce, exchange and use substantive knowledge that, in turn, enables change. This stresses the processual and transformative aspects of mission-driven territorial development.

5.5 Analytical framework

The second part of the chapter explores the heuristic triad discussed so far for three cases. To do so, the triad is operationalised in five steps, detailed in table 5.2. These steps are:

1. Setting of a territorial development mission,
2. Production and exchange of knowledge in supportive milieus,
3. Embedding of external substantive knowledge,
4. Anchoring of significant knowledge, and
5. Feeding of the acquired significant knowledge into the (re-) design of institutions and governance of (policy) design and implementation.

Steps 1 and 4 are derived from the discussions of missions, step 2, 3 and 4 are related to knowledge, and step 5 to governance. These steps are firstly to be seen as a list of key analytical aspects of mission-driven territorial development. For policy development, they can serve as a first move towards an overarching normative framework.

5.6 Case study set-up and methodology

The stepwise framework developed so far will serve to describe and analyse knowledge and governance dynamics in actual mission-driven territorial development practices. Three cases have been selected from India, Mexico and the Netherlands, which all present manifestations of sustainable food clusters, and notably of 'Metropolitan Food Clusters' (MFC). Notwithstanding, the very different territorial settings of the cases, they are comparable in their mission, in their cluster approach, in the industry (food) and in their knowledge and governance processes. MFC is a concept that aims for the sustainable development of the agrifood industry by increasing resource use efficiency, co-locating food companies, increasing yields, adding value to it and improving value chain integration (Smeets, 2011). The mission of MFC is to increase food security in metropolitan environments while also decreasing the environmental pressure per unit of food by increasing resource use efficiency. This concept and the related practices constitute an excellent example of mission-driven and knowledge-based territorial development.

The case information has been derived from a secondary analysis of notes, logs, interview data and especially technical reports produced in different contract research projects. Much information has been acquired through the direct involvement of authors in developing MFCs. This involvement included participatory observation, advice and knowledge-based interventions to change the territorial development process. This enables the understanding of the meaning and context of the territorial development processes in these cases and to use these insights for theoretical conceptualisations. To

prevent perception bias, the analyses were done in collaboration with a researcher who was not directly involved in the case. In the case descriptions below, the knowledge, related characteristics (2, 3 and 4) are taken together.

Table 5.2 Analytical framework for mission-driven territorial development

Steps	Description
1. Setting a territorial development mission	The starting point is an exploration of the socio-economic and political context, of what mission is formulated regarding (sustainable) development, with what broad set of governance interventions.
2. Production and exchange of knowledge in supportive milieus	Territorial knowledge processes initiated to advance missions require supportive milieus that are self-organising, focusing on social and reflexive learning and on transdisciplinary knowledge production. Key questions are how such milieus are constituted, how they produce and exchange substantive and significant knowledge, and how they connect with external knowledge sources.
3. Embedding external substantive knowledge	Substantive knowledge from outside of the territory is infused in the mission-driven process. A key question is how the external substantive knowledge is transported, transformed and embedded within internal territorial development processes. Of particular interest are the practices and projects of the embedding process and the role of the supportive milieu.
4. Anchoring significant knowledge	The developed and acquired knowledge is anchored in the territorial process. Key questions are how a shared understanding is created of the strategic needs for territorial development, as form of 'significant knowledge', how this knowledge is grounded in the territory, and to what extent it is derived from visions that were developed elsewhere. Again of interest are the practices and projects bearing on the anchoring process.
5. Feeding the acquired significant knowledge into the (re-)design of institutions and strategies of policy design and implementation	Significant knowledge generally warrants institutional change to be effective. This draws attention to the boundary arrangements enabling institutions to learn and adjust policies from the knowledge emerging from supportive milieus. It is of particular importance what arrangements and practices are used to bridge supportive milieus to decision-making networks and arenas.

5.7 Case studies of sustainable food clusters

5.7.1 Greenport Venlo

Setting the mission

Greenport Venlo is a horticulture cluster in the southeast of the Netherlands. It hosts 11,500 companies who produce, trade and process vegetables, fruits, mushrooms and decorative plants, mostly for the nearby Ruhr-Area in Germany. The cooperative 'Royal ZON Fruit & Vegetables' coordinates the trade and logistics of the produce at a dedicated business park near the city of Venlo. Since 2005, the cluster has the status of a 'Green Port' in regional and national policies, recognising its national importance to the national economy.

In the 1990s, the horticulture cluster came under societal pressure to reduce its environmental impact, such as high-energy use and damage inflicted on nature and landscape. They responded by engaging in an innovation-based approach that aimed at increasing both sustainability and competitiveness of the firms and the regional economy (Laurentzen, Kranendonk & Regeer, 2009). At that time, the horticulture cluster was considered relatively competitive, but the cluster companies, associated regional organisations, and public authorities decided there was a need to reduce production costs, optimize logistical practices, increase the efficiency of the production process and add more value to the produce. Moreover, cluster stakeholders aimed to establish closer relations with the consumers and the inhabitants of the Venlo region. The strategy to boost sustainability and competitiveness was to support the development of sustainable innovations by creating linkages between horticultural production, logistics, nature and landscape, and society, also in relation to intensive livestock breeding and feed production in the region (Laurentzen et al., 2009).

Mission and strategy prompted a wide range of projects and initiatives, with at first, limited coordination and alignment between them. After some years, cluster stakeholders decided to concentrate their investments on a selection of most-promising innovations. This received a further impulse in 2012, when Venlo became the site for the organisation of the 10-yearly Floriade world horticulture exhibition. The Floriade was expected to give a major boost to cluster development, and especially to its sustainability, competitiveness and image (Laurentzen et al., 2009).

Engaging in knowledge processes

The cluster invested strongly in a variety of knowledge processes. After 2000, the province of Limburg, the municipality of Venlo, a representative of the entrepreneurs in the cluster (KnowHouse), and two universities applied successfully for the four-year project 'Streamlining Greenport Venlo' under the national TransForum innovation programme for sustainable agriculture (2005-2010). In this project, cluster stakeholders would develop a more concrete mission that would lead to a more focussed territorial development and cluster strategy.

Applying for TransForum funding and status also meant that extra-territorial knowledge was brought into the territorial knowledge process. Through its network, TransForum was a source of both substantive and significant knowledge on sustainable agriculture, consumer

demands and the governance of innovation processes. Moreover, TransForum demanded from its projects to share knowledge with other projects. This resulted in the circulation and adoption of novel learning-oriented concepts, such as 'transdisciplinary knowledge', value creation and working in networks, and sustainability concepts, such as 'Cradle2Cradle' (Kranendonk & Kersten, 2011). Such exchange was supported by a new applied research programme for the Greenport Regions funded by the Dutch Ministry of Agriculture, Nature and Food Quality.

The TransForum project triggered intensive deliberation between entrepreneurs, regional civil servants, politicians, and representatives of research and education. They discussed the possibility to develop a stronger 'regional profile' to strengthen the cluster's vision and mission. During the project, the participants invested in getting to know one another and exploring common interests. Various experts supported this learning process, e.g. by sketching visions for the future of Greenport Venlo, by reflecting on the process, by explaining new concepts and by organising excursions (Kranendonk & Kersten, 2011). Participants were constantly pushed to look for new opportunities and perspectives. Researchers and other key participants regularly explored and shared new concepts and perspectives, notably concerning sustainable landscape design, quality of life, and resource efficiency. The regional organisation KnowHouse forged interactions between local businesses and individuals and organisations from outside the region. These activities aimed to embed the new substantive (concerning sustainability innovations) and significant knowledge (concerning the visions for the future and the Greenport Venlo mission) in the cluster activities. The collaboration with universities also resulted in initiatives towards EU funding and other funding possibilities.

The activities of the TransForum project produced a shared strategy, an implementation plan and an organisational strategy. In 20009, plans and strategy were submitted to, and endorsed by, the regional political leaders (Kranendonk & Kersten, 2011). The focus then shifted from learning and developing significant knowledge to coordination and implementation, building more on substantive knowledge. The latter focused on three distinct processes:

1. 'The basics', meaning the land development for the exhibition area of the Floriade 2012 expo and the development of a new business park;
2. 'Innovation', focussing on the attraction of new industries and economic activities and new business case development, and
3. 'Quality of life', aiming to improve the attractiveness of the region for its inhabitants and workers.

Feeding the significant knowledge into institutional and policy redesign

The separation into three processes led to the setup of distinct organisational structures and networks, each elaborating their own targets. The innovation process became focussed on business-driven innovation, but the other two shifted to marketing activities, financial revenues and solving regulatory issues. Each process communicated its own aspirations and progress. The exchange and interplay between the three processes had little priority; researchers were side-lined. As a result, the overarching significant knowledge developed

earlier was partly lost. Various conflicts emerged on what actors and which processes should feature how in the development of the Greenport Venlo cluster. The programme suffered, in other words, from a lack of anchored significant knowledge. After the ending of the TransForum programme (2010) the Floriade exhibition (2012), Greenport Venlo entered a stage of stagnation. Compounded by the general economic downturn, the horticulture industry faced a crisis and many of the installations built – including the landmark office tower 'Innovatoren' – became (partly) vacant.

In sum, the development of Greenport Venlo shows a rather mixed picture. The status as a national Greenport, the establishment of an associated national research programme, the selection as site for the Floriade and the inclusion in the TransForum programme all fostered institutional change. While this resulted in many knowledge and mission-related initiatives, a significant core failed to materialise, and the interest from policymakers and other actors waned. Not all was lost, however. Some important ideas and practices developed under 'Streamlining Greenport Venlo' were revived, for instance, in the recent establishment of the Brightlands Campus (materials, health, and food) at the former Floriade exhibition area.

5.7.2 Metropolitan Food Cluster Mexico

The mission

The Mexican state of Aguascalientes is home to agrifood companies of national importance, including cheese factories, vegetable and livestock processors and logistical firms. However, the sector's development is threatened by water scarcity as a result of both droughts and excessive depletion of the available water resources (Van Mansfeld et al., 2012). The problem is compounded by the fact that most of the land is used for water-intensive forms of agriculture, such as extensive livestock production and arable farming, while the suitable climate for greenhouse production is underused. Another issue is the low value added to agricultural produce and the dependence on the import of agricultural produce.

Mexican actors from government and business jointly decided that there is a need and potential to increase the productivity of Mexican agriculture, cutting imports and increasing added value. Moreover, it was recognised that an expansion of agricultural production called for a more sustainable production in terms of reducing water use. These challenges were addressed by a national government-led investment fund, endowed with the mandate and the means to experiment with promising innovative approaches to agriculture, such as dedicated agricultural business parks, such as a first 'agropark' consisting of clustered high-tech and water-efficient greenhouses that was developed in 2006 in the state of Querétaro. The investment fund found the state of Aguascalientes prepared for collaboration in engaging in innovative approaches to the development of the agrifood sector.

Engaging in knowledge processes

The government-led innovation fund saw the concept of MFC as an inspirational approach and conceptual framework to address sustainability challenges alongside boosting agriculture. A project was set up to explore how the concept could be implemented and what its feasibility would be, led by the investment fund and the state government in collaboration

with a team of academic consultants from the Netherlands, supported by Dutch technology providers, the embassy of the Netherlands and a Dutch government agency.

The introduction of the MFC concept was used by the core group of Mexican and Dutch actors to align the sense of urgency and the ambition for change among Mexican stakeholders. In workshops and during site visits to local companies, a shared vision and mission were created (Van Mansfeld et al., 2011). As such, significant knowledge was developed to enable 'leapfrogging' with the help of business investments. To advance this shared vision, feasibility studies were conducted to explore the level of interest among private parties and possible opportunities for increased resource use efficiency through clustering. The studies encouraged entrepreneurs to explore opportunities that arose from the use of advanced technologies in their own companies, and to discuss possibilities for business-to-business collaboration. Consequently, the technological innovations proposed in the cluster went far beyond the concept itself and stretched deeply into the dynamics of individual companies and value chains.

Following the feasibility studies, first drafts of a conceptual master plan for an MFC were created, including a vision on state-wide developments and the designation of zones for the development of key MFC components, including agroparks, consolidation centres and rural transformation centres (see Smeets, 2011). The conceptual master plan was again the result of an interactive process of stakeholder involvement, mainly through workshops. To enhance inspiration and to develop a shared understanding, site visits were organised for Mexican stakeholders to examine good practices in the Netherlands (Van Mansfeld et al., 2011). This knowledge exchange promoted the local embedding of both substantive (on sustainability innovations and business opportunities) and significant knowledge (the MFC vision for the Mexican food cluster). This fostered a mutual understanding of strategic needs. One of the key outcomes was that, in the Mexican context, agribusiness companies, the state government and academics were brought together, which traditionally keep a distance from each other. Moreover, efforts were made to establish business-to-business, government-to-government and university-to-university connections between Mexico and the Netherlands.

However, the initial momentum of mutual understanding, exchange and vision did not hold. A temporary standstill occurred as a result of a one-year 'halt', in which the government was acquiring land for the project in one of the areas indicated in the feasibility study. This resulted in the appropriation of 280 ha from 250 landowners, done in secrecy to prevent the risk of land speculation. Moreover, the government wanted to set up the MFC in public-private partnership (PPP), and that required much time and effort, because the state government was only allowed to participate in PPP through a concession agreement using a so-called 'special purpose vehicle'. Moreover, the state government was only entitled to hold the newly acquired land rights for a year, after which they had to be transferred to a private party, which put major pressure on the process.

Feeding the significant knowledge into institutional and policy redesign

The delay and associated troubles had a serious impact. Many entrepreneurs participating in the vision left the process because the project did not meet their own timelines. Newly interested entrepreneurs and new stakeholders came in, but these tended to

bring in their own agenda. Attention shifted form innovation and sustainability towards profitability. Moreover, because of the increasing role of local context, notably regulatory issues, the project assistance was transferred from the Dutch academic consultants to a local engineering firm primarily focusing on the construction of the agri-business park. Consequently, the project continued largely based on substantive knowledge, while previously accumulated significant knowledge was no longer shared among all participants.

However, not all was lost. Some knowledge reached out when the MFC approach became adopted in the national policy context. In collaboration with the federal government, the investment fund also applied the developed approach in the states of Nayarit and Chiapas. Meanwhile, the federal government embraced MFCs as a corner stone of its national food policy by designating a 'National System of Agroparks'. This framework heavily built on substantive knowledge and selection criteria and did not include the significant knowledge that was developed in the Aguascalientes project. In Aguascalientes itself, the conceptual generic master plan was finalized in 2014, providing the stakeholders with the framework for the future implementation of the MFC vision. At present, the actual implementation in Aguascalientes is yet to happen, but concrete steps have been made, such as the acquisition of land and the transfer of the land to an established special purpose vehicle.

5.7.3 Greenport Nellore

The mission

Although the majority of all inhabitants of the Republic of India are dependent on agriculture to make a living, its contribution to GDP is much lower and steadily decreasing. While India is an agricultural exporter, the country also remains very dependent on imports of processed food, due to fragmented land ownership, outdated logistical and processing infrastructure, the large percentage of perishable produce that ends up as waste, and the little value is added to the produce. Agriculture is also causing high environmental pressures, for instance by using pesticides and by depleting water sources.

Key actors from government and businesses in the south of India concluded in 2007 that there was sufficient potential to improve conditions in agribusiness (Smeets, 2011). The State of Andhra Pradesh hosts relatively high-productive farms with opportunities to increase productivity and sustainability. Moreover, some of these firms add value by processing food commodities and exporting them. The Indian Farmer Fertilizer Co-Operative (IFFCO) had approval of the state to develop a site of 2,800 acres of land near the city of Nellore. Plans were developed to establish an agricultural special economic zone (SEZ) at this site, to enable the development of a modern, export-oriented agriculture. The Metropolitan Food Cluster (MFC) concept was adopted as a promising concept for the SEZ and for meeting the regional ambition to push the competitiveness of the Indian agribusiness industry and to improve conditions for smallholders.

Engaging in knowledge activities

From 2008 onwards, a series of projects started that would lead to a generic masterplan for 'Greenport Nellore'. Next to Indian actors, these projects included academics, consultants and entrepreneurs, mostly from the Netherlands. The Dutch embassy supported the

collaboration and the Dutch innovation programme TransForum enabled a close monitoring of the cluster development. First, a partnership was sought with a private infrastructure developer interested in developing food-based business parks. This collaboration was not formalised, however, because it was deemed too sensitive for a private firm to benefit from land owned by local farmers.

The Greenport Nellore initiative started with the exploration of the MFC concept as a viable proposition under local conditions and context. This also included the addition of novel elements to the concept, such as Rural Transformation Centres that would function as satellites to the agropark. Meetings were held with private and public actors who were keen to pursue change of the agribusiness sector through adopting the MFC concept (Gerritsen, et al., 2011). Studies where carried out to discover what would be possible and feasible at Nellore and the surrounding area, what would be needed for park management and under what conditions, investors could be attracted. To do so, the knowledge on greenhouses from the Netherlands was applied and adjusted to the hot and dry conditions of the South-Indian climate. Entrepreneurs participated in the planning phase exploring business opportunities and elaborating realistic assessments of key estimates such as scale of business operations. Public authorities and societal actors were consulted and informed at the state and national level. Process facilitation techniques, network meetings and joint excursions were used to enable actors to detail and discuss needs and options and share insights with others (Gerritsen, et al., 2011). All this had a bearing on the masterplan, which included significant knowledge on the direction agriculture, agribusiness and particularly logistics needed to take and the commercial development strategy for the MFC.

Regular discussions also took place between IFFCO, the project infrastructure developer, and associated consultants and academics. This resulted in decisions on what to include in the MFC and how to develop the land, especially regarding landscaping, water storage and water use. Some differences in understanding remained, especially concerning whether the business activities would be export-oriented or serve local demand, and about the importance and content of sustainability.

The result of these activities was a generic masterplan for the agropark and its surrounding rural transformation centres, envisaging dairy and meat production, green houses, facilities for dairy cows and chickens, a rice mill, a power plant, processing industry, R&D activities, exhibition facilities, and a residential area (WUR & Yes Bank, 2010). In addition to the master plan, business models were explored, supply and demand analysis was conducted, an education and training strategy was established, and a geographic decision support system was prepared to kick-start the development.

Similar to the previous cases, the project's fate turned when the generic masterplan was implemented. The implementation was coordinated by a newly establishment business unit of IFFCO, whose employees were less acquainted with the significant knowledge developed so far. The unit contracted a local engineering firm to implement the masterplan, with again little knowledge of the previous process. The activities increasingly were directed towards engineering issues, such as designing and building infrastructure, a boundary wall, water storage, etc., and less towards organisational and social innovation issues, such as business models (Gerritsen et al., 2011). Therefore, the focus shifted from significant knowledge towards substantive knowledge directed towards engineering. With the

termination of the cooperation with the project infrastructure developer, most know-how on how to develop and manage business parks was lost.

Another issue was that not all stakeholders who had been involved in the initial talks became owners of the mission, while some of the later entrants had had no involvement at all. Although some interaction was established with the Union ministry of commerce, national government was mostly not connected to the cluster development (Gerritsen, et al., 2011). Local IFFCO cooperatives were largely not included in the process. Surrounding villages became increasingly opposed towards the SEZ, which was increasingly framed as a hostile takeover by large enterprises of an area that was previously mostly used by small landowners and livestock farmers.

Feeding into institutional and policy redesign

Despite limited reach and growing opposition, Greenport Nellore developed a shared mission resulting in the acquisition of resources such as land, funding, political support, a connection to the national highway, and interest from reputed companies and expertise. This allowed a boundary fence to be built around the SEZ area and infrastructure and facilities to be developed. The expectation of many stakeholders was that, with these steps, the agropark would soon become operational. Much pressure was put on quickly delivering concrete results that would directly benefit farmers, as was also stressed by the then prime minister of the state of Andhra Pradesh. Observed by thousands of people, the prime minister showed his support by laying the ceremonial first stone, which made the development instantly politically relevant.

No prompt results were forthcoming, however. IFFCO was prepared to take up the park management and to co-invest, but the actual business activities were left to the initiative of capable firms. Formal letters of intent were acquired and agreements were reached with a few potential first tenants. However, key requirements to start, such as the SEZ status, the availability of electricity and a connection to the railroad were not obtained, and therefore no business case could be established (Gerritsen et al., 2011). Some pilot projects were initiated concerning maize growing, the set-up of farm mechanisation facilities and for a large-scale dairy farm at the Greenport Nellore site. Although the Ministry of Commerce approved the plans for an agropark as formulated in the masterplan, in 2013 the SEZ Board rejected the plans, because they concluded that the plans did not conform to the SEZ Act. Thereafter, trust from partners and local stakeholders eroded and actual development is yet to take off.

5.8 Conclusion

Mission-driven territorial development focusing on sustainability requires modes of governance steering the absorption, development and application of knowledge. This chapter argues that such initiatives build on 'significant knowledge', locally anchored 'intelligence' on how to develop a territory. Analysis should focus, accordingly, on the characteristics and potentials of knowledge-based governance processes in mission-driven territorial development. The specific goal here was to understand, conceptually and empirically, the challenges sustainable food clusters meet in knowledge development and

application. To do so, the chapter elaborated a five-step analytical framework, consisting of 1) mission formulation, 2) production and exchange of knowledge in supportive milieus, 3) the embedding of substantive knowledge, 4) the anchoring of significant knowledge, and 5) the feeding of the acquired significant knowledge into the (re) design of institutions and strategies of policy design and implementation. The framework was applied to three cases of sustainability clusters from the food sector: Greenport Venlo, MFC Mexico and Greenport Nellore. The case studies revealed the challenges faced by sustainability clusters, illustrated how governance and intelligence worked in practice, and how the project evolved from conception to implementation with the help of external experts.

With the analytical framework, crucial issues could be identified. The application of the framework illustrated that while initial ambitions were high, the cases revealed serious tensions notably in the phase of implementation, due to vested interests, ideas and habits. It turned out to be difficult in particular, to reach a sufficient alignment and embedding of significant and substantive knowledge. Consequently, contributions and views of important stakeholders were excluded, while projects centred mainly on technical issues rather than the social and institutional aspects of sustainability and economic development missions. Each case illustrates how accumulated significant knowledge became side-lined, and how stakeholder networks changed their constitution. At that stage, most of the available resources were directed towards developing substantive knowledge to implement more technical aspects of the vision. The lack of anchoring of significant knowledge caused conflicts and disappointments to emerge blocking further institutional redesign and development. On the positive side, the diminished attention to significant knowledge enabled certain actors to implement specific parts of the mission, such as hosting the Floriade exhibition, building a wall and setting up a special purpose vehicle.

It is concluded here that harvesting the benefits of knowledge and governance for mission-driven territorial development proves highly challenging. All cases faced the challenge of maintaining anchorage of significant knowledge to conquer major obstacles and to elaborate the vision of the sustainability clusters obstacles in the face of specific local interests and conditions. Even with the help of dedicated experts and methods for handling knowledge and learning, with connections to extra-territorial knowledge, and substantial local support for sustainability, cluster missions are difficult to achieve. The initial anchoring amongst the main strategic actors did not pose a major problem. It is the anchoring of significant knowledge in everyday structures, projects, rules, cultures, and habits of the cluster network that proves difficult. In these networks, cluster visions and initiatives tend to be co-opted by pre-existing skills and orientations, through which they are tactically and opportunistically tweaked. Vital steps such as mobilising private investments, aligning policies of different government agencies, maintaining a focus on sustainability innovations and forging enduring cluster relations can then become insurmountable hurdles for the implementation of sustainability missions.

Accordingly, in research as well as policy, more work needs to be done on how missions can be implemented effectively in highly complex settings in which stakeholder act from perspectives, habits, capabilities, beliefs and ambitions that tend to oppose the implementation of sustainable territorial development missions. It is expected that the analytical framework developed here can be of use for this.

Chapter 6

Changing economic governance: the case of sustainable development of greenhouse horticulture in the Netherlands

Abstract

This chapter analyses the knowledge and governance practices of economic actors as a means to foster sustainable development. It starts from the constantly changing nature of capitalism, partly in response to its own deficiencies, and partly due to the rise of new technological, organisational and institutional capabilities. Two shifts are particularly pertinent here. The first one is the transition from industrial capitalism to knowledge capitalism (Caruso, 2016). While industrial capitalism also heavily relies on knowledge for product development and marketing, knowledge capitalism is fuelled by an order of knowledge in which the way capitalist forms of innovation and production are organised themselves are subject to knowledge processes. The second shift entails the alternation between market and institutional logics. Market logic places economic value in a competitive setting up front. Institutional logic starts with roles and values such as in sustainable development, thus framing the scope and meaning of market competition and economic values. The two dimensions, industrial vs. knowledge capitalism and market vs. institutional logics result in a matrix in which four basic types of economic governance are distinguished: 1) chain coordination, 2) sectoral innovation systems, 3) reflexive management and 4) value-based management. While these types are archetypical, they can be recognised in dominant forms of economic governance as evolved over the last century. To illustrate this, the four types are applied to the case of sustainable development in greenhouse horticulture in the Netherlands. It is found that knowledge capitalism and its institutional type of governance, value-based management, does not replace other types of economic governance, but interacts with sectoral innovation systems, value chain coordination and reflexive management. Therefore, the path dependencies and historical aspects to knowledge and learning-based forms of governance that pursue sustainable development need to be paid sufficient attention when discussing governance options for sustainable development.

To be published as: Gerritsen, A.L., Lagendijk, A, Groot, A.E., Nieuwenhuizen, W. (to be submitted). *Changing economic governance: the case of sustainable development of greenhouse horticulture in the Netherlands*.

6.1 Introduction

Sustainable development is a major societal, economic and policy issue, which receives much attention and traction, especially since the publication of the Sustainable Development Goals (United Nations, 2015). Sustainable development touches on issues or transitions such as climate change, life on land and water, poverty, and responsible consumption and production and is increasingly regarded as an economic and territorial development issue (Coenen et al., 2015; Hansen & Coenen, 2015; Kebir et al., 2017). Moreover, from a territorial-economic perspective, sustainable development is related to the competitiveness of firms, the public image of firms and the development of new (niche) markets. To work in this context, a key concept to elaborate and apply is that of 'values' (Porter & Kramer, 2011).

Yet, although the importance of values such as sustainability has been addressed in both business studies and economic geographic literature on knowledge and institutions (e.g. Kebir et al., 2017; Hansen and Coenen, 2015), the economic aspects of sustainable territorial development and how coordination is achieved between actors, is still a novel research area and is in need of further conceptualisation, especially concerning knowledge and governance (Flanagan & Uyarra, 2016; Gerritsen et al., 2018). This warrants a more fundamental understanding of capitalism and its dynamic nature, because this provides the context in which sustainable development has emerged and will develop further. In particular, the transition from industrial capitalism to knowledge capitalism (Caruso, 2016), in which the role of knowledge and human sensibility in the labour process intensifies profoundly (Scott, 2013), is a relevant development. In knowledge capitalism, knowledge, ideas and values have become much more at the heart of the economy than before. Accordingly, knowledge and learning have become much more central to governance processes and therefore knowledge governance has been proposed as a distinct mode of governance, in addition to the triad of markets, hierarchies and networks (Gerritsen, Stuiver & Termeer, 2013; Michaelova & Foss, 2009; Van Buuren and Eshuis, 2010). Moreover, the nature of knowledge in these governance processes shifts from technological knowledge to strategic-reflexive knowledge, or significant knowledge (Crevoisier, 2016) in which values play a central role (Porter & Kramer, 2011, Gerritsen et al., 2018).

This chapter presents a theoretical and empirical assessment of how sustainability, as a critical value aspect of economic development, evolves 1) as a part of emerging 'knowledge capitalism' and 2) through the increasing importance of societal values, in addition to utilitarian values, against the background of the changing nature of knowledge and its supporting institutions. The basic premise in this chapter, is that the economy can be characterised as an intermingling of different types of economic governance which, partly based on ideological and epistemic grounds, cope in different ways with the promotion of market development, the safeguarding and pursuit of values (distribution of wealth, sustainability, balanced territorial development), and knowledge. Hence, although knowledge is becoming more central to economic governance processes, other types of governance and their institutions remain in existence and remain influencing these initiatives. Firstly, this will be explored theoretically and then empirically in a case study on the emerging issue of sustainability in greenhouse horticulture in the Netherlands.

6.2 Four modes of economic governance

Through history, capitalism has constantly changed, partly in response to its own moments of crisis, and partly due to the rise of new technological, organisational and institutional capabilities. Two shifts are particularly noteworthy. The first one is the transition from industrial capitalism to knowledge capitalism (Caruso, 2016), prompted by the rise of management and cognitive sciences, and digitalisation. While industrial capitalism, as developed in the 19th century, also heavily relied on knowledge and learning for product development and marketing, knowledge capitalism is fuelled by another order of knowledge (Caruso, 2016). Under knowledge capitalism, the way capitalist forms of innovation and production are organised themselves are subject to knowledge development and application. Instead of an occasional input into technological-organisational improvement, knowledge presents a continuous, strategic stream at the heart of economic activities (Ascher, 2001; Foray, 2004; Crevoisier & Jeannerat, 2009). In terms of Crevoisier (2016), it is especially 'significant knowledge', embedded in strategic networks and shared missions, rather than substantive knowledge, fuelling development.

The second shift entails the alternation between market and institutional logics. Market logic places competition upfront, within a predefined understanding of the basic institutional operation of a market (Needham, 2006). Economic values are limited to individual, subjective values, as expressed through preferences, with roles of firms and organisations meeting those preferences in competitive settings. Institutional logic starts with social values, as inscribed in market institutions, with a more open, and associational perspective on roles in the economic system (Correljé, et al., 2015). Market subjects, buyers, sellers and regulators, as well as other societal stakeholders then frame the scope and meaning of market competition and market values. While market logic sees commodification and growth as given ambitions and competition as the default mode of organisation, an institutional logic permits the creation of more complex arrangements and goals, in line with the school of 'Old Institutional Economics' (Hodgson, 1988). A key difference, but also dilemma, is that institutional logic allows for a more fluid transition between competitive and 'organised' market spaces, whereas market logic adheres to a crisper definition and operationalisation (regulation) of competition (Groenewegen, 1994). The recent re-appreciation of social values, fuelled by concerns about inequality and sustainability, have rekindled the interest in the institutional dimension of market development and the role of values.

The two shifts result in a matrix yielding four basic types of governance of economic systems. While these types are archetypical, they help to shed light on how economic governance has evolved in practice over the last century, as we will also show in the following empirical part. In each of these types, knowledge and learning are of a different nature, and play different roles in processes of economic governance, as we will discuss below.

Table 6.1 Modes of economic governance

	Market logic	Institutional logic
Industrial capitalism	1. Chain coordination	2. Sectoral innovation system
Knowledge capitalism	3. Reflexive management	4. Value-based management

6.2.1 Chain coordination

Market logic under industrial capitalism is primarily concerned with the organisation of the (economic) value chain from raw materials and inputs to the final product and its market valorisation. The key factor of chain coordination, is efficiency in light of market-driven demands for coordinating and reaping the benefits from transacting, investing and learning, as elaborated through 'Transaction Cost Economics' (Williamson, 1985). Where market coordination fails to deliver, for instance because of the need to protect knowledge investments and coordinate learning processes, other forms emerge, such as vertical integration (business formation) and contractual networking. In brief, vertical integration has given rise to the historical growth of industrial capitalism, dominated by corporate organisations, while contractual networking has fuelled the recent proliferation of the more flexible and diverse 'network economy' (Dicken, 2015). When considering how markets can be developed through certain forms of knowledge (for instance geared to sustainability), one should bear in mind two key aspects of (Williamsonian) market logic. First, the coordination of knowledge processes is captured either fully external to the market (exogenous, pre-competitive), or as part of the transactional process. In the latter case, one can see a shift in which improving contractual and entrepreneurial skills allow for firms to capture risks incurred by innovation and knowledge development (such as leakage of knowledge and benefits) through networking rather than full vertical integration. (Langlois, 2007). Second, the basic logic and norm behind chain coordination is that of efficiency, as conveyed by the calculation of opportunity costs. As a norm, the insistence of efficiency requires markets to function in line with expectations on adequate calculations of costs, appropriate rules and institutions concerning free market entry, legal enforcement, etc. Continual 'market structuring' (Needham, 2006) is geared to make markets perform in line with this norm, remedying suboptimal calculative practices, ineffective regulation and 'distorting' business strategies. Importantly, and different from the next type, interventions at the institutional level are primarily and principally geared to uphold market logics, setting the 'rule of the game' for competitive ('free') market behaviour', plus coordination and financing of pre-competitive technology development.

6.2.2 Sectoral innovation system

Market logic may go a long way in promoting productivity and innovation, but it also manifests clear limitations. The initiation and coordination of knowledge (as part of innovation) is confined to two institutional options, namely what can be facilitated by current or reconfigured transactions within the value chain (integration of networking), or coordination outside the value chain. Innovation and technology studies, however, have pointed out the significance of

governance involving both the value chain and the broader institutional setting, characterised as the 'innovation system' (Hekkert, 2007). Innovation generally warrants forms of coordination and strategy development encompassing the whole value chain, due to radical uncertainty (Metcalfe, 2005). This is where state-based/related actors (business association, sectoral organisations, and universities) come in as supporter, or even orchestrator, of processes of innovation and transactions. This is especially relevant to more system-wide and radical forms of change, such as in sustainable development and the circular economy.

Such orchestration is based on an understanding of knowledge and value chains from the perspective of 'sectoral innovation systems' (Malerba & Adams, 2014). Rather than considering knowledge development, application and valorisation in either pre-competitive or transactional terms, it presents a system in which parties (from investors in fundamental knowledge up to marketeers) play different, complementary roles. Moreover, it is the system as a whole, rather than individual firms, that amounts to competitive development. Market logic, with its emphasis on decentralised coordination and competition as environmental condition and incentive, thus gives way to institutional logic prefiguring roles, processes and systemic outcomes. The core governance challenge is how, in an evolving institutional infrastructure or 'system' of innovation, knowledge is created, tested, adapted, relayed, extended and absorbed from the upstream to downstream parts of value chains, in a context which is goal-oriented and mission-driven (Kattel & Mazzucato, 2018). Governance interventions are based on innovation goals, programmes, institutions and projects, with roles and responsibilities assigned to different agents in knowledge and value chains across sectoral and spatial domains, In the post-war period this was primarily oriented towards industrial transformations, such as in agro-food, automotive and space technologies; current emphasis lies more on digital and environmental challenges. While this may involve certain forms of competition (like tendering for research grants), the main forms are strategic agendas and alliances, collaborative networks, cluster programmes and projects consortiums joining research centres, businesses and intermediary organisations, consultants, etc.

The major issue is that, in contrast to market logic, the institutional logic of innovation systems demands a collective form of oversight, coordination and financial support, to shape the associational and collaborative processes (Alkemade et al., 2011b). Due to its systemic character, innovation warrants complex policy and governance interventions, for which little 'proven' recipes exist (Edler & Fagerberg, 2017). Moreover, successful innovation requires a creative exploration of how new technology can meet demand, often in forms yet unknown, in ways that are highly specific to the kind of businesses, markets and territories involved (Sandberg & Aarikka-Stenroos, 2014). Yet, for 'sectoral innovation systems', to go truly beyond the lures of 'technology push', role prescription and continual state nurturing and support, remains a formidable challenge. The lack of national and European innovation policy to truly infuse and diffuse radical technology breakthroughs with global market potential is testimony to this issue (Krieger et al., 2018).

6.2.3 Reflexive management

The rise of knowledge capitalism, presents a way to imbue value chains with innovation and development capacities without superseding market logic. The key is to use strategic

and reflexive forms of knowledge, both qualitative and quantitative ('big data'), to steer and develop value chain development in both its productive and market capabilities and its relational composition. This still involves a kind of institutional challenge, but rather than an orientation to specific roles and relations, the aim is to shape basic prompts to transitions and transformation through forms of reflexive management at (inter)sectoral, value chain and business levels (Burton-Jones, 2011, Loorbach & Wijsman, 2013).

So how to create intelligibility for enhancing and rolling out innovations geared to wealth-creation, sustainability and enduring competitiveness? While this obviously poses a major challenge, fraught with all kinds of political-economic tensions and dilemmas, this presents the key aim of transition thinking, and its governance perspective of strategic niche management (Geels, 2002). Transition thinking includes an institutional dimension, through its focus on stakeholders, interaction and regulations, for instance as part of the transition arena and niche development. However, the approach generally adheres to a market logic. The institutional interventions are geared to upscale niche development, which show the path to an effective transition, to the larger market, to infuse territory-wide (regional to global) change (Droste et al., 2015). Niches present important sites and networks of learning, in which roles and responsibilities of stakeholders can be developed and mutually aligned, and in which new regulations and policies are developed and tested to change basic incentives towards innovation and value chain development. A key outcome, besides a modified institutional and policy environment, is the development of new 'business models' (Proka et al, 2018, Loorbach & Wijsman, 2013).

Therefore, while transition thinking adopts an institutional dimension, which goes further than just addressing transaction costs, it neatly aligns with market logic, albeit in a more reflexive form (Voß, 2014). Institutional and policy intervention is not geared here to constitute roles and interactions at the level of innovation activities and value chains, like with sectoral innovation system, but to providing experimental havens and manage upscaling. This adherence of market logic has its benefits, because of its practical and political conformity, yet, it also has its limits. Most importantly, not all processes of innovation support and regulatory and policy change lend themselves to a 'bottom-up' trajectory. Many niche developments remain too experimental and symbolic to overcome the 'valley of death', to move from pilot and prototype to commercial products (Normann, 2015). More politically, there is also a strategic hurdle, notably concerning incumbent firms. The double role of incumbent firms in niches and transition arenas provides them the opportunity to cherry-pick good ideas and to tactically block policies and regulatory changes that could affect market shares and performance (Smink, 2015). Therefore, while transition initiatives may increase the intelligibility of markets in processes of transition, and may help to create new market opportunities, they often fail to provide the drive and agency to effectuate systematic and lasting change (Bosman & Rotmans, 2016). Despite the drive and energy put into transition policies and projects, the search for intelligibility and reflexivity only yields a limited institutional and political leverage to transform economic sectors. Using knowledge to move to a more sustainable and equitable economy warrants more than reflexive management confining itself to a market logic.

6.2.4 Value-based management

Meeting society's major challenges warrants more than an enriched market logic. It needs an institutional logic of transformation. An institutional logic puts relational aspects first, and subjects market exchange to a careful assessment of where competitive relations are meaningful and effective. The starting point of an institutional approach to economic governance under knowledge capitalism is the collaboration between institutional parties and stakeholders at the level of the value system. In this collaboration, actors engage in 'purposefully organising the development of knowledge in order to deal with societal problems' (Van Buuren & Eshuis 2010: 284). This involves temporary knowledge and learning institutions, characterised by social learning, self-organisation and transdisciplinary learning and specific knowledge diffusion and institutional take-up, crossing the boundaries with decision makers (Gerritsen et al., 2013). The fundamental challenge here is how to orchestrate these knowledge endeavours, not absorbed by market logic, while taking full benefit of market creativity and efficiency.

There is often a tendency in the pursuance of innovations to focus on substantial artefacts, such as technology, while it is especially knowledge as vision or opinions, or significant knowledge, that has the potential to change systems (Edler & Fagerberg, 2017, Crevoisier, 2016; Gerritsen et al., 2018). Such knowledge is generally tactical and contextual rather than technical, anchored in social-institutional networks, and corroborated through extended social and political processes of validation. The institutional setting for creating, fine-tuning and employing significant knowledge is the 'Quadruple Helix' (Carayannis & Rakhmatullin, 2014, cf. Etzkowitz & Leydesdorff, 2000) encompassing public authorities, business, research and education organisation, and civil society organisations. Compared with transition management, stakeholder involvement has to be much wider and more strategic in scope, embracing transformative change through fundamentally altering the perspectives, attitudes and roles of all stakeholders to move towards more environmentally and socially sustainable consumption patterns, supported by citizens that have become committed to sustainable development agendas and values.

The institutional logic suggested here, requires a fundamental change in the role of values. Beyond subjective (individual, organisational) values, this entails sector-wide social and shared values (Correljé et al., 2015; Porter & Kramer, 2011; Taebi et al., 2014). To reverse the hierarchy between market exchange and social collaboration, and to steer knowledge development to infuse that, implies alignment between parties about core values and directions (Crevoisier, 2016). A shared and evolving value basis guides the shaping of institutional logics and roles, and hence the shaping of ways-of-thinking and ways-of working that really hold transformative power. Fundamentally, transformation can only occur when social values drive economic values, and when the knowledge development and use driving such transformation is guided by shared values and missions. It is an understatement to say that this presents a formidable challenge. As Crane et al. (2014) conclude in their dissection of Porter and Kramer's advocacy of shared value, there is a long way to go, both conceptually and practically, before shared value will really supersede an individual (market-oriented) perspective and turns truly social. More fundamentally, Caruso (2016) doubts whether a reversal between social and economic values will ever be possible under the current condition of capitalism. This thesis is not able, obviously, to exhaust that debate here. The contribution of this chapter so far, has been the

conceptualization of this formidable challenge along two dimensions, namely institutional (featuring roles, interaction and values), and reflexivity (featuring intelligence, reflexivity and the governance of significant knowledge), as summarised in Table 6.1. The second part applies the thinking as presented here, to a case study.

6.3 Research method

The remainder of the chapter will discuss the drive towards suitability innovation in the Dutch greenhouse sector in the context of wider changes in the greenhouse horticulture system. The case 'Greenhouse horticulture in the Netherlands' was selected for three reasons:

1. There have been various policies, sector initiatives and joint sustainable development missions since the 1980s (e.g. Porter & Van der Linde, 1995; Bieleman, 2010),
2. The sustainability measures and impacts have been monitored thoroughly (e.g. CBS et al., 2013; CBS et al., 2011; Boone & Dolman, 2010),
3. Horticulture, and particularly greenhouse horticulture have a strong tradition of innovation at the level of the firm and of strategies to support and enhance private innovation by institutions, including by actively organising and supporting knowledge and learning processes (De Haas, 2013; Pannekoek et al., 2005; Hekkert, 2017; Alkemade, Hekkert & Farla, 2011; Jacobs & De Jong, 1992; Porter & Van der Linde, 1995; Kishna et al., 2016).

Therefore, the case of sustainable development of greenhouse horticulture in the Netherlands is of use for illustrating how the various modes of economic governance manifest themselves, what it entails and how this changes over time. The case study entails a mostly qualitative analysis of the case of sustainable development in greenhouse horticulture in the Netherlands. The study consisted of a literature and document review on trends and characteristics of the greenhouse horticulture sector in the Netherlands, its sustainability activities and impacts, on how innovation and learning are organised, and within what institutional setting. In addition, quantitative data on the sustainability impacts of the sector was studied, mostly from technical reports and publicly accessible databases. Moreover, the research method involved semi-structured interviews with twelve respondents from the greenhouse horticulture sector (a grower, a banker, a greenhouse project developer, and consultants), from government, from research and education and from societal organisations.

These research methods were deployed to explore the different types of economic governance in the pursuance of the sustainable development of the greenhouse horticulture industry in the Netherlands, in relation to knowledge and innovation. In the interviews, the respondents were questioned on the characteristics and trends of greenhouse horticulture in the Netherlands, including processes of coordination, the reasons and forces behind its sustainability activities, and the knowledge, institutions and values that have shaped the industry and how it handles sustainable development. The interviews were both backward and forward-looking. The results of the case study were analysed in light of the typology of economic governance as presented in this chapter.

6.4 Sustainable development in greenhouse horticulture in the Netherlands

6.4.1 Introduction: Greenhouse horticulture in the Netherlands and the pursuance of sustainable development

Greenhouse horticulture is a sub-sector within horticulture that cultivates vegetables, fruits, cut flowers and decorative plants in greenhouses. Since the 1850s, greenhouses are used in the Netherlands (Bieleman, 2010). In 2018, there were somewhat over 3,000 greenhouse horticulture firms in the Netherlands, which covered 9,100 hectares of land with glass greenhouse structures (CBS Open Data). When the whole value chain is taken into consideration, the greenhouse horticulture industry in the Netherlands consists of 24,000 businesses. For cut flowers and pot plants the sector is strongly export-oriented, as 80% of the production is exported (PBL, 2018), which for 2017, amounted to 17 billion euro (CBS Open Data).

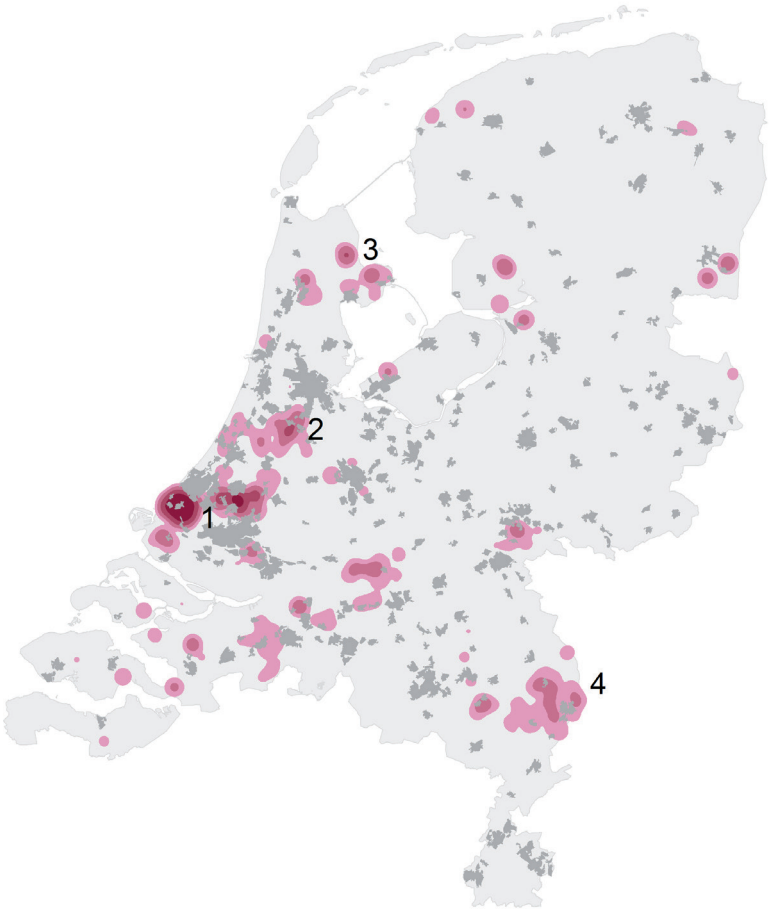

Figure 6.1 Concentration of greenhouse horticulture firms in the Netherlands (Source: LGN7; Hazeu et al., 2014), with the Greenports 1. Westland–Oostland, 2. Aalsmeer, 3. North-Holland North and 4. Venlo.

Greenhouses are mostly located in four regions, notably the 'Greenports' of Westland – Oostland, Aalsmeer (close to Amsterdam and Schiphol airport), Noord-Holland Noord (to the north of Amsterdam) and the Venlo region (close to the German Ruhr metropolis). Figure 6.1 shows their location. Other areas with concentrations of greenhouses do exist (such as Emmen, or the Bommelerwaard), but these are of limited national importance.

In the following sections, the dynamics of the governance of the greenhouse horticulture sector will be described, especially in relation to sustainable development and with a focus on the role of knowledge, learning and innovation. First, from an industrial capitalism perspective (6.5), and second, a knowledge capitalism perspective (6.6). Within these two categories, the balance between adherence towards market and institutional logics will be examined, following a chronological order. The description of the case will be relatively light on theory. Afterwards, a reflection is given, based on the typology of economic governance (6.7).

6.5 Greenhouse horticulture from an industrial capitalism perspective

6.5.1 Greenhouse horticulture: the auction system

Since its emergence in the 1850s, the greenhouse horticulture sector has been dominated by small and medium sized family owned firms (Bieleman, 2010, Snijders et al., 2007). The growers brought their produce to the auction and were not involved in other activities downstream or upstream of production, such as engaging in marketing and selling activities. Such activities were coordinated by the auctions, which, in turn, were owned by a grower cooperative. At the auctions, sellers and buyers interacted and a market was established. To remain competitive, the growers would focus on the reduction of production costs by adopting new technologies (Kishna et al., 2016; Alkemade et al., 2011a). Price levels were partly subjected to EU regulation, to guarantee growers a basic income and protect them somewhat from market fluctuations. This centralised corrective regulation functioned until the early 2000s (Schuurman, 2013).

6.5.2 Greenhouse horticulture: an innovation-oriented sector

The greenhouse horticultural sector has been characterised as innovation-oriented (Schuurman, 2013). Around 2000, between 3% (Pannekoek, 2005) and 10% (Breukers et al., 2008) of the greenhouse horticulture firms were regarded as innovators in the sense that these entrepreneurs were the first in the Netherlands to introduce a new product or process. To do so, growers engaged in study groups in which they share experiences and discuss the latest innovations offering them the opportunity to decide which innovations to pursue. These innovations were often developed by technology providers that are also active in other sectors besides greenhouse horticulture and were therefore able to discover new innovations relevant to the sector (Vermeulen & Poot, 2008).

Innovation activities in greenhouse horticulture primarily concerned process innovations (Alkemade et al., 2011), meaning innovations in technological production by which growers would increase the efficiency of the production and would guarantee quality

specification in a situation of low profit margins. Because of this focus, greenhouse horticulture can be considered a mature sector in which reducing production costs is essential (Alkemade et al., 2011a; Kishna et al., 2017). Moreover, these process innovations haven been primarily incremental (Berkers & Geels, 2011). Radical innovations have been pursued, but most growers have shied away from them.

6.5.3 The 'OVO triad'

Greenhouse horticulture's innovation-orientation had a clear institutional dimension, with informal as well as formal aspects of sectoral innovation systems. The Westland area in particular has functioned as a typical cluster in which learning and innovation processes between the growers and associated businesses where crucial to its development (Jacobs & De Jong, 1992; Porter & Van der Linde, 1995), enabled by family relations, a shared vision and an attitude to see each other primarily as colleagues (often also family) and not as competitors (Alkemade et al., 2011a). These tight and productive connections between businesses have been accompanied by a formal support structure. From the early 1900s onwards, the Netherlands developed a strong linkage between horticulture, and extension, education and research (Bieleman, 2010). The Ministry of Agriculture was responsible for this 'OVO triad', coordinating research, extension and education ('Onderzoek, Voorlichting, Onderwijs'). The OVO triad presented the institutional setting in which actors from research, education and extension collaborated to increase the agricultural/horticultural productivity and to secure food availability in the Netherlands (Bieleman, 2010). This was integrated in a corporatist system in which government and the market collaborated from a clear perception on roles and relations, including the co-funding of research. The OVO triad enabled the development and implementation of many technological innovations in agriculture and the greenhouse horticulture sector, giving a boost to global competitiveness (Bieleman, 2010).

Within the OVO-triad, the producer organisation 'Productschap Tuinbouw' played a central role in the programming and funding of horticulture related research. This legally constituted producer authority had law making capabilities, which were binding to the sector and executed the implementation of EU market policies in the Netherlands. Productschap Tuinbouw functioned as a major assigner for greenhouse related research and innovation projects, promoting new process technologies notably in the fields of vegetables, cut flowers and decorative plants.

6.5.4 Discontinuation and renewal

In what can be regarded as a return to stricter market logic, the OVO triad was terminated in the 1980s (Bieleman, 2010). With the exception of education, the government no longer wanted to play a leading role in developing the sector. The extension services were privatized and the research directorate was set at a distance from the Ministry of Agriculture with the aim to become a commercial research institute, although publicly funded research programmes remained an important component. This took place within the context of a wider return to a competitive form of capitalism in agriculture and horticulture (Schuurman, 2013).

Productschap Tuinbouw, as a sectoral stronghold and key player in innovation, lasted until 2014, when the government decided to disband all producer authorities. The innovation support that was provide by the Productschap Tuinbouw was subsumed by the new national 'Topsector' innovation policy, one of which is about horticulture. In this Topsector, a consortium of entrepreneurs from the horticulture chain, national government and research organisations, or Top consortia for Knowledge and Innovation (TKI), jointly programme and fund innovation projects and knowledge-dissemination activities. This new framework supports 'pre-market' research and innovation projects in the private sector, based on grant applications.

The scope of innovation projects largely remained on technological innovation, although it has widened somewhat to market development and marketing. The Topsector policy implemented a market approach in which individual entrepreneurs would increasingly decide what innovations to pursue and which research to fund. The influence of government and also research diminished somewhat. Because of this, some actors feared that with the termination of Productschap Tuinbouw entrepreneurs would only fund direct impact-oriented and short-term research, and the transitional approach will end[i]. In response, initiatives arose to set up a new type of Productschap Tuinbouw, but it is yet to be seen how this will be structured.

Interviewees[ii] indicated that the disbanding of the producer organisation was widely perceived as a negative development because it was so central in organising and financing research and innovation, both in the short and long term. Yet others[iii] perceived this institution as too conservative and not supportive enough of innovative entrepreneurs. Not all support was terminated. Moreover, some institutions survived the institutional culling, such as the greenhouse branch of the national farmers union LTO Glaskracht, the innovation support organisation SIGN and the support organisations of the 'Greenports' and the municipality of Westland. Since 2017 new institutions have been formed, such as Greenports Nederland with its Greenboard and Tuinbouw NL. It is too early to judge what their role will be, but it seems they aim to revive some of the coordinative roles of Productschap Tuinbouw.

6.6 Emerging knowledge capitalism

6.6.1 A time of change

Since the 2000s, various changes occurred or persisted, undermining standing practices. A major development was the demise of the auction system for vegetables and fruits. Despite the merger of local auctions into one big organisation, auctioning lost its central position in horticulture chains, due to changing retail purchasing practices. This weakened the position of the growers in the relevant value chains, especially for vegetables and fruits. Producer organisations were set up to tackle this, but without really countering the shifting balance of power between procurers and growers. Only in cut flowers, the position of the auctions in Aalsmeer and Naaldwijk persisted. Other factors that drove change were the increasing production costs and especially the energy costs, that constitute a major part of the total production costs.

The economic crisis of 2008 caused a 'shake-out' resulting in a decrease in the number of firms. Overall, the number of growers fell from 20,000 in 1970 to under 11,000 in 2000 to somewhat over 3,000 in 2018 (Source: CBS Open Data). Moreover, since the year 2000, the total land use by the sector has decreased by 10% (Source: CBS Open Data). The flipside of this shake-out is that remaining firms have grown in size. Already in 2011, 39% of firms classified as 'very big' in terms of yields (Agricola et al., 2011) and this has only increased since then. The remaining mostly big companies expanded their businesses, to decrease production costs, and to improve earnings and competitiveness (PBL, 2018). These changes prompted the remaining growers to explore new business models. In response, some growers started to develop niche products (Kishna et al., 2016), such as taste-based products as 'honey tomato's, or aromatic products (such as cresses) that were marketed more intensely than before. Others have started producing bio-based inputs for building and packaging materials, chemicals and pharmaceuticals. To innovate, many growers try to establish closer relations with the consumer. At the same time, some companies are investing outside of the Netherlands and are setting up new production locations all over the world, closer to the consumer in foreign markets.

6.6.2 The emerging issue of sustainability

In this period of change, sustainability became an important issue for the sector. Although in the 1960s first steps were made in the introduction of organic plant protection products (Bieleman, 2010), the attention for sustainability only took off in the 1980s. The sector was reputed to be wasteful, using too many pesticides, energy, and fuel, badly affecting the environment. Pressured by public authorities and civic society to change these practices mounting, horticulture actors judged that it was only a question of time before government would impose regulations or the consumers would turn to other products and producers.

At first, sustainability measures were primarily seen as a strategy to reduce production costs, as is the case in adopting process innovations such as geothermal energy or heat co-generators. The consequence of this was that innovations were primarily adopted and implemented if suited to current business models (Alkemade et al., 2011a). Accordingly, it took longer before entrepreneurs became interested in reducing nutrient runoff to the water system, because water did not represent a major production cost. Interest remained low, even when national government set objectives to reduce energy usage and the runoff of polluted water to the surface water system. Radical system-changing innovations that coupled sustainability with market creation and value addition had an even harder time to attract interest of most entrepreneurs (Kishna et al., 2016).

Alongside this cost reducing innovation strategy, innovations that were potentially more radical and system-changing, were pursued. The main example of this is the 'Energy Producing Greenhouse' that would turn an energy-wasting industry into a net producer of energy. Some growers experimented with it, but when the first steps were taken towards upscaling, this proved to be too ambitious at the time[iv]. In practice, growers found it too hard to implement, because of the incurred level of production costs. The innovation mainly resulted in opening minds towards new possibilities, and to stir further interest in energy

use reduction. Moreover, parts of the concept have indeed been adopted by growers, yielding some advances in energy efficiency.

Despite some setbacks, it should be noted that the sector's basic commitment to energy-saving has resulted in an energy reduction of about 40% since the 1980s (Van der Velden & Smit, 2013). The CO_2 emissions from the greenhouse horticulture companies in the Netherlands decreased over the years 7 mega ton in 1990 to 5, 7 mega ton in 2015 (Van der Velden & Smit, 2015). Since 1995 the usage of plant protection steadily declined in greenhouse horticulture (CBS et al., 2011), to increase again slightly, since 2009 (Buurma et al., 2012), primarily at cut flower firms (CBS, 2011).

6.6.3 Transition pathways

While, from a market logic sustainable development is primarily an issue for individual entrepreneurs that is related to mainstream growth and efficiency investments, an undercurrent of institutional development arose, drawing attention to sustainability along a different path. In the early 1990s, frontrunners in the horticultural growers' union LTO Glaskracht decided that they would have to meet the society's sustainability challenges through collective communication and action. Gradually, this led to a vision co-owned by an alliance of organisations consisting of actors from government, banks, growers, greenhouse developers and scientific research. Together, these organisations started to engage in discussions about the need for more sustainability in the greenhouse horticulture sector. This culminated in the covenant 'Greenhouse horticulture and the Environment' in 1997 (Platform Duurzame Glastuinbouw, 2010). In 2011. The covenant was followed by the 'Sustainability Agenda 2011-2015' (Platform Sustainable Greenhouse horticulture, 2011) and ultimately 'the National Horticulture Agenda 2019-2030' (Greenports Nederland, 2019). With these agendas, the sector committed itself to a package of targets and measures for the environmental and energy ambitions. Also, other platforms were established, such as 'Platform Light Pollution', resulting in further agreements, agendas and measures on sustainability, such as the 'CO_2 covenant' (2011-2016), the 'Multi-year agreement on the greenhouses energy transition' (2014-2017 and 2018-2020) and innovation agendas for programming research and development programs.

In these initiatives, sustainable greenhouse horticulture is generally framed as a transition to be realised through the development and mainstreaming of innovations, especially for energy-related issues (LTO Glaskracht & Ministerie van Economische Zaken, 2018; LTO Glaskracht & Ministerie van Economische Zaken, 2017; Hekkert, 2017). For energy, six so-called 'Transition Pathways' were designated: 1) solar energy, 2) geothermic energy, 3) growing strategies and energy poor crops, 4) maximal usage of light, 5) more sustainable energy and 6) sustainable CO_2. These routes were organised around technological innovations, such as a new energy-saving greenhouse technologies, for instance through the usage of geothermic energy, a floating greenhouse, which can be built on water, new lighting technology, new applications of heat co-generators etc. When climate change became an issue, these measures were increasingly framed as contributing to climate mitigation (LTO Glaskracht & Ministry of Economic Affairs, 2017). The impact of horticulture on water quality by using pesticides and water quality became an issue only much later

(Platform Sustainable Greenhouse Horticulture, 2010). The pressure to take water-related measures was mounting (LTO Glaskracht & Ministry of Economic Affairs, 2017).

6.6.4 Further institutionalisation

Government used various measures to support the sustainable development transition in greenhouse horticulture. Through various covenants, national government conveyed it was in support of measures that the sector wanted to take. Government engaged in regulating sustainability and more specifically setting a target of zero-sum emissions for minerals (Nitrates and Phosphorus) to the water systems in 2027, to reduce the use of plant protection projects by 90% and to reduce the energy usage of the sector to 40%. Initiatives of the sector to take measures for these objectives were supported through covenants, such as 'Green Deals', which were meant to increase the credibility of greening greenhouses and enable coordinated-action. Public authorities and infrastructure project developers also influenced the transitions for example, by developing new greenhouse business parks, such as Agriport A7 in Greenport Noord-Holland Noord, where the newest and most sustainable greenhouses were built. In other areas, the focus was on demolishing less sustainable greenhouses.

The selected transition pathways were also supported with innovation programmes, such as 'The energy producing greenhouse', 'Energetic 2020', 'The New Growing' and 'Greenhouse horticulture water proof' for water. Innovation activities targeted the individual businesses, supporting them with research, knowledge dissemination, execution of pilot studies, highlighting best practices, etc. Examples of the activities in these innovation trajectories included the setting up and using of pilot facilities at a greenhouse from a horticulture business or at the greenhouse research centre at Bleiswijk, the setting up and facilitation of knowledge exchange networks of growers, communication activities like websites, and the organisation of events where one can meet each other and share experiences. The results of the development and adoption of the energy-producing greenhouse and other technological innovations (as part of the innovation pathways) were monitored by research institutes. This division of tasks is not so different from the OVO triad, with the exception of a stronger role for the private sector and their innovation agenda. For example, in 2019 the sector has united around a vision for circular horticulture, encompassing both competitiveness as well as sustainability targets (Greenports Nederland, 2019).

Recently, the government of the Netherlands is implementing a mission-driven approach to its research and innovation policy, notably its Topsector policy. These missions are co-developed with stakeholders from business and now also civil society, and there is still much attention to entrepreneur-driven innovation, but public-led institutionalisation is on the rise, also because the scale enlargement within the sector makes it more difficult to find common ground. In elaboration of the mission-driven approach, the Topsector consortium is developing a new knowledge and innovation agenda for 2020-2023. The mission of energy transition and sustainable development is central to this. This mission has a strong focus on objectives to reduce greenhouse gas emissions in 2030 and further in 2050.

Research projects are jointly programmed. Each year 10 – 15 million euros were allocated to greenhouse related research, partly paid by the sector and partly by national

government. This was initially organised by the producer authority 'Productschap Tuinbouw' (Termeer & Dewulf, 2012), and later by TKI Tuinbouw en Uitgangsmaterialen, together with partner organisations. As in the case of 'energy producing greenhouse', these initiatives started small-scale and protected from the forces of the market. Notwithstanding initial failure to interest growers, the development of such a production facility has continued and pushes the boundary of sustainable development (Vogelezang, 2017; LTO Glaskracht and Ministry of Economic Affairs, 2017). This was enabled by dedicated research and development programmes in which the focus on sustainability became stronger over time. Therefore, while sector ambitions remain somewhat limited, this signals that new forms of institutional strategies and governance are in the making.

6.7 Changing governance and the pursuance of sustainable development

So how should this long century of horticulture development be regarded? First, there has been a historical swing from a predominantly market logic to an institutional logic. In the 1970s, this culminated in a definite shift from a more fragmented and decentralised industry to an innovation-oriented sector with strong central orchestration, benefitting from the long-standing Dutch tradition in institutional cooperation (Kickert, 2003). The ruling OVO Triad clearly was an example of the innovation system approach, which very much depended on institutional support of entrepreneurs. Although the institutional coordinative mechanisms were dominant, the latter meant that there was a strong focus on market logic, as expressed by respondents when speaking about the sector[v]. Even in the sustainability transition programmes, the framing is very much about entrepreneurialism and the market as the primary force and coordinative mechanism for change. By the 'Productschap' and later the TKI Horticulture, research and innovation, funding was gathered and its spending was coordinated, Moreover, government and the sector coordinated the sanitation of non-competitive firms and thereby enabled competitive companies to grow and become more competitive (PBL, 2018).

Subsequently, the 1990s and 2000s ushered in a return to market logic and a more competitive form of capitalism, with less central orchestration. More recently, a re-institutionalisation around missions and sustainable development is witnessed, ushering in a new focus in research and development activities. Initially, some indications of a reflexive management approach to sustainable development can be noticed, notably collaboration between institutional parties and stakeholders around a shared vision and the purposeful pursuance of knowledge creation, coordinated by the Topsector policy. These are not so well articulated yet. At the end of the day, much cooperation between different types of stakeholders comes down to what has been defined as chain coordination, with attention to increasing sustainability and for decreasing production costs and (international) competitiveness (Kishna et al., 2017). Market logic continues to prevail.

While change appears to be modest, accordingly, there are prompts for further systemic change at the institutional level. Sector organisations, public authorities and innovation supporters recognised that the initial designs for closed greenhouses were too ambitious and they adapted accordingly, by focussing on elements that were within reach

for entrepreneurs. This made sure that the innovation potential that was present, could run its course and that the sector made steps towards energy reduction (Hekkert, 2017). While these were not effective immediately, the radical designs have not been forgotten and continue to inspire the programming of research and innovation activities, pushing the innovation borders. Since then, some of those elements have been implemented or have been brought closer to implementation and new elements, such as circular horticulture, have been added. Moreover, the drafting of covenants, accords, green deals, mission-based knowledge and innovation agendas and the designation of Greenport status to a selection of production areas, made the transition pathways credible to all connected actors and enabled coordination of the various supporting activities. So, the old innovation supporting institutions ('OVO triad') have been partly rejuvenated around the sustainability agenda, but with a new focus on values and missions.

6.8 Conclusions

This chapter assessed how sustainability, as a critical value aspect of economic development, evolves and how different types of economic governance are deployed in this process. Especially, the relations between 1) knowledge-driven economic development as a part of emerging knowledge capitalism, 2) the changing nature of knowledge and its supporting institutions and 3) the increasing importance of societal values and missions such as sustainability in addition to utilitarian value have been explored. It was stated that the focus on sustainable development coincided with attempts to maintain the competitiveness of the greenhouse horticulture sector and involved institutional support and shared vision development and coordination. Moreover, the governance of sustainable development has to deal with governance mechanisms from both industrial capitalism and market logic and from knowledge capitalism and institutional logic. Periods of institutionalisation and de-institutionalisation occurred because the differing logics compete for prevalence, while significant knowledge slowly increases in importance, although it becomes more difficult to unite the sector as the result of scale enlargement and a rapidly decreasing number of greenhouse horticulture firms. The path dependencies and historical aspects to knowledge and learning-based forms of governance that pursue sustainable development warrant sufficient attention to discuss governance options for sustainable development. The typology that was developed in this chapter was helpful to identify the various logics in the governance of sustainability, although it is of course a stylised presentation of a very big and complex discussion and literature.

Chapter 7

Conclusions and discussion

7.1 Introduction

This thesis has elaborated the knowledge governance of sustainability clusters in agriculture and food, which was here named territorial knowledge governance. This thesis filled knowledge gaps, such as a lack of use of knowledge and learning in theories on modes of governance, a lack of a territorial-economic approach to the governance of sustainable development transitions, and a lack of integration of governance and territorial thinking. Moreover, the thesis aimed to strengthen the theoretical understanding of how knowledge processes achieve coordination in advancing sustainable development in agriculture and food clusters through territorial knowledge governance. More specifically, it aimed to establish a conceptual framework, which can be used to analyse the principles by which knowledge processes of sustainability clusters coordinate the advancement of sustainable development in agriculture and food systems.

This thesis has produced the analytical framework of territorial knowledge governance in an iterative development process. In this process, preliminary versions of the analytical framework of territorial knowledge governance were used in case studies to grasp its scope and completeness and to advance accordingly. Firstly, a set of coordinative principles of knowledge governance was developed, based on theories on governance, knowledge and learning. This was tested in the case of the Northern Frisian Woodlands, which produced insights regarding the constraints, enablers and results of knowledge governance. It was concluded that the set of coordinative principles was useful in studying how knowledge development functioned as a form of governance, but that in practice, knowledge governance practice would manifest itself in different ways. Accordingly, this first set was used in a comparative analysis of three cases (Seaweed farming in the North Sea, Metropolitan Food Cluster Mexico and again the Northern Frisian Woodlands). This led to the identification of two empirical types of knowledge governance: 1) implementation-oriented and advocacy-oriented knowledge governance. Each of these types has its own constraints, enablers and results.

So far, the literature on territorial development had not been used explicitly in the conceptual development and therefore, knowledge governance had no explicit territorial dimension yet. As this literature pays much attention to knowledge and innovation, the decision was made to explore this literature. This was not meant to elaborate the two identified types of knowledge governance, but to elaborate *territorial* knowledge governance. First, the anchoring of extra-territorial knowledge was added to the first set of coordinative principles. This expanded set of coordinative principles was used in a comparative case study of the same three cases and of four new cases. This again led to the identification of constraints and enablers.

Afterwards, it was decided to deal with the integration of knowledge governance with territorial development thinking in the concept of territorial knowledge governance in a more encompassing manner. Accordingly, a new set of coordinative principles was developed to highlight territorial aspects of knowledge governance, focussing on mission driven and knowledge-based territorial development, which had recently been explored in new territorial development literature. The previous sets of principles were integrated with these territorial theoretical approaches. This new set of principles was

applied to three cases of Metropolitan Food Clusters: Greenport Venlo, MFC Mexico and Greenport Nellore. Lastly, reflections were made on the institutional aspects of knowledge governance, and particularly on recent changes in the economic system (cf. capitalism). These highlighted the constraints and enablers to knowledge governance that are caused by existing structures and cultures, cf. by its path-dependencies. Moreover, it identified a challenge for sustainability clusters to deal with various logics when pursuing knowledge development. These iterative research steps together fed the analytical framework of territorial development that will be elaborated in this final chapter. The iterative process is summarized and schematised in figure 7.1

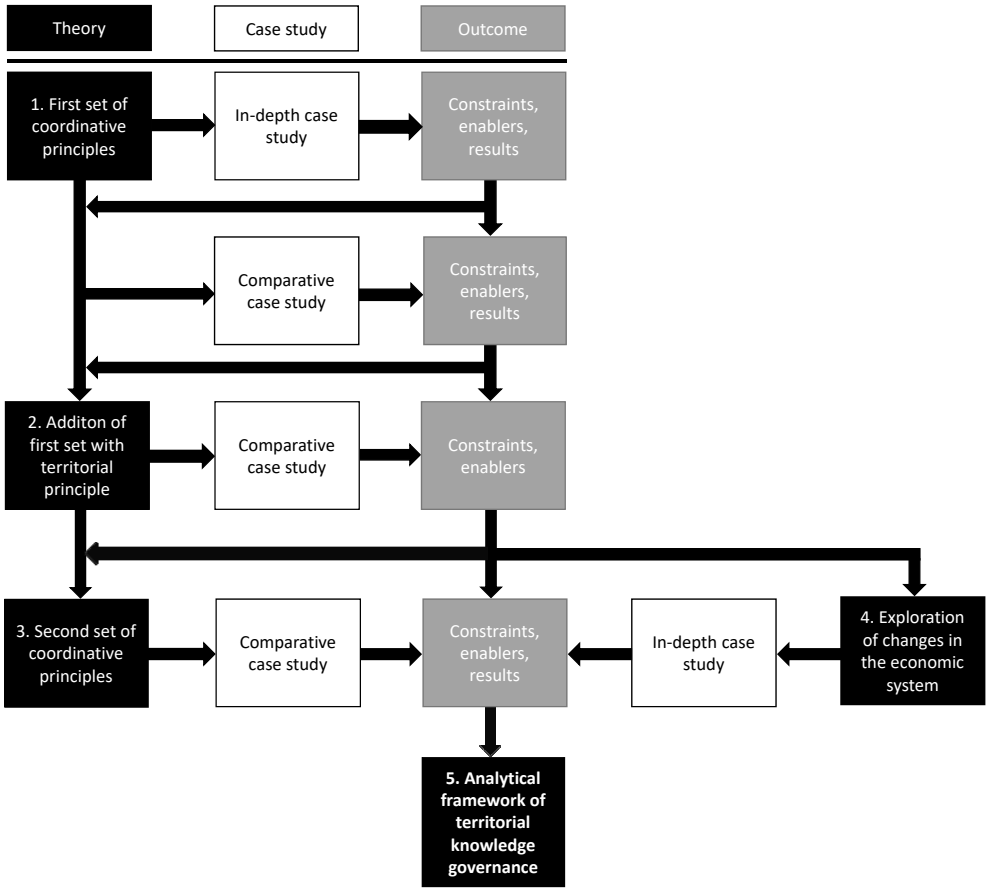

Figure 7.1 The iterative process of the development of the analytical framework. The arrows represent the iterative learning process, which led to the formulation of the analytical framework of territorial knowledge governance.

In this concluding chapter, the insights into 'territorial knowledge governance for pursuing sustainability in agriculture and food clusters, are synthesised by answering the research questions. Finally, the contribution of the thesis to the scientific debate is assessed.

Subsequently, the theoretical framework, the research design and the role of the researcher are reflected upon. Lastly, the societal relevance will be discussed and suggestions for further research are provided.

7.2 Answering the research questions

The main research question of this thesis was formulated as: *Through which principles and to what extent do knowledge and learning establish coordination in the pursuance of the sustainable development of agriculture and food clusters?* To answer this question, the following sub-questions need to be answered:

1. *What are the coordinative principles of territorial knowledge governance in the pursuance of sustainable development of agriculture and food clusters?*
2. *What are the constraints and enablers of territorial knowledge governance for pursuing sustainable development in agriculture and food clusters?*
3. *What type of results are produced by territorial knowledge governance?*

These sub-questions are answered in the paragraphs 7.2.1, 7.2.2 and 7.2.3. The closing paragraph 7.2.4 is dedicated to the main research question.

7.2.1 The coordinative principles of territorial knowledge governance

In this paragraph, the first question is answered: *What are the coordinative principles of territorial knowledge governance in the pursuance of sustainable development of agriculture and food clusters?* Based on the theoretical and empirical explorations in this thesis, it is concluded that territorial knowledge governance (in the pursuance of sustainable development of agriculture and food clusters) achieves coordination through processes of 1) setting a joint sustainable development mission, 2) producing and exchanging knowledge in supportive milieus, 3) embedding of substantive knowledge, 4) anchoring of significant knowledge, and 5) feeding of significant knowledge into the (re) design of institutions and strategies of policy design and implementation (see table 7.1). These principles constitute the main syntheses between theories of governance, knowledge and learning, and geographical and economic literature in this thesis.

To describe it in a more comprehensive manner, in territorial knowledge governance cluster actors formulate a sustainability mission, such as producing vegetables without contributing to climate change or producing dairy products in harmony with nature and cultural heritage. This mission is taken up by a deliberately started and largely self-organising knowledge process in a supportive environment, as for instance a learning community. In this environment, participants explore new insights in a reflexive, transdisciplinary and social learning process. The knowledge is partly produced from within a sustainability cluster and partly derived from extra-territorial sources. The produced knowledge can be divided in substantive and significant knowledge. Whereas substantive knowledge is content- and transaction-based, significant knowledge is about less technical, more politically and personally sensitive issues. Substantive knowledge, – for instance about innovations in

greenhouse technology – is embedded in decision-making networks that are relevant to the sustainability cluster. This requires some atonement to territorial processes and framing. Boundary arrangements support the transport and associated transformation of the produced (substantive) knowledge. This is relatively straightforward, but the handling of significant knowledge is more complex, as normative visions are more difficult to transport, due to their tacit nature. Boundary arrangements are of great importance to this type of knowledge and that is why the mission formulation process is the result of a reflexive, transdisciplinary social learning process as well. The significant knowledge from outside of the territory, still needs to be anchored in local practices, projects and actor-networks to safeguard following-up on the insights from knowledge development.

These coordinative principles of territorial knowledge governance are of a generic nature. Of course, in the case studies of this thesis their manifestations varied. Although the principles were very useful in identifying key issues regarding the set-up and implementation of territorial knowledge governance, not all principles manifested themselves clearly and sometimes in different forms. Especially reflexivity and transdisciplinarity were implemented to a limited extent in the supportive milieus in the cases. This is concluded, because a certain rigidity manifested itself in the cases regarding the mission and measures to be considered and because different stakeholder groups did not always cooperate with one another. Another source of variety was related to the boundary arrangements that were used in the cases. In some cases, these were relatively formal, while in other cases they were more informal, because the same individuals participated in both knowledge and decision making networks, making the transportation of knowledge less complicated. Knowledge governance by sustainability clusters also varied in its focus, especially in the time-scale in which the results that were aimed for are thought to be realized, as was elaborated in both chapter 3 and 4 and, more implicit, in chapter 5.

These distinctions were first discussed in chapter 3. In particular, a distinction was made between advocacy-oriented knowledge governance and implementation-oriented knowledge governance that was derived from case studies. The final understanding of territorial knowledge governance in this thesis, as derived from further theoretical and empirical explorations, is that both advocacy and implementation are relevant to territorial knowledge governance, but that a knowledge process that is primarily aimed at implementing a pre-defined mission, cannot be regarded as a good example of territorial knowledge governance, as mission formulation is a key coordinative principle of territorial knowledge governance. Still, the balance between advocacy and implementation can and does vary between the cases of territorial knowledge governance in this thesis.

7.2.2 Constraints and enablers of territorial knowledge governance for sustainable development in agriculture and food clusters

In this paragraph, question two will be answered: *What are the constraints and enablers of knowledge governance for pursuing sustainable development in agriculture and food clusters?*

Constraints

As was illustrated in this thesis, engaging in territorial knowledge governance clearly is a highly challenging activity, especially concerning the deployment of all coordinative principles of territorial knowledge governance. When these coordinative principles are not implemented sufficiently, issues can emerge in the implementation stage of the studied endeavours in territorial knowledge governance, and sometimes even before.

The results of the case studies made it clear that the learning in multiple cases was primarily incremental and mostly within the confines of a previously identified mission by some of its participants (e.g. public authorities, consultants, etc.). Secondly, the collaboration between different stakeholders groups (especially between farmers, other businesses, government and science) is sometimes difficult to achieve, making it difficult for key stakeholders to participate in the knowledge development process. Both issues, led to the formulation of two constraints to territorial knowledge governance that have been identified, concerning the willingness and ability 1) to consider new ideas and directions and to engage in a self-organising, reflexive, social learning and transdisciplinary knowledge process, and 2) to the alteration of existing routines. These constraints can lead to essential knowledge – both substantive and significant – being excluded from the process.

These constraints are related to the openness of the learning community or another type of supportive milieu and therefore to the capability and willingness of its participants to engage in knowledge development and social learning. This can be caused by a (perceived) limited freedom to self-organise, because decision makers aim to control what knowledge is explored or because the participants do not think they are allowed to deviate from official policy. Another reason could be that actors simply have not enough in common and are not able to align well and co-develop a shared mission. A lack of willingness or ability to change existing routines is a manifestation of the absence of a clear learning attitude and therefore is hard to combine with developing significant knowledge. This would limit the knowledge activities to substantive knowledge that does not address fundamental systemic issues that are essential to the sustainable development of agriculture and food clusters. It can simply be the case that essential knowledge may not be present in the cluster and cannot be mobilised either. This is especially relevant to peripheral regions, as was elaborated in chapter 4. Moreover, these processes of altering existing practices and acquiring knowledge take time and therefore a strong focus on short-term impact can be considered a serious risk that the knowledge governance activities may fail.

These constraints clearly have consequences for the content and support of the formulated mission, for the developed knowledge and for the commitment of stakeholders to engage in follow-up actions. This especially holds true for the embedding and anchoring of knowledge and the institutional and policy re-design that follows. In multiple cases, changes in content and participation during the territorial knowledge governance process lead to a limited anchoring of the developed significant knowledge. This caused a loss of significant knowledge in the process that was hard to compensate for afterwards. The knowledge was still being developed and discussed, but not shared and co-owned by key individuals. Moreover, contributions and views of important stakeholders are excluded, while attention centred mainly on technical issues and short-term results, rather than on the social and institutional aspects of missions that are of crucial importance to sustainable

development in agriculture and food. This type of loss of significant knowledge can lead to conflicts and disappointments, blocking further institutional redesign and development. Vital steps, such as mobilising private investments, aligning policies of different government agencies, maintaining a focus on sustainability innovations and forging enduring cluster relations, can then become insurmountable hurdles for the implementation of sustainability missions.

These constraints are mainly related to the coordinative principles 2 (producing and exchanging knowledge in supportive milieus), 4 (anchoring of significant knowledge), and partly also to principle 1 (mission formulation).

Enablers

The constraints to territorial knowledge governance, elaborated above, can partly be reformulated as enablers that concern the same coordinative principles of territorial knowledge governance. When, for instance, there is commitment, a dedication to undertaking actions for a prolonged time, supportive institutions are developed, missions and developed knowledge are well positioned with historic pathways and essential knowledge can be mobilised and anchored, then the coordinative principles of territorial knowledge governance can function. Success is of course not guaranteed, but more likely than if these enablers are not present. Moreover, the specific design of boundary arrangements proved to be an enabler to the anchoring and embedding of knowledge. In addition, boundary arrangements can have a formal and a somewhat informal nature, but both consist of individuals who are active in both decision making as in knowledge creation and therefore they were able to introduce insights to decision making networks and ensure that follow-up activities are taken. This tailoring of the boundary arrangements to the specific context of a territorial knowledge governance process, clearly is an enabler.

Moreover, to prevent the described negative cycle of loss of significant knowledge and follow-up by a lack of anchoring of significant knowledge, is connected with the historic pathways of the sustainability clusters and its related institutions. Tailoring the territorial knowledge governance initiatives to these path dependencies can be regarded as a clear enabler. This is a challenging activity as these path dependencies can also hinder the development and implementation of the missions, especially in a value-driven approach, such as sustainable development.

Lastly, sustaining endeavours in knowledge development and learning over time and over projects is a key enabler. Territorial knowledge governance of sustainable development is complex and challenging. Hence, knowledge governance is enabled by a clear commitment of supporting actors and therefore will have to be institutionalised to a certain extent. Not coincidentally, in multiple cases organisations were set-up to enable the continuation of territorial knowledge governance.

7.2.3 Results of territorial knowledge governance

In this paragraph, question three will be answered: *What type of results are produced by territorial knowledge governance?* It can be concluded from the studied theories, that territorial knowledge governance has the potential to open new pathways for collective

action and that it is especially suited for solving complex societal problems, such as sustainable development. Of special importance is the alignment between cluster actors that is established through knowledge governance, because of the co-developed significant knowledge in the form of a shared sustainability mission and understanding of the steps to be taken to advance this mission. This alignment enables the implementation of the developed knowledge.

These results of territorial knowledge governance were largely confirmed in the case studies. There were examples of the incorporation of new knowledge and ideas about sustainable agriculture and food in policies of private and public actors. Some ideas were strictly speaking not new, but were now seriously considered and enriched. However, achieving and maintaining the new connections between stakeholders around these ideas, proved highly complicated. Missions were formulated and concrete steps were taken to their implementation. Sometimes, these steps were very tangible, such as a tool to be used by farmers to monitor water quality, a set of geographic data for regional policymaking, a proto-type for bio-energy, or facilities to grow and harvest seaweed at sea and for energy producing greenhouses, or the outline of an agri-business park with basic amenities as fences, and infrastructure. These results did not remain ideas, but partly were implemented on sites that can be visited. The knowledge that was produced also found its way into the development of various plans and strategies, which could be implemented by cluster actors that engage in other types of governance. Examples of this are regional economic policy frameworks, and masterplans for business parks. These were produced by collaborating actors who got to know one another better, especially through the developed significant knowledge and by the anchorage of this knowledge, became co-owners of the knowledge that was developed. This acted as a reservoir that actors could use for further initiatives in advancing sustainable development.

The type of results of territorial knowledge governance varies between the different cases that were studied in this thesis. Sometimes the results laid primarily in getting the sustainability mission in agenda setting processes, sometimes results were tangible artefacts, as was discussed above. Moreover, territorial knowledge governance sometimes leads to new territorial knowledge governance. This is probably caused by the advocacy seeking aspects of these knowledge governance practices. In these cases, territorial knowledge governance laid the foundations for future results. Because of the difficulties that come with the anchoring of significant knowledge and the tenacious character of the existing economic system that is not focussed on sustainability, it is not evident that this future will emerge and it requires enduring work for all involved. Still, in the emerging age of knowledge capitalism, shared missions and shared value have become much more central to economic processes and continuous knowledge governance becomes a much more central mode of governance as learning and innovation are no longer exceptional, but central and continuous activities.

7.2.4 Answering the main research question

The main research question was: *Through which principles and to what extent do knowledge and learning establish coordination in the pursuance of the sustainable development of*

agriculture and food clusters? The central research question has been studied by elaborating, coordinative principles, constraints, enablers and type of results of territorial knowledge governance, that are presented in the analytical framework in table 7.1. The coordinative principles of territorial knowledge governance have been defined as: 1) setting sustainable development missions, 2) producing and exchanging knowledge in supportive milieus, 3) embedding substantive knowledge, 3) anchoring significant knowledge, and 5) feeding the acquired significant knowledge into the (re-)design of institutions and strategies of policy design and implementation.

Table 7.1 Analytical framework of territorial knowledge governance of agriculture and food clusters

	Territorial knowledge governance
Coordinative principles	- Setting a joint sustainable development mission - Producing and exchanging knowledge in supportive milieus, that are o self-organising, o engaging in social and reflexive learning and o focussing on transdisciplinary knowledge - Embedding external substantive knowledge - Anchoring significant knowledge - Feeding the acquired significant knowledge into the (re-)design of institutions and strategies of policy design and implementation
Constraints	- Lack of willingness or ability to change - Lack of willingness or ability to engage in a knowledge process - Lack of lasting commitment and focus on short term results - Lack of alignment of actors - Essential knowledge cannot be mobilised
Enablers	- Commitment to engage in knowledge processes that surpasses an individual project or event - Ability to acquire and use essential knowledge - Relating activities to existing development pathways - Tailoring boundary arrangements to the governance context - Establishing supportive institutional arrangements - Dedication and ability to persist
Type of results	- Opening new pathways for sustainable development - Establishing alignment between cluster actors - Follow-up knowledge governance activities - Artefacts, such as tools, data, proto-types, facilities and infrastructure

The constraints that were elaborated, such as a lack of willingness or ability to change in relation to the mission and to engage in a self-organising, reflexive, social learning and transdisciplinary process, are relevant to principle 2: the production and exchange of knowledge in supportive milieus. Constraints such as a lack of lasting commitment and a focus on short term results, a lack of alignment of actors and therefore of significant knowledge and essential knowledge, that may not be present in the cluster cannot be

mobilised, are primarily related to principles 1 (the setting of a mission), 4 (the anchoring of significant knowledge) and 5 (the feeding of acquired significant knowledge into the (re-) design of institution and strategies of policy design and implementation.

The enablers of territorial knowledge governance are largely the opposites of the constraints, such as commitment to engage in knowledge processes that surpasses an individual project or event, the ability to acquire and use essential knowledge, the establishment of (temporary) supportive institutional arrangements for knowledge governance initiatives, boundary arrangements that are tailored to the cluster context and relating territorial knowledge governance activities to existing development pathways of clusters.

Territorial knowledge governance opens new pathways for sustainable development, establishing alignment between cluster actors around a jointly developed vision and mission, follow-up knowledge activities, and tangible artefacts, such as tools, data, prototypes, designs and plans, facilities and infrastructure. By these results, territorial knowledge governance establishes coordination in the pursuance of the sustainable development of agriculture and food clusters. Territorial knowledge governance is especially suited to complex challenges, such as sustainable development.

This framework can be used to study governance interventions of cluster actors that rely on engaging in knowledge and learning processes, especially in relation to the pursuance of the sustainable development of agriculture and food. While no other sectors have been studied in this research, it is expected that the framework is also useful for other industries, as the theoretical explorations were derived from territories of knowledge, governance, learning and territorial development and accordingly, were not limited to agriculture and food. It is very possible and relevant if its use in, for instance, bioeconomy cases would lead to other constraints and enablers. This can be studied in future research.

7.3 Contribution to the scientific debate

This thesis aimed to elaborate territorial knowledge governance by filling three knowledge gaps. The first knowledge gap was the lack of attention in literature on modes of governance to study knowledge and learning on a more fundamental level. Especially the coordinative and transformative aspects of knowledge and learning had been somewhat overlooked. This is a major knowledge gap, because empirically, there are many examples of knowledge and learning processes that do establish coordination, such as innovation projects and programmes, and because there are situations in which neither hierarchy, nor market, nor network can solve the problems at hand (Van Buuren & Eshuis, 2010). Accordingly, this thesis has elaborated knowledge governance as a distinct mode of governance. A key contribution to science has been the definition of coordinative principles underlying knowledge governance as a fundamentally distinct mode of governance that has also been explored in case studies (chapters 2-4). Therefore, knowledge governance is not a utopian vision in which policymaking has become rationalised and the 'best' policy options are chosen. Moreover, it is not about governing knowledge, but constitutes a mode of governance with its own coordinative principles that distinguishes it from hierarchy, market

and network. These have been defined in chapter 2. This set of coordinative principles is not to be regarded as the coordinative principles of *territorial* knowledge governance. These were elaborated in chapter 5 and in this concluding chapter.

The second knowledge gap this thesis has addressed is the lack of a territorial approach in the governance of sustainable development transitions, and especially regarding knowledge and learning. This body of literature deals with the institutional embeddedness of sustainable development initiatives within specific territorial spaces (Coenen et al., 2012), the spatial configurations and dynamics of the networks within which transitions evolve (Coenen et al., 2012) and territorial development processes (Kebir et al., 2017). Therefore, this literature is highly relevant to attempts to integrate knowledge and learning interventions in modes of governance frameworks. The literature on modes of governance also has much to offer to economics and economic geography, as that literature has not developed much of a governance framework that surpasses the firm and transactions and often uses normative and simplistic interpretations of governance (Flanagan & Uyarra, 2016). This thesis combined territorial-economic thinking with modes of governance thinking and thereby closing both knowledge gaps.

Finally, this thesis integrated governance and territorial approaches by developing an analytical framework of *territorial* knowledge governance. In this framework, the first set of coordinative principles of the fundamental mode of governance in chapter 2 and the expansion to this set in chapter 4 have been synthesised with key issues from a territorial perspective, such as the role of missions, significant versus substantive knowledge and territorial knowledge dynamics. These concepts are not widely known and used in the scientific community that studies sustainability governance and have the potential to enrich the scientific debate on how knowledge and learning can establish coordination in sustainable development transitions, also in relation to its territorial dimensions.

7.4 Reflections

7.4.1 Reflections on the theoretical framework

The central theoretical concept, which this thesis produced, is territorial knowledge governance. A simple heuristic model was the start of the elaboration of an analytical framework of territorial knowledge governance. This analytical framework provides a way to understand how knowledge and learning relate to policy change in sustainability clusters and to discover its constraints, enablers and results. The theoretical concept of territorial knowledge governance proved to be a useful framework, because it is able to identify key issues, such as values, missions, territorial knowledge dynamics and changing capitalism. These are key issues for the study and design of knowledge activities to pursue the sustainable development of agriculture and food clusters. To be able to do this, the analytical framework of territorial knowledge governance had to be elaborated and coordinative principles had to be defined that integrated different theoretical approaches.

Notwithstanding the many empirical examples of territorial knowledge governance in sustainable development, it is primarily a theoretical framework. Moreover, the practitioners in the selected cases of territorial knowledge governance in this thesis would perhaps not

identify with this label. Moreover, the cases are not perfect examples and contain elements of other modes of governance. This was partly caused by the nature of the research as the cases were derived from contract research projects that were not exclusively set-up to be used as cases. This is not problematic, because territorial governance, just as any other concept, is an archetypical concept that was primarily used to highlight key issues to the pursuance of sustainable development in agriculture and food clusters. Another possible issue is that the developed coordinative principles of territorial knowledge governance might be too ideal type to be realistic, considering the complexities involved in changing existing habits, cultures, practices and attitudes of policymaking. It is not concluded that this is the case, because they were useful in discovering key issues and are not meant to evaluate knowledge-based cluster initiatives.

7.4.2 Reflections on the research design

The research design of this thesis relied on both theoretical and empirical explorations. These were elaborated in an iterative manner by selecting theoretical areas of exploration and the case studies that would be able to provide insights into the key issues in these theories. Afterwards, it was reflected what the analysis delivered concerning the understanding of territorial knowledge governance and what to explore theoretically next, starting a new iterative cycle. Especially the shift from literature about knowledge and modes of governance to territorial development literature and the interplay between theoretical and empirical explorations were examples of the iterative approach to the research design.

The research questions of this thesis made it crucial to explore different bodies of literature derived from different scientific communities, each with its own discussions and concepts. Even if they use the same words, the meanings can be quite diverse, as is for instance the case with 'governance' or even 'knowledge'. Of course, this thesis was not the first attempt to cross-disciplinary boundaries in studying the governance of sustainability and the governance of territorial development. For instance, economic geographers have been developing linkages to political sciences and sustainability sciences before, because there were the insights they needed to advance their knowledge trajectories. More strongly put, geographic analysis is characterised by integrating different scientific disciplines in a territorial setting. Such an interdisciplinary approach to the theoretical exploration did complicate the research though, because it required a thorough exploration of the different bodies of literature and how they relate, without 'hijacking' literature for purposes that its owners would not recognise anymore. The publication of the chapters as scientific papers and book chapters, the review process that belonged to that, and the collaboration with co-authors, made sure that this did not happen. Thereby, the thesis has organised that critique would be provided by experts.

The second pillar of the research was constituted by explorations in case studies. The cases were central to the iterative research design of this thesis. The cases were not so much used to derive generic conclusions about aspects of territorial knowledge governance, but to explicate territorial knowledge governance practices, their coordinative principles, constraints and enablers and impacts. Instead, certain aspects of these practices were highlighted to derive new insights about the coordinative principles of territorial

knowledge governance and the pursuance of sustainable development in agriculture and food clusters.

The selection of the cases in the case study, is an issue for reflection as well. The selection was limited to cases that are related to sustainable agriculture and food. One could argue that this is indeed limited, because now it is not known whether the results would be different if for instance sustainability in energy production was studied. This is of course true, but this can be addressed in follow-up research. Moreover, this focus was chosen on purpose, because it made the cases comparable and guaranteed a more in-depth understanding. Moreover, this empirical field is highly relevant to sustainable development and its governance. Lastly, this limitation was recognised in the research design and to prevent this becoming a problem, the scope of analysis was broadened by incorporating various operationalisations of sustainability. For example, there is a big difference between what is seen as sustainable in the Northern Frisian Woodlands case as it is in the cases of Metropolitan Food Clusters. The geographic diversity of the cases also enabled the incorporation of different settings and context that made it possible to explore and compare differences between the cases.

Reflections can also be made about the research method. The case study in this thesis mainly made use of qualitative research, which build on interviews, observations and document analysis. Moreover, the case information was partly derived from action research in which also advice and feedback was given to practitioners. These activities have been captured in interview notes and logs, but it is recognised that it is not so transparent how exactly the analysis was conducted, as no coding has been applied nor reported on. This is a limitation of this thesis, but considering the research objective and its focus on a theoretical elaboration of the coordinate principle it is not problematic, as the cases are mainly used to highlight key issues and to test the analytical framework and not to prove that certain principles are present. Nonetheless, the consequence is that the constraints, enablers and type of results are to be regarded as preliminary, as these have been partly derived from the case studies.

7.4.3 Reflections on the role of the researcher

The main reflection on the role of the researcher is concerned with how the case information was derived. Excluding the case of Sustainable greenhouse horticulture in the Netherlands and the five minor cases, they were at least partially the result of participation in contract projects that did not only included research activities, but also interaction with stakeholders, advisory activities and process facilitation. In all of these case studies at least one person was consulted, whom had participated directly in the process that was described, and in most cases, collaboration was established in the analysis of the case information. Therefore, the case studies were partly grounded in action research. With the assistance of the developed analytical frameworks, it became possible to analyse the cases critically and surpass the perceptions and framings that had been developed in these applied projects. Additionally, this enabled a rich and practice-oriented case analysis.

Not all cases were grounded in action research though. For instance, the case of greenhouse horticulture in the Netherlands had been derived from a more classical research

project that was based on literature studies and interviews. In some cases (e.g. India), a mix of action research and more distanced research was used.

A specific issue for reflection is whether the direct involvement of the researcher in contract research and especially in intervening in project management did not blind or bias the research. In the research steps were taken to prevent this, such as 1) collaboration in the analysis with researchers that were not so strongly involved in the studied cases, 2) the grounding of the analyses in issues that were derived from theory and not from practice, and 3) the inclusion of cases that were not based on action research, but on more distanced analysis. Moreover, this involvement provided the thesis with many insights into the contingencies of the cases, which enabled a richer analysis than otherwise would have been possible.

7.5 Societal relevance and policy implications

Because of the centrality of knowledge, learning and missions to sustainable territorial development, how knowledge shapes the governance of territorial development and sustainability is relevant to all types of cluster actors, such as public authorities, universities, businesses, as organisations and as individuals. This is not only theoretically relevant, but something that is happening in the real world, as was shown with the case studies in this thesis.

This thesis provides insights for knowledge-driven territorial development initiatives that pursue sustainability in agriculture and food. The analytical framework as was elaborated, can be used to understand and appreciate what is happening in sustainability schemes and how to adjust interventions to advance them. Therefore, the analytical framework is of use as an inspirational source for designing and setting-up knowledge schemes and therewith to overcome an improvised approach that is opportunistic and focussed on short-term impact. Accordingly, it is recommended to start with defining a clear mission, together with other cluster actors. When setting up knowledge and learning activities, it is also recommended to focus on the anchoring of knowledge that is related to sustainable development visions and on measures to overcome institutional boundaries by making the ideas and results meaningful to decision makers. Of course, the principles of territorial knowledge governance should not be applied one on one, but after critical assessment of their usefulness. Moreover, these insights should also be of interest to other industries than agriculture and food, such as sustainable energy and the bioeconomy that pursue sustainable development in territorial development processes.

The concept of territorial knowledge governance can also be used as an inspiration to policies that attempt to stimulate innovation and economic development through research, technology and innovation policies. Examples of these policies are the European Union Horizon 2020 programme, the Smart Specialization Policy (RIS3) of the European Union, the Topsector innovation policy of the Netherlands or regional attempts to create 'valleys' that would follow the examples of the famous Silicon Valley region in the United States. These policies all have issues in reaching out to relevant actors to participate in them, e.g. small and medium sized firms, universities from central and Eastern Europe or civil society.

Sometimes the institutional frameworks that were set up seem to be a major obstacle to achieve the ambitions behind them. This can for instance be caused by requirements for co-funding, rates to be used by applied research institutes, education and consultancy firms, or by having a preference for known partners that lack key capabilities, such as disseminating knowledge to small and medium sized firms.

In particular, the importance of significant knowledge around jointly developed missions is of importance to the mentioned policies. As was shown for the cases in this thesis, the implementation of the developed knowledge is a real challenge, due to difficulties in anchoring the developed knowledge. It is particularly important to firmly ground policy missions, such as those of the Topsector and RIS3 innovation policies, in joint intelligence activities and joint sense making. Moreover, supportive frameworks and institutions are instrumental in enabling cluster actors to pursue this mission, instead of fulfilling the requirements of public authorities, without achieving much. For this, it is wise to critically consider with whom to collaborate, instead of by default working together with 'the usual suspects'.

The thesis also has implication for research institutes, universities and other knowledge-oriented organisations. That they play a role in territorial innovation and sustainable development that surpasses notions on 'evidence-based policy making' (Solesbury, 2001), or 'speaking truth to power' (Wildavsky, 1979) and have a close connection to sustainable development missions, should not come as a surprise, since this was already discovered in the beginning of this century and even earlier (e.g. Etzkowitz & Leydesdorff, 2000 or Drucker, 1969; Uyarra, 2010; Hoppe, 1999). It can be learned from this thesis that for pursuing sustainable development missions, it is crucial to focus on developing significant knowledge in cluster networks and on anchoring the produced knowledge, in addition to focussing on substantive knowledge, such as technological innovations. These are important, but without social innovations, they will likely not lead to sustainable development transitions. This also means that knowledge is not the sole domain of the knowledge provider, but is co-owned by all cluster actors and that the neutrality of knowledge, if possible at all, is not always that important. Being connected to missions is more important when the knowledge is part of a sustainable development transition. Of course, the knowledge needs to be of good quality and be recognised as such, so territorial knowledge governance has high knowledge standards as well. Although these insights are not particularly new (e.g. Nowotny et al., 1991; Thompson-Klein et al., 2001), this has yet to become mainstream.

Lastly, the coupling to missions that makes knowledge significant has implications for the institutional setting under which knowledge and learning trajectories are set up. These need to be tailored to develop and anchor significant knowledge that can find its way to policy alteration and adjustment and thereby supporting the aimed for sustainable development mission in agriculture and food in an effective manner. The institutional adjustments to support knowledge and learning processes are quite complex, as the existing institutions have been the result of a previously travelled path and accordingly can often not be changed easily. This is a major challenge for governments, universities and businesses alike.

7.6 Suggestions for further research

The first suggestion for further research is to implement the analytical framework of this thesis in more case studies, and particularly to focus on different manifestations of territorial knowledge governance. These can be explored further, by engaging in empirical studies with the assistance of the analytical framework as was developed in this thesis. These studies would also need to incorporate the constraints and enablers of territorial knowledge governance. Much more can be said about them in-depth than was possible in this thesis, particularly concerning how cluster actors develop the capabilities to act in a reflexive, transdisciplinary, boundary crossing and self-organising manner by which significant knowledge is anchored in policies. Especially, there is a need to understand how the constraints to territorial knowledge governance can be overcome. Therefore, attention should be given to the design of boundary management in knowledge governance, and especially to the openness of organisations to policy learning.

Important issues to be explored are the time-aspects and the institutions that govern and enable knowledge and learning processes. Accordingly, more work needs to be done on how missions can be implemented effectively in highly complex settings, in which stakeholders act from different perspectives, habits, capabilities, beliefs and ambitions, a trait that tends to oppose the implementation of sustainable territorial development missions. Of particular importance is the question of how to maintain the efforts and its institutional support over a longer timeframe, beyond a single project. Implementing and managing such institutions is very complex and challenging in itself and, as discussed in chapter 4, many territories do not have the resources and capabilities to do so. Incorporating linkages to trans-territorial knowledge and anchoring the knowledge in projects, programmes and policies make it even more complex because it is developed in other contexts that are not necessarily meaningful to a specific territorial knowledge process. Therefore, a better understanding of specific and situated territorial knowledge governance arrangements is required to enable the emergence of such a knowledge, learning and adaptation-oriented approach to territorial innovation policy. Moreover, it is highly relevant to identify the pathways to collectively acting in a reflexive, transdisciplinary and self-organising manner by which trans-territorial knowledge is anchored in territorial innovation policy and policy learning.

Finally, future research can be done by expanding the empirical focus. This thesis focussed on agriculture and food clusters, but there are many other industries where sustainable development is pursued with knowledge activities. It should be considered critically, whether the analytical framework can be applied, but it is expected to be applicable to other contexts as well. If the focus is less on territorial development, than this thesis still provides a generic set of coordinative principles of knowledge governance (chapter 2). By such an empirical expansion, it becomes possible to compare knowledge governance arrangements from different industries or type of development processes. A suggestion would be to direct such a study at the bioeconomy, climate adaptation and mitigation and urban development, all major areas for sustainable development. Moreover, the domain of territorial research and technology policies has been touched in this thesis, but can be taken up further. All these empirical domains are of importance to advancing sustainability in territorial development.

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Summary

Introduction

Sustainable development is a major societal, economic and policy issue, which receives much attention and traction, especially since the publication of the Sustainable Development Goals in 2015. These SDGs cover social and economic development issues, including ending poverty and hunger, improving health and education, making cities more sustainable, combating climate change, and protecting oceans, forests and other terrestrial ecosystems. This is of particular interest to agriculture and food. In response to these sustainable development challenges in agriculture and food, a multitude of innovative activities and approaches to sustainability in agriculture and food systems has emerged. Notwithstanding the many initiatives in sustainable development, it is not yet within reach and current usage of natural resources is far from sustainable.

Sustainable development has been described as one of the 'grand challenges' or transitions of this age. Directing such a systemic transition in a desired direction is a highly complex activity in which existing institutions and practices have to make way for the desired activity. Moreover, the complexity that was mentioned above makes it difficult to select governance interventions to advance the pursuance of sustainable development. Sustainability is therefore a major governance challenge.

In practice, many activities in the pursuit of sustainable development focus on knowledge development and learning. Moreover, participants collaborate in sustainability clusters, in groups of related companies aim to increase the sustainability of their firms, value chains and territories, supported by stakeholders from public authorities, science, society and business. On that account, the role of knowledge in advancing sustainable development in clusters in agriculture and food became the object of this thesis.

Knowledge gaps in understanding the role of knowledge in sustainability governance

The knowledge and learning aspects of sustainability governance have been studied extensively, especially regarding social learning and the use of scientific knowledge to pursue sustainable development. Nonetheless, this knowledge- and learning-based approach to governance has not been well integrated in the literature on modes of governance. Governance literature has largely neglected to study knowledge and learning on a more fundamental level that would address the coordinative mechanisms of governance, which lead to transformative change. Especially the coordinative and transformative aspects of knowledge and learning have been somewhat overlooked.

The second knowledge gap this thesis addresses, is a lack of a territorial-economic approach in the governance of sustainable development transitions, and especially regarding knowledge and learning. In economics and economic geography, there has been much attention to knowledge and learning that lead to economic development through innovation. Nonetheless, this literature generally has a strong focus on the firm and transactions and a limited one on the role of public actors (Ebbekink & Lagendijk, 2013; De Propris and Wei, 2007; Flanagan & Uyarra, 2016). Moreover, the complexity of governance tends to be underestimated (Flanagan et al., 2011; Flanagan & Uyarra, 2016). Hence, this thesis focusses on two aspects of the governance of sustainable development transitions in agriculture and food systems: 1) the coordinative role of knowledge and learning and 2)

the territorial aspects of the knowledge and learning processes that establish coordination in sustainable development transitions. Moreover, these aspects are integrated in this thesis.

Research objectives and questions

This thesis, aims to improve the theoretical understanding of how knowledge processes achieve coordination in advancing sustainable development in agriculture and food clusters, or 'territorial knowledge governance'. Particularly the proposition was explored that knowledge governance should be considered as a distinct mode of governance with its own coordinative principles. For this objective, a heuristic framework has been elaborated, consisting of sustainable development missions, knowledge and governance, that together constitute territorial knowledge governance (in agriculture and food).

The main objective of this thesis is to elaborate a conceptual framework for studying sustainability-driven territorial knowledge governance. Therefore, the scientific contribution is mainly theoretical. This analytical framework is meant to be of use to explore the practices by which knowledge processes in agriculture and food clusters coordinate the establishment of sustainable development. It is also used as such in this thesis for the case studies of various practices of knowledge governance by actors in sustainable agriculture and food clusters. The central research question is:

Through which principles and to what extent do knowledge and learning establish coordination in the pursuance of the sustainable development of agriculture and food clusters?

To answer this question, the following sub-questions are studied in this thesis:

1. *What are the coordinative principles of territorial knowledge governance in the pursuance of sustainable development of agriculture and food clusters?*
2. *What are the constraints and enablers of territorial knowledge governance for pursuing sustainable development in agriculture and food clusters?*
3. *What type of results are produced by territorial knowledge governance?*

Research design

The thesis uses an iterative research design that developed through a series of stages in which literature was explored to define principles, enablers, constraints and results of territorial knowledge governance that were then applied in case studies. From these case studies, conclusions were drawn that served as input for the next cycle of literature research. The first set of coordinative principles that this thesis produced, started from generic theories of modes of governance, knowledge, learning, innovation, and territorial development and was used and tested in the first case study and then again more in-depth in a comparative case study that identified constraints, enablers and type of results. Iterative cycles that followed, could expand this understanding and finally led to an analytical framework of territorial knowledge governance. Literature and case studies were explored to contextualise territorial knowledge governance with discussions on the changing

nature of economic systems in which knowledge, institutions, values and missions become more important, but still have to relate to a strongly developed market and transactional logic.

The case studies enable the identification of key issues, which then were explored theoretically. The case studies are not so much meant to derive generic conclusions, but to test and enrich the framework and to identify issues and angles that would be needed to grasp territorial knowledge governance for sustainable development missions in agriculture and food, and thereby feed the argumentative exploration in this thesis. Moreover, much attention is given to exploring and integrating different bodies of literature.

The core selection criterion for the cases is that they are examples of agriculture and food clusters that pursue sustainable development and for that objective would employ knowledge activities in the form of research, innovation, design activities or social learning as its main strategy. The cases were partly found in direct and indirect relation to the Dutch innovation program TransForum in which knowledge and learning was organised to advance sustainable development in agriculture and food and therefore, very relevant to this thesis.

Two types of case studies are part of this thesis: 1) in-depth explorative case studies and 2) cases for comparative analysis of cases. The first category is constituted by two case studies: Sustainable dairy farming in the Northern Frisian Woodlands and Sustainable development of greenhouse horticulture in the Netherlands. The second type of case studies are used for comparative analysis. All case studies are based on a secondary analysis of available information. As cases were selected: Food Cluster Mexico, Seaweed Farming in the North Sea, Greenport Venlo (Netherlands) and Greenport Nellore (India). The Northern Frisian Woodlands case is also used for comparative analysis. Moreover, a set of minor comparative cases was used: 1) Spatial information of Castilla y Leon, 2) Policy entrepreneurship Scotland, 3) Policy tourism in urban planning in the Netherlands, 4) Éupolis Lombardia, 5) Brussels Studies Institute.

Conclusions

This thesis elaborates the coordinative principles, constraints, enablers and type of results of territorial knowledge governance and presents them in one analytical framework (table 1). The coordinative principles of territorial knowledge governance have been defined in this framework as: 1) the setting of sustainable development missions, 2) the production and exchange of knowledge in supportive milieus, 3) the embedding of substantive knowledge, 4) the anchoring of significant knowledge, and 5) the feeding of the acquired significant knowledge into the (re-)design of institutions and strategies of policy design and implementation.

The constraints to territorial knowledge governance that are elaborated in this thesis, include a lack of willingness or ability to change in relation to the mission and to engage in a self-organising, reflexive, social learning and transdisciplinary process. These constraints are relevant to the coordinative principle of knowledge production and exchange of knowledge in supportive milieus. Some more constraints are the lack of lasting commitment, a focus on short term results, a lack of alignment of actors and a lack of essential knowledge in the cluster. These constraints can lead to a loss of significant knowledge and cause various

problems when the devised plans are to be implemented, because they lack the support of key stakeholders. Therefore, the constraints are primarily related to the coordinative principles setting of a mission, anchoring significant knowledge) and feeding of acquired significant knowledge into the (re-)design of institutions and strategies of policy design and implementation. These constraints manifest themselves differently according to a stronger focus on advocacy or on implementation.

The enablers of territorial knowledge governance are partly the opposites of the constraints. This is especially true for the commitment to engage in knowledge processes, surpassing an individual project or event and for the ability to acquire and use essential knowledge. Other enablers are relating activities to existing development pathways, tailoring boundary arrangements to the governance context, establishing supportive institutional arrangements and dedication and ability to persist.

Table 1 Analytical framework of territorial knowledge governance of agriculture and food clusters

	Territorial knowledge governance
Coordinative principles	- Setting a joint sustainable development mission - Producing and exchanging knowledge in supportive milieus, that are o self-organising, o engaging in social and reflexive learning and o focussing on transdisciplinary knowledge - Embedding external substantive knowledge - Anchoring significant knowledge - Feeding the acquired significant knowledge into the (re-)design of institutions and strategies of policy design and implementation
Constraints	- Lack of willingness or ability to change - Lack of willingness or ability to engage in a knowledge process - Lack of lasting commitment and focus on short term results - Lack of alignment of actors - Essential knowledge cannot be mobilised
Enablers	- Commitment to engage in knowledge processes that surpasses an individual project or event - Ability to acquire and use essential knowledge - Relating activities to existing development pathways - Tailoring boundary arrangements to the governance context - Establishing supportive institutional arrangements - Dedication and ability to persist
Type of results	- Opening new pathways for sustainable development - Establishing alignment between cluster actors - Follow-up knowledge governance activities - Artefacts, such as tools, data, proto-types, facilities and infrastructure

Territorial knowledge governance is especially suited to complex challenges, such as sustainable development. It can lead to the opening of new pathways for sustainable development, through the establishment of alignment between cluster actors around a shared vision and mission that emerges during endeavours in territorial knowledge governance. Sometimes, a result is follow-up knowledge activities. There are also tangible results that concern substantive knowledge, such as tools, data, proto-types, designs and plans, facilities and infrastructure. By this, it establishes coordination in the pursuance of the sustainable development of agriculture and food clusters.

Contribution to the scientific debate

A key contribution to the scientific debate is the definition of coordinative principles underlying knowledge governance as a fundamentally distinct mode of governance. Moreover, this thesis developed an analytical framework (table 1) for territorial knowledge governance that is focussed at pursuing sustainability in agriculture and food systems. Through this analytical framework, literature on governance, knowledge and learning and literature on territorial development were integrated. This produced insights into the principles by which knowledge and learning establish coordination in sustainable development transitions, also in relation to its territorial dimensions.

Reflections

The main reflection on the research designs concerns how the case information was derived. Excluding two major comparative cases and the five minor comparative cases, the information was at least partially derived from direct participation in contract research projects. This involvement provided the thesis with many insights into the contingencies of the cases, so a richer analysis became possible than otherwise would have been within reach. To prevent bias in the research, steps were taken to prevent this, such as collaboration in the analysis with researchers that had not been so strongly involved in the studied cases, the use of an analytical framework that was derived from theory, and the inclusion of cases that were not on more distant analysis, in addition to the ones that were based on action research.

This thesis provides valuable insights for cluster and territorial development initiatives that pursue sustainability in agriculture and food, that in principle should also be of interest to other industries than agriculture and food, such as sustainable energy and the bioeconomy, that also pursue sustainable development in territorial development processes. The conceptual framework can be used to understand and appraise what is happening in sustainability schemes and how to adjust them, if needed. It can also be used as inspiration for setting up knowledge activities to overcome an improvised approach that is opportunistic and focussed on short-term impact. Moreover, the concept of territorial knowledge governance can be used as an inspiration to policies that aim to stimulate innovation and economic development through research, technology and innovation policies. Examples of these policies are the European Union Horizon 2020 program, the Smart Specialization Policy (RIS3) of the European Union, the Dutch Topsector innovation policy and regional attempts to create 'valleys'.

The thesis also has implications for research institutes, universities and other knowledge-oriented organisations. They play a role in sustainable territorial development that surpasses notions on 'evidence-based policy making' or 'speaking truth to power'. Research and education co-develop significant knowledge in cluster networks and by anchoring the produced significant knowledge, in addition to providing substantive knowledge, concerning technological innovations. The neutrality of knowledge is not always that important in these processes. Being connected to missions is more important. Notwithstanding, knowledge still needs to be of high quality and be recognised as such.

Advice for follow-up research

The first suggestion for further research is to implement the analytical framework in more case studies, and particularly to focus on different manifestations of territorial knowledge governance, starting with advocacy, implementation, mission- and value-driven types of territorial knowledge governance, as were explored in this thesis. Further variables to be explored are time-aspects and the institutions that govern and enable knowledge and learning processes, in research as well as in policy. Accordingly, more work needs to be done on how missions can be implemented effectively in highly complex settings in which stakeholders act from perspectives, habits, capabilities, beliefs and ambitions that tend to oppose the implementation of sustainable territorial development missions and particularly, how to maintain the efforts and its institutional support over a longer timeframe, surpassing a project approach. Finally, further research can also be done by expanding the empirical focus to other industries.

Samenvatting

Inleiding

Duurzame ontwikkeling is een belangrijke maatschappelijke, economische en beleidskwestie die vooral sinds de publicatie van de Sustainable Development Goals (SDG's) in 2015 veel in de aandacht staat. Deze SDG's behandelen sociale en economische ontwikkelingskwesties, waaronder het beëindigen van armoede en honger, het verbeteren van gezondheid en onderwijs, het duurzamer maken van steden, het bestrijden van klimaatverandering en het beschermen van oceanen, bossen en andere terrestrische ecosystemen. Als reactie op deze uitdagingen is een veelheid aan innovatieve activiteiten en benaderingen van duurzaamheid in landbouw en voedselsystemen ontstaan. Ondanks de vele initiatieven is duurzame ontwikkeling nog niet binnen bereik en is het huidige gebruik van natuurlijke hulpbronnen verre van duurzaam.

Duurzame ontwikkeling is wel beschreven als één van de grote uitdagingen of transities van deze tijd. Het sturen van een dergelijke systemische transitie in een gewenste richting is een zeer complexe activiteit waarbij bestaande instituties en praktijken plaats moeten maken voor de gewenste activiteit. Bovendien maakt de hierboven genoemde complexiteit het moeilijk om governance-interventies te selecteren die het streven naar duurzame ontwikkeling bevorderen. Duurzaamheid is daarom een governance uitdaging.

In de praktijk zijn veel duurzame ontwikkelingsactiviteiten gericht op kennisontwikkeling en leren. Bovendien werken deelnemers samen in duurzaamheidsclusters. Dit zijn groepen van verbonden bedrijven die tot doel hebben de duurzaamheid van hun bedrijven, waardeketens en fysieke omgeving te vergroten. Zij worden hierin ondersteund door actoren uit overheden, wetenschap, maatschappij en bedrijfsleven. De rol van kennis in het bevorderen van duurzame ontwikkeling in clusters in landbouw en voedsel is het onderwerp van dit proefschrift.

Kennislacunes over de rol van kennis in de governance van duurzaamheid

De kennis- en lerenaspecten van de governance van duurzame ontwikkeling zijn uitgebreid bestudeerd; met name met betrekking tot sociaal leren en het gebruik van wetenschappelijke kennis. Deze kennis- en leren gebaseerde benadering van governance is echter niet goed geïntegreerd in de literatuur over 'Modes of Governance'. De governance literatuur heeft het grotendeels nagelaten om kennis en leren op een meer fundamenteel niveau te bestuderen; met name voor wat betreft de coördinerende mechanismen die tot transformatieve veranderingen rondom duurzame ontwikkeling kunnen leiden. Kortom, vooral de coördinerende en transformatieve aspecten van kennis en leren zijn tot nu toe grotendeels over het hoofd gezien.

De tweede kenniskloof die in dit proefschrift wordt opgepakt is een gebrek aan een ruimtelijk-economische benadering in het sturen van duurzame ontwikkelingstransities, met name met betrekking tot kennis en leren. In de economische wetenschappen en de economische geografie is er wel veel aandacht geweest voor kennis en leren en de economische ontwikkeling die het gevolg is van innovatie. Deze literatuur heeft over het algemeen echter een sterke focus op bedrijven en transacties tussen bedrijven en een beperkte focus op de rol van publieke actoren (Ebbekink & Lagendijk, 2013; De Propris en Wei, 2007; Flanagan & Uyarra, 2016). Bovendien wordt de complexiteit van governance vaak onderschat (Flanagan et al., 2011; Flanagan & Uyarra, 2016). Daarom richt dit proefschrift zich

op twee aspecten van het sturen van duurzame ontwikkelingstransities in landbouw- en voedselsystemen: 1) de coördinerende rol van kennis en leren en 2) de territoriale aspecten van de kennis en leerprocessen die deze coördinatie tot stand brengen in duurzame ontwikkelingstransities. Bovendien worden in dit proefschrift deze aspecten geïntegreerd.

Onderzoeksdoelstelling en -vragen

Dit proefschrift heeft als doel het theoretische begrip te verbeteren van hoe kennis- en leerprocessen coördinatie bewerkstelligen bij het nastreven van duurzame ontwikkeling in landbouw en voedselclusters, of 'ruimtelijke kennis governance'. In het bijzonder wordt de stelling onderzocht dat kennis governance moet worden beschouwd als een afzonderlijke mode of governance, met zijn eigen coördinerende principes. Voor deze doelstelling is een heuristisch kader ontwikkeld, bestaande uit duurzame ontwikkelingsmissies, kennis en governance, die samen ruimtelijke kennis governance vormen (met betrekking tot landbouw en voedsel).

Het hoofddoel van dit proefschrift is om een conceptueel kader uit te werken voor het bestuderen van duurzaamheidsgerichte ruimtelijke kennis governance. Daarom is de bijdrage aan de stand van de wetenschap vooral van theoretische aard. Dit analytische kader is bedoeld om te gebruiken bij het onderzoeken hoe kennisprocessen in landbouw- en voedselclusters de totstandbrenging van duurzame ontwikkeling coördineren. Het kader wordt ook als zodanig in dit proefschrift gebruikt voor de casestudies van verschillende praktijken van ruimtelijke kennis governance door actoren in duurzame landbouw en voedselclusters. De centrale onderzoeksvraag is:

Op basis van welke principes en in welke mate zorgen kennis en leren voor coördinatie bij het streven naar duurzame ontwikkeling van landbouw- en voedselclusters?

Om deze vraag te beantwoorden, worden de volgende sub-vragen in dit proefschrift bestudeerd:

1. *Wat zijn de coördinerende principes van ruimtelijke kennis governance bij het streven naar duurzame ontwikkeling van landbouw- en voedselclusters?*
2. *Wat zijn de barrières en versterkers voor ruimtelijke kennis governance bij het nastreven van duurzame ontwikkeling in landbouw en voedselclusters?*
3. *Welk type resultaten worden geproduceerd door ruimtelijke kennis governance?*

Onderzoeksontwerp

Het onderzoek van dit proefschrift maakt gebruik van een iteratief onderzoeksontwerp dat werd uitgewerkt in een reeks van fasen waarin literatuur werd verkend om principes, versterkers, barrières en resultaten van ruimtelijke kennis governance te definiëren. Deze inzichten werden vervolgens toegepast in casestudies. Uit deze casestudies werden conclusies getrokken die als input dienden voor de volgende cyclus van literatuuronderzoek. De eerste set van coördinerende principes die voortkwam uit het onderzoek achter dit proefschrift gaat uit van generieke theorieën over sturing, kennis, leren, innovatie en ruimtelijke ontwikkeling. Deze set van coördinerende principes werd gebruikt en getest in de eerste casestudy en vervolgens nog diepgaande gebruikt in een vergelijkende

case studie die barrières, versterkers en type resultaten identificeerde. De iteratieve cycli die volgden, breidden het ontstane begrip uit en leidden uiteindelijk tot een analytisch kader voor ruimtelijke kennis governance. Literatuur en casestudies zijn onderzocht om ruimtelijke kennis governance te contextualiseren met discussies over de veranderende aard van economische systemen (in het bijzonder het kapitalisme) waarbij kennis, instituties, waarden en missies belangrijker worden, maar nog steeds verband moeten houden met een sterk ontwikkelde markt- en transactielogica.

De casestudies maakten het mogelijk om belangrijke kwesties te identificeren, die vervolgens theoretisch werden onderzocht. De casestudy's zijn niet zozeer bedoeld om generieke conclusies te trekken, maar om het kader te testen en te verrijken en om problemen en invalshoeken te identificeren die nodig zouden zijn om ruimtelijke kennis governance voor duurzame ontwikkelingsmissies in landbouw en voedsel te begrijpen. Bovendien wordt uitgebreid aandacht besteed aan het verkennen en integreren van verschillende typen wetenschappelijke literatuur.

Het belangrijkste selectiecriterium voor de cases was dat het voorbeelden zijn van landbouw- en voedselclusters die duurzame ontwikkeling nastreven en voor dat doel kennisactiviteiten in de vorm van onderzoek, innovatie, ontwerpactiviteiten of sociaal leren als hoofdstrategie zouden gebruiken. De cases werden deels gevonden in directe en indirecte relatie met het Nederlandse innovatieprogramma TransForum. In dit programma werd kennis en leren georganiseerd om duurzame ontwikkeling in landbouw en voedsel te bevorderen. Daarom is dit programma zeer relevant voor dit proefschrift.

Twee soorten casestudies maken deel uit van dit proefschrift: 1) diepgaande verkennende casestudies en 2) cases voor vergelijkende analyse. De eerste categorie bestaat uit twee casestudy's: Duurzame melkveehouderij in de Noordelijke Friese Wouden en Duurzame ontwikkeling van de glastuinbouw in Nederland. Het tweede type casestudy's wordt gebruikt voor vergelijkende analyse. Alle casestudies zijn gebaseerd op een secundaire analyse van beschikbare informatie. Als cases werden geselecteerd: Food Cluster Mexico, Zeewier teelt op de Noordzee, Greenport Venlo (Nederland) en Greenport Nellore (India). De casus Noordelijke Friese Wouden werd ook gebruikt voor vergelijkende analyses. Bovendien werd een aantal kleine vergelijkende cases gebruikt: 1) Ruimtelijke informatie in Castilla y Leon, 2) Beleidsondernemerschap Schotland, 3) Beleidstoerisme in stadsplanning in Nederland, 4) Eúpolis Lombardia en 5) Brussels Studies Institute.

Conclusies

Dit proefschrift werkt de coördinerende principes, barrières, versterkers en het type resultaten van ruimtelijke kennis governance uit en presenteert ze in één analytisch kader (tabel 1). De coördinerende principes van ruimtelijke kennis governance zijn in dit kader gedefinieerd als: 1) het formulieren van duurzame ontwikkelingsmissies, 2) de productie en uitwisseling van kennis in ondersteunende milieus, 3) de inbedding van inhoudelijke kennis[1], 4) de verankering van significante kennis, en 5) het inbrengen van de verworven significante kennis in het (her) ontwerp van instituties en strategieën voor beleidsontwerp en -uitvoering.

[1] Substantive knowledge in het Engels

Tabel 1 Analytisch kader voor ruimtelijke kennis governance van landbouw- en voedselclusters

	Territoriale kennis governance
Coördinatieve principes	- Het formuleren van een gezamenlijke missie voor duurzame ontwikkeling - Kennis produceren en uitwisselen in ondersteunende milieus die worden gekenmerkt door o zelforganisatie o sociaal en reflexief leren o transdisciplinaire kennis - Inbedding van externe inhoudelijke kennis - Verankering van significante kennis - Het inbrengen van de verworven significante kennis in het (her)ontwerp van instituties en strategieën voor beleidsontwerp en –uitvoering
Barrières	- Gebrek aan bereidheid of vermogen om te veranderen - Gebrek aan bereidheid of vermogen om deel te nemen aan een kennisproces - Gebrek aan blijvende inzet en focus op korte termijn resultaten - Gebrek aan gezamenlijkheid tussen actoren - Essentiële kennis kan niet worden gemobiliseerd
Versterkers	- Bereidheid om kennisprocessen aan te gaan die een individueel project of evenement overstijgen - Vermogen om essentiële kennis te verwerven en te gebruiken - Relateren van activiteiten aan bestaande ontwikkelingstrajecten - Afstemmen van grensarrangementen op de governance context - Implementatie van ondersteunende institutionele arrangementen - Toewijding en het vermogen om door te zetten
Type resultaten	- Nieuwe paden openen voor duurzame ontwikkeling - Het op één lijn brengen van clusteractoren - Vervolg-kennisactiviteiten - Artefacten, zoals tools, data, prototypes, ontwerpen en plannen, faciliteiten en infrastructuur

De belangrijkste barrière voor ruimtelijke kennis governance die voorkomt uit het onderzoek achter dit proefschrift is een gebrek aan bereidheid of vermogen om te veranderen in relatie tot de missie en om deel te nemen aan een zelforganiserend, reflexief, sociaal leren en transdisciplinair proces. Deze barrière is relevant voor het coördinatieprincipe van kennisproductie en kennisuitwisseling in ondersteunende milieus. Andere barrières zijn het gebrek aan blijvende inzet, een focus op korte termijn resultaten, het niet op één lijn zitten van actoren en de afwezigheid van essentiële kennis in het duurzaamheidscluster. Deze barrières kunnen leiden tot verlies van significante kennis en kunnen allerlei praktische problemen veroorzaken wanneer de opgestelde plannen moeten worden uitgevoerd, omdat ze de steun van belangrijke actoren missen. Daarom zijn de barrières primair gerelateerd aan de coördinerende principes van het formuleren van een gezamenlijke missie, het verankeren van significante kennis) en het inbrengen van de verworven significante kennis in het (her)ontwerp van instituties en strategieën voor beleidsontwerp

en -uitvoering. Deze barrières manifesteren zich anders naar gelang de focus ligt op agenda setting of op implementatie.

De factoren die ruimtelijke kennis governance versterken, zijn deels het tegenovergestelde van de barrières. Dit geldt met name voor de mate van inzet om de geplande kennisactiviteiten ook daadwerkelijk tot uitvoering te brengen en vol te houden. Dit overtreft een individueel project of gebeurtenis. Ook is het vermogen om essentiële kennis te verwerven en te gebruiken ook een belangrijke versterkende factor. Andere versterkers hebben betrekking op het relateren van de kennisactiviteiten aan bestaande ontwikkelingstrajecten, het afstemmen van grensarrangementen op de governance context, het implementeren van ondersteunende institutionele arrangementen, toewijding en het vermogen om te volharden.

Ruimtelijke kennis governance heeft in het bijzonder potentie voor complexe uitdagingen, zoals duurzame ontwikkeling er één is. Het kan het openen van nieuwe paden voor duurzame ontwikkeling mogelijk maken door het bewerkstelligen van coördinatie tussen clusteractoren rond een gedeelde visie en missie die ontstaat door gezamenlijke inspanningen. Soms bestaat het resultaat uit vervolg-kennisactiviteiten. Er zijn ook tastbare resultaten die betrekking hebben op inhoudelijke kennis, zoals tools, data, prototypes, ontwerpen en plannen, faciliteiten en infrastructuur. Hiermee wordt coördinatie tot stand gebracht bij het nastreven van de duurzame ontwikkeling van landbouw- en voedselclusters.

Bijdrage aan het wetenschappelijke debat

Een belangrijke bijdrage van deze thesis aan het wetenschappelijke debat is het benoemen en uitwerken van de coördinerende principes die ten grondslag liggen aan kennis governance als een fundamenteel en onderscheidend type governance. Bovendien ontwikkelt dit proefschrift een analytisch kader (tabel 1) voor ruimtelijke kennis governance dat gericht is op het nastreven van duurzaamheid in landbouw- en voedselsystemen. Door dit analytische kader wordt de literatuur over governance, kennis en leren en ruimtelijke ontwikkeling geïntegreerd. Dit levert inzichten op over hoe kennis en leren zorgen voor coördinatie bij transities van duurzame ontwikkeling, ook in relatie tot de ruimtelijke dimensies hiervan.

Reflecties

De belangrijkste reflectie op het onderzoeksontwerp betreft de wijze waarop de informatie over de casestudies is verworven. Uitgezonderd twee vergelijkende casussen en de vijf kleinere casussen, was de informatie ten minste gedeeltelijk afkomstig van directe deelname aan contractonderzoeksprojecten. Deze betrokkenheid leverde de thesis veel inzicht op in de context van cases, zodat een rijkere analyse mogelijk werd dan anders het geval zou zijn geweest. Om bias in het onderzoek te voorkomen zijn stappen genomen, zoals samenwerking in de analyse met onderzoekers die niet zo sterk bij de betreffende case betrokken waren, het gebruik van een analytisch kader dat was afgeleid van de theorie en de opname van cases die op meer afstandelijke analyse waren gebaseerd, in aanvulling op cases die gebaseerd zijn op actieonderzoek.

Dit proefschrift biedt waardevolle inzichten voor cluster- en territoriale ontwikkelingsinitiatieven die duurzaamheid nastreven rondom landbouw en voedsel. Deze inzichten zijn in principe ook interessant voor andere sectoren dan landbouw en voedsel, zoals duurzame energie en de bio based economy. Hier wordt namelijk ook duurzame ontwikkeling nagestreefd en werkt men ook met ruimtelijke ontwikkelingsprocessen. Het conceptuele raamwerk kan worden gebruikt om te begrijpen en te beoordelen wat er gebeurt in duurzaamheidsprogramma's en hoe deze indien nodig kunnen worden aangepast. Het kader kan ook worden gebruikt als inspiratie voor het opzetten van kennisactiviteiten en daardoor een geïmproviseerde en opportunistisch aanpak die is gericht op korte termijneffecten te overstijgen. Bovendien kan het concept ruimtelijke kennis governance worden gebruikt als inspiratie voor beleid dat gericht is op het stimuleren van innovatie en economische ontwikkeling door middel van onderzoek-, technologie- en innovatiebeleid. Voorbeelden van dit beleid zijn het Horizon 2020-programma van de Europese Unie, het Smart Specialization Policy (RIS3) van de Europese Unie, het Nederlandse innovatiebeleid van de Topsectoren en regionale initiatieven om 'valleys' te creëren.

Het proefschrift heeft ook implicaties voor onderzoeksinstituten, universiteiten en andere kennisgerichte organisaties. Ze spelen een rol in duurzame ruimtelijke ontwikkeling die noties over 'evidence-based policy making' of 'speaking truth to power' overtreft. Onderzoek en onderwijs ontwikkelen samen significante kennis in clusternetwerken en verankeren de geproduceerde significante kennis, naast het bieden van inhoudelijke kennis over technologische innovaties. De neutraliteit van kennis is niet altijd zo belangrijk in deze processen; verbonden zijn met missies is belangrijker. Desondanks moet kennis nog steeds van hoge kwaliteit zijn en als zodanig worden erkend.

Advies voor vervolgonderzoek

De eerste suggestie voor vervolgonderzoek is om het analytische kader in meer casestudies te implementeren. Het advies is ook om zich te concentreren op verschillende manifestaties van ruimtelijke kennis governance, te beginnen met agendasetting, implementatie, missie- en waardegedreven typen van ruimtelijke kennis governance, zoals naar voren kwamen in dit proefschrift. Andere te onderzoeken onderwerpen zijn tijdaspecten en de institutionele arrangementen die kennis- en leerprocessen besturen en mogelijk maken, zowel in onderzoek als in beleid. Dienovereenkomstig zou meer moeten worden gewerkt aan de manier waarop missies effectief kunnen worden geïmplementeerd in zeer complexe omgevingen waarin actoren handelen vanuit hun eigen perspectieven, gewoonten, capaciteiten, overtuigingen en ambities en de neiging hebben zich te verzetten tegen de nieuwe duurzame ruimtelijke ontwikkelingsmissies en bijbehorende kennisactiviteiten. Het is in het bijzonder is van belang hoe de inspanningen en de institutionele ondersteuning die daarvoor nodig is gedurende een langere periode gehandhaafd kunnen worden; langer dan een individueel project. Ten slotte zou vervolgonderzoek ook de empirische focus uit kunnen breiden naar andere sectoren dan landbouw en voedsel.

Annexes

1. List of conference contributions
2. Respondents Chapter 6
3. Endnotes

Annex 1. List of conference contributions

In anticipation of and during the PhD research, presentations were provided at the:

1. ERSCP-EMSU 2010 conference 'Knowledge Collaboration & Learning for Sustainable Innovation', 28 October 2010, Delft, Netherlands.
2. Scaling and Governance conference, 12 November 2010, Wageningen University & Research, Wageningen, Netherlands.
3. Expert Group Meeting on Knowledge Networking and Network Governance, United Nation Industrial Development Organisation (UNIDO) & the Leuven Centre for Global Governance, 18 September 2012, Vienna, Austria.
4. Regional Studies Association (RSA) European Conference 'Diverse Regions: Building Resilient Communities and Territories', track on sustainable development, Dokuz Eylul University, 16 June 2014, Izmir, Turkey.
5. TCI Global Conference 'Clusters in a creative economy', Korea Industrial Complex Corporation (KICOX), 5 November 2015, Daegu, Korea.
6. Workshop 'Knowledge, policymaking and learning in European metropolitan areas: experiences and approaches', 25 January 2016, Brussels, Vrije Universiteit Brussel, Éupolis Lombardia & Committee of the Regions.
7. TCI Global Conference 'Challenges for innovation clusters', Brainport Development & Wageningen University & Research, 10 November 2016, Eindhoven, Netherlands.
8. Open Evaluation Conference, track on Smart Specialization Strategies, Österreichische Plattform für Forschungs- und Technologiepolitikevaluierung (fteval), the Manchester Institute of Innovation Research and Institut Francilien Recherche Innovation Société (IFRIS), 25 November 2016, Vienna, Austria.

Annex 2. Respondents Chapter 6

	Organisation	Type of organisation
1.	Natuur & Milieu	Non-governmental organisation
2.	LTO Groeiservice	Service provider for growers
3.	Rabobank	Bank
4.	Unie van Waterschappen	National federation of water boards
5.	SIGN	Innovation support provider for growers
6.	LNV - DAK	Ministry of Agriculture, Natuur and Food, Directorate agricultural knowledge
7.	Agriport A7	Real estate developer for horticulture
8.	WUR Glastuinbouw	Applied research institute for greenhouse horticulture
9.	LTO Glaskracht	Non-governmental organisation for greenhouse horticulture
10.	Wageningen Economic Research	Applied research institute
11.	Wageningen Environmental Research	Applied research institute
12.	Kalter Aardbeien	Horticultural firm (strawberries)

Annex 3. Endnotes

[i] Respondents from the Ministry of Agriculture, Wageningen Economic Research and WUR Glastuinbouw

[ii] Respondents from the Ministry of Agriculture, Wageningen Economic Research and WUR Glastuinbouw

[iii] Notably respondents from SIGN and WUR Glastuinbouw

[iv] Respondents from SIGN, LNV, WUR Glastuinbouw

[v] Notably respondents from SIGN, LNV, LTO Glaskracht, Wageningen University and Research, Rabobank and LTO Groeiservice

Acknowledgements
About the author

Acknowledgements

The history behind this thesis started in the mid-2000s. I clearly remember that I took part in a lunch colloquium on a new project at Wageningen Environmental Research (then called Alterra) that aimed to design an agropark in China. The project team not only provided information and evidence to the Chinese assigner, but also engaged in process facilitation, in combining expert knowledge with knowledge from practice and in devising plans for the development of the agropark. I was highly impressed and curious. Later, I learned this Chinese endeavour was just one example of projects that pursued real life change in sustainable development through knowledge and learning activities. This was also the time in which in Wageningen the 'Delta Approach' was developed, stressing te need and the way forward for collaboration between the natural, social and design sciences. Moreover, there was much to do about Mode 2-science, Third Generation Universities, Action Research, Transdisciplinary Research, Reflexive Monitoring, Learning Evaluations and Communities of Practice, and what these concepts would mean for research institutes such as Wageningen Environmental Research. I assessed that although these approaches were very relevant and necessary for the big challenges of our age, they were far from easy to implement in projects and programs and that there was a need for conceptualisation and perhaps also professionalisation. I very much wanted to play a constructive role in this.

From working on projects that are behind the case studies of this thesis, I learned that, notwithstanding the struggles and disappointments that are also associated with it, knowledge processes *can* be pivotal in the governance of sustainable territorial development. I also learned that there is a need to improve the capacity to achieve this, at research institutes and universities, but also at public authorities, business and non-governmental organisations. Although I do not think that research institutes and universities should stop doing 'regular' research, there is room for improvement to strengthen the connections to real-life sustainable development endeavours in agriculture, food and related domains such as the bioeconomy, climate change, regional development and land use planning. This can be pursued through the development and implementation of innovation services for clusters and individual actors. This thesis contributed to identifying the design principles behind them.

A last point I would like to make, is that I learned from engaging in this thesis that applied research and consultancy can be valuable for advancing science. This issue is perhaps a bit under-appreciated in the scientific community. Working at Wageningen Environmental Research helped me in selecting the object of the thesis and in defining the research questions. Because of the contract research projects I was involved in, I *knew* my research subject was relevant to both knowledge organisations and sustainable development practice. This was very important to me in selecting the subject for my thesis, as this is where the motivation came from. Moreover, because of the iterative nature of my research, insights that were derived from it already found their way to applied research projects, especially in defining new projects. Therefore, a PhD research can be valuable to applied research and consultancy as well. Although, I could have chosen an easier way, the combination of an employment at Wageningen Environmental Research and doing a PhD-research made it feasible and worthwhile for me to finish the thesis.

Advancing sustainable territorial development through knowledge and learning is something I still work on and I would very much like to continue after the defence of this thesis. Being part of the Wageningen Environmental Research programme Metropolitan Solutions, the WUR investment theme Protein Transition, and the Learning Evaluation of the Nature Pact, I trust that I will remain doing so.

Now, I come to the point where I express my thanks. I start with thanking the people that I worked with in the contract research projects behind some of the case studies of this thesis. In random order and without being complete: Douwe Hoogland, Sjef van der Lubbe, Sylvia Koenders, Bianca Domhof, Sander Mager, Rik Eweg, Madeleine van Mansfeld, Peter Smeets, Hans Farjon, Joep Dirkx, Prof. Han Wiskerke, Gerard van Drooge, Henk Oostindie, Prof. Dirk Strijker, Paul Swagemakers, Arjen Simons, Kalyan Chakravarthy, Annelies, Bruinsma, Pieter Zwaan, Sander van den Burg, Jan Broeze, Kor Zwart, Sjaak Zwart, Henny van der Windt, Resie Oude Luttikhuis, Else Giesen, Han Soethoudt, Paul Bartels, Mariette van Amstel, Renate Werkman, Gopinath Koneti, Baskar Reddy, Sandeep Durga, Gopi Krishna Swarangi, Ingrid van Huizen, Martijn Sonneveld, and Raju Poosapati. It's been a while, but many thanks for the cooperation!

I thank three individuals for influencing me in the road towards deciding to start with the thesis: Leo van den Berg, who was my coach for a couple of years and with whom I first discussed my ambition for pursuing a PhD and encouraged me to do so, Paul Kersten, who provided me with much inspiration in my early career and also for stressing the need for an economic geographical approach to Metropolitan Food Clusters, and Roald Plug for helping me in taking the first steps in reconnecting to economic geographic thinking with me.

I thank the co-authors of my papers and book chapters: Marian Stuiver, Nicola Francesco Dotti, Remco Kranendonk, Mirte Cofino, Wim Nieuwenhuizen and Annemarie Groot. Moreover, I thank Lidy van der Lugt who helped me tremendously with language and grammar issues and read and commented the whole thesis to do so. You all have travelled this road with me. I thank my paranymphs Remco Kranendonk and Miko Flohr for supporting me in the defence of my thesis, for the many discussions over the years about the role of universities and research institutes in society, and for setting an example by your own professional activities.

I thank Madeleine van Mansfeld for providing me with information about the case MFC Mexico and Willem Brandenburg who provided me with information on the Seaweed farming in the North Sea case. Without your help, two of the case studies in this thesis would not have been available to me.

I thank my fellow external PhD students at Wageningen Environmental Research, such as Judith Westerink, Irene Bouwma, Ingrid Coninx and others, for being a sounding board and for offering moral support and tips. I also want to express my thanks to colleagues with whom I occasionally talked about this thesis, such as Dana Kamphorst, Jeroen Sluijsmans and Nienke Nuesink. These small conversations do matter and had a positive influence on the process of writing this thesis. A special mention and thank you to Arjan Koomen who supported me throughout the process in his capacity as team manager and who organised some financial support for finalising, layouting and printing.

A special thanks to my promotors prof. Katrien Termeer and prof. Arnoud Lagendijk, who have guided me in setting-up and implementing my thesis and who also co-authored with me. Many thanks for your inspiration, feedback, support and trust, without which I could not have finished this thesis. It has been a unique and stimulating experience and I have learned much from the both of you.

Lastly, I want to thank family and friends for enduring the sometimes obscure stories about my PhD-research and a general lack of attention in these long years. I am looking forward to spending more relaxed time with you. This in particular for my parents Paul and Margriet, my brother Roald and my 'in law' family, with special mention of Jan Gerrit and Ria. All of you have shown your interest throughout and supported me a lot.

My greatest thanks I direct to my wife and love Chantal, who endured the most. During my PhD research, we were fortunate to welcome our children and sources of pride, Vera and Lars. Doing a PhD in this family forming time was quite a challenge and was somewhat egoistic of me. I left the three of you on your own on too many occasions, because I had to read papers or revise some section of the thesis. Many thanks for allowing me to do this! I am very content and proud that I have finished this thesis, but I do have much to make up for. I am looking forward to being a better husband and dad with all my heart.

About the author

Alwin Gerritsen was born on 5 May 1976 in Wageningen (the Netherlands). During his childhood in Renkum he attended VWO at Het Stedelijk in Wageningen. He studied Human Geography and Policy Studies at Radboud University in Nijmegen and graduated in 2000, after finishing his master thesis on the regional development of the German-Polish border area at the Leibniz Institut für Länderkunde (Institute for Regional Geography) in Leipzig, Germany. After a first employment at Ernst & Young International Location Advisory Services (ILAS) he obtained a position in 2001 at Wageningen Environmental Research (WENR, Alterra in former years). First as a researcher in socio-economic aspects of water management and land use planning. Since 2005 he works in his current position as a research and project manager governance and regional development. From 2009 to 2012 he was seconded to the Netherlands Environmental Assessment Agency to integrate governance issues in its environmental policy studies. Alwin Gerritsen has been closely involved in the organisation of the scientific program of the TCI 2016 Global Conference 'Challenges for innovation clusters' in Eindhoven, the Netherlands. As a researcher, project manager and knowledge coordinator he has been working on conceptual and methodological projects, such as the WUR Knowledge Base and WOT Nature & Environment Knowledge Development projects, on policy evaluation studies as on impact oriented projects, such as for instance TransForum innovative practice and EIT Climate-KIC projects. Alwin Gerritsen has managed and participated research activities on sustainable agriculture, circular economy, environmental governance, spatial water policies, and the protein transition. He has worked both nationally and internationally, for example in India and various European countries.

Colophon

No external funding was received for this thesis. Notwithstanding, the information of the case studies was largely derived from contract research projects. The following contracts were used for this: KB-14-001-037, KB-14-005-008, KB-14-007-001, WOT-04-011-036.23, WOT-04-011-036.43, BO-01-008, TransForum KP-094 and RO-086, grant 288710 of the OCEAN.2011-1 theme of the EU Seventh Framework Program, and a grant by a Mexican investment agency. Some time was provided by the Public Administration and Policy Group of Wageningen University and by Wageningen Environmental Research to spend on finalise the thesis. Moreover, Wageningen Environmental Research paid the layouting and printing of the thesis. Lastly, I received language support from an English – Dutch translator from Wageningen University & Research.

Cover design by Dennis Hendriks, Digiforce Wageningen
Thesis layout by Renate Siebes, Proefschrift.nu
Printed by Digiforce, Wageningen