

Reflexive transitions

*An exploratory application of assumption based planning as
a reflexive tool in transition management*

Master Thesis

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a reflexive tool in transition management*

Graduation date: 5 September 2016

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Executive summary

We live in a world of transitions. Everywhere we look the world is changing in ways that were long seemed impossible. These changes, or transitions, radically change the way we do, we see, we connect. Especially the field of sustainability radically changes the processes and connections that have been developed during the fossil regime.

Governments aim at controlling these radical changes both by keeping up in regulation as well as in steering the transition in a favorable way. An approach that has gained ground within the Dutch government is transition management. Transition management is an approach that stimulates the new development from the lowest level and aims of stimulating the natural behavior of transitions. This behavior includes the nurturing, acceleration and taking over of the new ideas within the existing regime.

The process of a transition marks itself by a high degree of uncertainty, and unknown and possibly unintended consequences. Governments as institutions are averse of this dynamic behavior. A way to deal with this dynamic behavior is the expression of reflexive behavior. Using methods in which the current practice is evaluated and adjusted according to the needs of this moment. Previous transitions have shown that a lack of reflexive behavior allows for the failure of a transition from a governance point of view.

This thesis proposes the use of assumption based planning within the transition management framework as a way to introduce reflexivity in the most crucial parts of the transition. This research shows that assumption based planning expresses reflexive behavior without redesigning complete and approved plans. By identifying the weaknesses in the plans and adjusting for those weaknesses it aims at maintaining robust governance.

Based on both literature research and exploratory application of the assumption based planning approach this thesis concludes that assumption based planning would be a suited reflexive method within the transition management framework. More research and testing would need to be done however on the subject of iteration throughout the methodology. The narrowing of the method could be an obstacle for the execution of the future planning section of the research.

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Introduction

In the first three chapters of this thesis I present the research problem and approach of this thesis. The first chapter outlines the environment of transitions in which the problem is identified. The chapters following are used to identify the problem and propose a solution and approach.

Transitions are radical changes in society that alter the way we interact in our society. While transitions come about through technological development, governments are increasingly trying to stimulate and guide preferred transitions. This thesis investigates the use of transition management as an approach used to stimulate transitions.

Transition management is an approach that governments use to stimulate transitions. Analysis of previous transition experiments has shown success with the early stimulation of a transition. Over time however the governmental stimulation misaligns with the developments of the transition and is unable to adjust to uncertain events. This misalignment is associated with fundamental governmental structures and a lack of reflexive behavior in transition management. In this thesis an improvement for the lack of reflexive behavior is investigated.

This thesis proposes the use of assumption based planning as an approach that could induce reflexive behavior in the transition management approach. Through a theoretical investigation and an exploratory case study the application of assumption based planning is analyzed as a tool in the transition management approach.

1 Background

This thesis analyzes a problem in the application of transition management. In order to understand this problem this first chapter introduces the concept of transition management and the context in which this method is applied. This context is the (sustainable) transition, a process in which radical change alters the system.

1.1 Transitions

Our society is in constant motion. On a daily basis increasing (technological) knowledge is altering the way people behave, interact and find their way in society (Rotmans and Horsten, 2012). These motions will affect the world of today and change the world of tomorrow, it is a continues interaction between social and technological advancement.

The majority of these changes build upon existing patterns and structures. The interaction between society and technology gradually changes in small incremental steps. These changes are part of a dynamic equilibrium that our society is in. But once in a while this equilibrium is abruptly disturbed. Within a timeframe of 20-30 years the entire way we think and act changes radically and the existing patterns and structures become obsolete (Rotmans et al., 2001). During this period the relationships that exist between society and technology changes fundamentally. The process of such a radical change from the initial ideas to the integration into society is a socio-technical transition (Kemp, 1994).

This process of change towards a new state is a transition. A change both on the level of technological advancements that will be made, as well as on a level of social changes that occur due to the implementation of these technological changes (Kemp, 1994). The concept of a sociotechnical transition and the consequences for a society will be discussed in the further part of this chapter.

The development of a renewable energy system is an example of a sociotechnical transition. By transforming the current fossil oriented system into a renewable energy system, societal functions change. Transitions are major transformations in the way societal functions are fulfilled (Geels, 2002; Geels and Schot, 2007). This involves not only technological changes, but also changes user practices, regulatory processes and industrial networks. With the development of a renewable energy economy for example, production power shifts from fossil rich regions to regions that have vast access to wind and sun. The transformation from the current power towards the new will cause tension and the outcome will be difficult to predict.

The main element of change in a transition is the socio-technical regime. A regime refers to rules in the sense of roles and practices that are established and that are not easily dissolved. It are the dominant practices, rules and shared assumptions (Berkhout et al., 2004; Elzen et al., 2004; Kemp et al., 1998; Rotmans et al., 2001). The socio-technical aspect refers to the semi-coherent set of rules by different social groups and engineering practices that emphasis the broad perspective under research (Markard et al., 2012). A regime is a dynamically stable, powers are balanced and are only slightly changed, allowing

for improvements of an incremental kind (Elzen et al., 2004; Geels and Schot, 2007). A transition reflects the change of one regime to another.

Transitions are disruptive of nature and involve instability and uncertainty. Socio-technical regimes are dynamically stable systems where improvement occurs in an incremental way, creating limited disruption and staying within the boundaries of the regime. Transitions occur when changes are made that change both existing technology and current behavior. Changes occur both in the supply and demand side of the regime, there is a large degree of co-evolution (Elzen et al., 2004). The period of change involves a high level of instability and uncertainty. As new practices are introduced it is unknown which will eventually embed in the new regime.

Using the increased knowledge on the process of transition attempts are made to control, guide and stimulate desired transitions. Increasingly governments aim at stimulating the development and implementation of sustainable technologies. A framework for stimulating (sustainable) transitions used by the Dutch government is transition management.

1.2 Conclusion

In this chapter I have introduced the concepts of transitions. Transitions are radical changes of the system that mature over several decades. This period of radical change is surrounded by uncertainty and instability of the system. Governments are increasingly interested in ways to control, guide and stimulate desired transitions. A framework used by the Dutch government is transition management. In the following chapters I introduce the framework of transition management and identify a specific problem that exists in the application of approach.

2 Problem description

During the application of transition management the developments of governance go out of sync with the developments of the transition. In this chapter I will elaborate on this problem and discuss the main causes that have been identified. The problem of misalignment between governance and transition is the main problem under research in this thesis.

2.1 Transition management

Transition management is an approach used in several instances in Dutch transition projects. Analysis of past transition management experiments has shown that the transition management approach is relatively successful in stimulating the pre-development phase of a transition. The initial organization of the transition and the early experiments are put in place relatively successfully. After the initial success, the governance of the transition starts to fall behind compared to the developments of the transition, eventually inhibiting the progress of the transition (Kemp et al., 2007b; Kern and Smith, 2008; Rotmans, 2011). This problem of misalignment between the transition and governance is the main topic of research in this thesis

To date, transition management has been applied to various systems in transition, mainly in the Netherlands (Kemp et al., 2007b; Kern and Smith, 2008). The largest and most notable transition using transition management is the energy transition (Rotmans, 2011). Analysis of these transitions focused on the development of the transition and the implementation of the transition management framework. Results of those analysis show that there is a similar pattern that exists among the various transition experiments, where governance and transition drift apart in later stages of the transition (Kern and Smith, 2008).

The early development of a transition is well governed through the transition management approach. Various key components of the approach are present and executed well (Kern and Smith, 2008). There is central coordination and image generation, providing a broad outline of the transition development. There is decentralization of transition experiments and the execution of the transition is well organized. Decentralization allows for flexible action and a widening of the search for new technologies (Loorbach 2007). Actors that are engaged early on are stimulated and supported. During the early phase of the transition, experiments take place and the governments assist the process.

Misalignment between governance and the transition start to exist in later stages of the transition (Kern and Smith, 2008). During the process of the transition the government turns out to be unable to adjust to the uncertain events in the transition. While new developments require adjustment of plans and governance, government remains unable to adjust from the existing plans. The process of a transition is surrounded with uncertainty, unexpected behavior and incumbent resistance. While the uncertainty in the early phases of the transition can be managed based on the initial plans, uncertainty, unexpected developments and incumbent resistance in later stages require adjustments in plans, organization and governance. Transition experiments have shown that the non-adaptive and non-responsive governance leads to a misalignment of the

transition and governance (Kern and Smith, 2008). This misalignment causes the governance to inhibit the process of the transition.

Research on past transition experiments has shown a misalignment taking place between the developments of the transition and the mode of governance. Two main reasons for this misalignment of governance have been identified. The first reason relates to the structure of governmental organizations and accountability, and the second is related to the lack of reflexive behavior in the application of transition management. Both of which will be elaborated on in the following sections.

2.2 Governmental organization

The inability of governments to keep pace with the developments of the transition has been associated with three intrinsic governmental characteristics: political cycles, accountability and planning approval (Hess, 2014). Governmental structures and activities are broadly organized around election cycles. As these do not overlap with the lengthy cycles of a transition, changing government could change the support for transition. A change in governmental support for a transition particularly hurts the transition in the middle stages as the opposition of incumbents is largest and governmental support is most needed (Hess, 2014).

A second factor in the governmental structures is the need for accountability and control that governments express. Accountability leads to stringent goals and criteria while a transition benefits from a more directional approach as new ideas shift in direction could lead to more optimal results while not reaching the specific or originally intended target (Hendriks and Grin, 2007; Hess, 2014).

The process from idea generation to planning approval in governments does not only deal with effectiveness of the ideas, but is also largely dependent on political support. This leads to a governance structure where adaptation and adjustment of approved plans is much harder to come by as it involves a new cycle of political approval.

2.3 Reflexivity

The transition management framework supports the governance of a transition. To deal with uncertainty and dynamic behavior during the transition the framework puts emphasis on the expression of reflexivity (Loorbach 2007, 2010). Reflexivity can be seen as a deep form of reflection and deals with the monitoring, evaluation and learning process of a transition (Stirling 2006). Reflexivity allows for the adjustment of governance to use the uncertainties to further stimulate the development of the transition.

Based on the transition management framework the reflexivity would be able to adjust the governance to deal with the pressures of politics, government accountability and incumbent firms. Analysis of transition management experiments has shown that there is a lack of reflexive expression and activities that lead to reflexive expression. Various scholars have identified the lack of reflexive activities as a main weakness in current transition experiments (Hendriks and Grin, 2007; Kern and Howlett, 2009; Rotmans, 2011; Rotmans and Horsten, 2012).

2.4 Problem statement

The main problem identified in the application of transition management is the misalignment between the development of the transition and the mode of governance that emerges during the later stages of the transition. Two main reasons for this misalignment are related to the structure of governmental organizations and a lack of reflexivity in the application of transition management. This thesis acknowledges that governmental structures will be difficult to alter for the use of transition management. Therefore the focus of this research lies in the lack of reflexivity that has been identified as a reason for governance misalignment. For this research the problem is stated as follows: *The practical implementation of the transition management approach lacks the reflexive behavior, which causes problems in the governance during the take-off and acceleration phases of the transition.* In the following chapter a solution for this problem is proposed and the research goals of this thesis are formulated.

3 Research approach

In this chapter I will formulate the thesis objective and research questions. Based on the identified lack of reflexivity in transition management a possible addition to transition management will be proposed. Furthermore I will provide an outline of the thesis in which a distinction will be made between the theoretical opportunities of the proposed solution and the application of the solution through a multi method analysis.

3.1 Thesis objective

In the previous chapter the lack of reflexivity has been identified as a main threat to a successful transition management approach. In this thesis I propose the use of assumption based planning, a future planning approach, as a method that enables reflexivity and can be used within the transition management environment. Through research in both the theoretical interfaces and the application of assumption based planning I aim to support this claim.

From a theoretical perspective there are two main objectives in this thesis. The first is to establish that assumption based planning enables reflexivity, and second that assumption based planning can be used in transition management. The literature review part of this thesis (chapter 4-9) is dedicated to these two objectives.

For the application of assumption based planning there are three objectives in this thesis. The first objective is to describe a method that can be implemented in a transition management environment. Secondly it has to be established that this method achieves the goals of enabling reflexivity. And finally it has to be established as practically applicable in a transition environment. These three objectives will be elaborated on in the part of the multi method analysis (chapter 10-14) of this thesis.

The use of assumption based planning as a method that enables reflexivity in the context of transition management will be researched both on the theoretical and practical level. The goal of this thesis can be formulated as follows: The objective of this thesis is to investigate the method of assumption based planning as an exercise in the transition management framework to induce the expression of reflexivity.

3.2 Research questions

The main research question that this thesis aims to answer is formulated as follows:

To what extent can assumption based planning be used as a reflexive exercise in the transition management approach?

In order to answer the main research question the following sub questions have been formulated.

- 1 What are the interfaces between reflexivity and assumption based planning?*
- 2 How does assumption based planning fit within transition management as a reflexive tool?*

- 3 What does an assumption based planning design look like?*
4 How do the results of an assumption based planning approach relate to reflexivity?
5 How does an assumption based planning approach fit within transition management as an reflexive exercise?

3.3 Thesis outline

In order to answer the research questions the research will consist of two distinct sections. A theoretical section that looks into assumption based planning as a reflexive exercise and a case section where the experience of the theory will be translated into a practical experiment. This all will be concluded into an extensive conclusion and reflection chapter.

Literature review

The first part of this thesis will look into the theoretical knowledge on transition management, reflexivity and assumption based planning. Based on this literature an analysis will be made to what extend assumption based planning would be a candidate methodology for use as a reflexive exercise. The analysis will further look into the issues that will occur and the adaptations that need to be made in order to create a reflexive methodology for the use in transition management and the transition environment in general.

Case study

The case study consists of the execution of the assumption based planning approach in a transition management environment. In this section I will identify the case as a transition and a project that could face issues with reflexivity. I will describe the used methods that combine into the assumption based planning approach and explore the application of assumption based planning.

Conclusion/Reflection

The conclusion will answer the research questions formulated in this chapter. Furthermore an advice will be given for further research. The reflection chapter will analyze the process of the case study and reflect on the adaptations made to the assumption based planning methodology. Improved adaptations will be proposed.

In the first part of this thesis I have introduced transitions and transition management, outlined the misalignment that has been identified as a problem with the application of transition management and discussed two main reasons for the misalignment. Of the two main reasons for misalignment the lack of reflexivity is the topic of research in this thesis. I have proposed the use of assumption based planning as a method that enables reflexivity and is well suited for the use in transition management. Finally I have formulated the research questions and given an outline of the thesis. In the following parts I will substantiate my proposal both from a theoretical and application perspective.

Literature review

In this literature review I will explore the current literature on three topics related to transition management. First I will discuss the concept of transitions. Transitions are the behavior which are guided by transition management, and one of the central conceptual models used in transition literature forms the basis for transition management. This chapter will provide a context in which transition management is applied. Secondly I will discuss the transition management approach and the activities related, as it is the main approach under research in this thesis. In the final chapter of this part a key activity of transition management, namely reflexivity, will be discussed. This activity is one of the core activities of transition management and is identified as vulnerable during application of transition management.

Transitions are changes in a regime that radically alter or entirely change the current regime. In order to describe and analyze a transition two different structures can be distinguished (Rotmans et al., 2001). The interaction between actors at a certain moment can be described with the use of the multi-level perspective (Geels, 2002, 2011), and the development of a transition in time can be shown with the use of the different phases of a transition (Kemp et al., 2007a). Applying those structures in a strategy for the guidance of a transition has led to the development of transition management. Transition management advocates the application of four different groups of activities that enable the stimulation of a transition (Loorbach, 2010).

A core group of activities within transition management are reflexive activities. These type of activities deal with learning, reflecting and adapting with taking into account the consequences of governance itself throughout the transition (Stirling, 2006; Voß and Kemp, 2005). Reflexive activities within transition management are engaged in the process of evaluating and improving of the other activities in the program (Loorbach, 2007). Reflexive activities have been identified as lacking in the current transition management practices and are a main reason for failure of transition management governance.

After the literature review I will discuss the structure of transition management in a way that it can be used for analysis of application of the proposed method of assumption based planning. Secondly I will provide a set of characteristics that are required for reflexive exercises. These findings will be applied in the following parts of this research.

4 Transitions

Transition management aims at guiding transitions in a desired direction. In order to understand the context in which transition management is applied this chapter discussed the concept of transitions. First I will discuss the nature and behavior of a transition followed by two conceptual models that describe the structure and process of a transition. Finally I will discuss the specific group of transitions, the sustainable transitions.

Sociotechnical transitions are complex processes that radically change the existing patterns and relations. In order to conceptualize the behavior of a transition two transition structures have been identified. The first structure is the structure of interaction between groups of actors within and around the regime. This is described as the multi-level perspective (Geels, 2002). Secondly there is the development of a transition in time. This model consists of four different phases that a regime is subjected too throughout a transition (Rotmans et al., 2001). Both of these structures can be used to define and analyze the development of a transition.

4.1 Radical change

Transitions are changes that occur on the level of a sociotechnical regime. The sociotechnical regime is based upon the concept of the technological regime from Nelson and Winter (1982) and encompasses all organizational and cognitive routines. The sociotechnical regime has expanded this concept with a sociological set of rules including social groups into the concept, thus creating a system that exists of the rule-set of grammar embedded in a complex of engineering practices, production process technologies, skills and procedures embedded within a multi-actor network of institutions and infrastructures (Geels, 2002). A sociotechnical regime provides a dynamic stability to the actors involved.

Change does occur within the dynamic stability of the regime. Progress within a sociotechnical regime occurs incrementally. Innovations build upon existing structures improving the known set of rules. There are instances in which changes occur that do not build upon existing structures but introduces new rules and routines. Through the introduction of entirely new technologies, new modes of interaction or other radical new developments. The process of this radical change is a transition.

4.2 Multi-level perspective

The multi-level perspective has first been described by Rip (1995) and has since been further developed most notably by Kemp, Geels and Schot (Geels, 2002, 2011; Geels and Schot, 2007; Kemp et al., 1998). The main idea of the multi-level perspective lies in the sociotechnical regime and its interactions internally and its environment.

Externally from the sociotechnical regime there are two major concepts that exert forces. These are the sociotechnical landscape and niches. Where the latter has a smaller scope the former has a wider view than the sociotechnical regime. The sociotechnical landscape consists of a set of deep structural trends. The landscape is an external structure containing factors as cultural and

normative values, economic growth, wars and environmental problems. Regime actors are exposed to the forces of the landscape but have limited power to influence the behavior of the landscape (Geels, 2002). Landscapes do change, albeit at a much slower pace than sociotechnical regimes. The smallest view is depicted by niches, encapsulated spaces or environments where more radical changes and innovation occurs. Niches can be depicted as ‘incubation rooms’ for more radical innovation. Within the environment of niches innovations can be tested and brought to maturation. These niches can occur naturally in places that are favorable for the development and not hindered by common competition (eg. the development of new automotive technologies within the auto racing circuit) or can be established with the help of regulation (eg. subsidies). The main importance for niches is the learning capacity that they provide for the development of an innovation (Kemp et al., 1998). When a novelty has matured within a niche it can be incorporated within a regime.

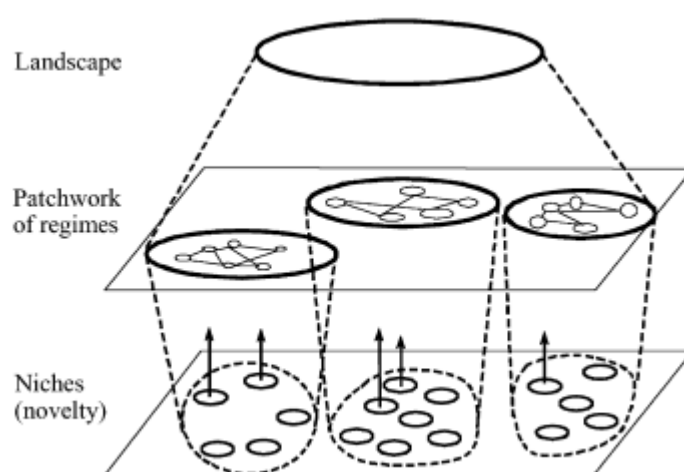


Figure 4-1: Nested view of the multi-level perspective (Kemp et al., 1998)

The three concepts can be visualized as a nested hierarchy, as shown in figure 4-1. This formation of concepts is the multi-level perspective. The nested character of the levels highlights the interaction between the levels, where the stable regime is pressured by both the niches and the landscape and has its influence on both other levels as well. For technological transitions to come about using the multi-level perspective framework, niches are crucial for the development of new ideas. Novelties start in niches. But the idea of the multi-level perspective is the notice that the further success of a niche development depends on the interaction between the three levels and the developments within the regime and landscape. If there is no alignment a niche innovation will not reach the regime level (Schot and Geels, 2008).

4.3 Transition pathways

During a transition of one regime to another, four different phases (figure 4-2) could be identified on a more conceptual level (Rotmans et al., 2001). Starting from a stable regime that is disturbed by new developments that emerge and finally make their way into a new stable and improved regimen. In the first phase new technologies emerge, this is confined in small market niches and is hardly recognized by the existing regime. The technology that is being developed adapts to the existing regime. During the second phase more interaction between the new technology and existing regime actors are formed, professional

networks are created and learning experiences are exchanged. This leads to best practices and the development of an own set of rules. The third phase is characterized by competition with the existing regime. Wider diffusion of the new technology starts and the price/performance ratio matches existing technology. Network externalities, economies of scale and complementary technologies may lead to increased performance and returns. During the final phase the technology replaces the current technology and gradually a new equilibrium regime emerges (Elzen et al., 2004; Loorbach, 2010; Rotmans et al., 2001).

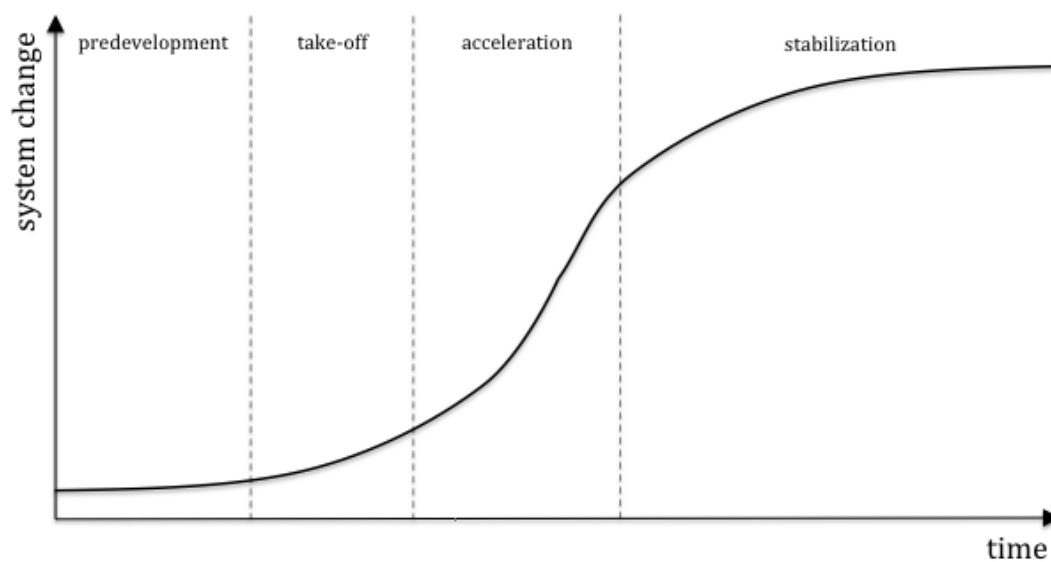


Figure 4-2: Transition development in time

4.4 Sustainable transitions

Of the transitions that take place a specific group of transitions has received special attention by scholars recently. This is the group of sustainable transitions. Sustainable transitions have various characteristics that distinguish them from other transitions. This mostly relates to the efficiency of the current regime, the problem that is being addressed and the advantage that is being generated. This paragraph will outline these differences between general transitions and sustainable transitions.

The concept of sustainability gained worldwide importance since the 1987 convention of the United Nations (Drexhage and Murphy, 2010; WCED, 1987). This convention created the definition of sustainability still seen as the main definition:

“Development that meets the need of the present without compromising the ability of future generations to meet their own needs”

With increasing knowledge on and attention for global warming and carbon emissions the concept of sustainability and sustainable development is becoming more important. There is increasing interest for technological advancements made that are more sustainable than their existing counterparts .

While some systems will gradually become more sustainable, various systems are inherently unsustainable mainly involving non-renewable

resources. And although incremental improvements will certainly make them more sustainable, becoming fully sustainable in way that they are only using renewable resources require a complete revision, or transition, of the system. Research on these sustainable transitions focuses on the way of creating a process in which activities are developed that stimulate this transition from an inherently unsustainable system to a system that has the potential to be sustainable for future generations.

What makes these sustainable transitions differ from conventional transitions lies encapsulated in the definition of sustainability. Namely 'the ability of future generation to meet their own needs'. This statement encompasses two aspects that require a novel approach. The statement focuses on the future generation as the main beneficiary of a sustainable transition (Markard et al., 2012). From an economic theory perspective this requires firms to improve their current profitable business without gaining any clear benefit themselves. Even more so a transition requires them to encounter an uncertain period of developing new products in which new entrants could come up and their new market position will be unclear. As such there is hardly any incentive for the existing regime of developing into a new regime that offers them little benefits (Unruh, 2000, 2002).

The second aspect of the statement relates to the future needs of society. It is not specified what those future needs are. There is no clear final position of a sustainable society. When is a society a sustainable society? This makes a sustainable transition a directional transition in the sense that the transition moves towards a desired state that most likely will never be reached or will be adjusted before it is reached (Drexhage and Murphy, 2010).

4.5 Conclusion

Transitions are radical changes of a system. In this chapter I have discussed the radical nature of transitions and discussed two structures of conceptualizing a transition. Furthermore I have elaborated on the concept of sustainable transitions and the implications of the sustainability aspect on the transition process.

Both of the identified structures discussed relate to transition management. Where the multi-level perspective is translated into different activities in transition management, the structure of changing pathway can be seen as a vulnerability in the application of transition management. Both of these relations will be elaborated on in the following chapter in which I will discuss the transition management approach.

5 Transition management

In this chapter I will discuss the transition management approach. Discussing transition management serves two purposes. First it gives an overview of the activities involved, this structure of activities will be used for analysis of the proposed method and the application of this method in transition management. Secondly the discussion of transition management is used to identify reflexivity as a different type of activity compared to the other activities.

The first section of this chapter describes transition management, its core activities, and how it builds upon the notion of the multi-level perspective. Then the core activities of transition management will be discussed separately.

5.1 Structure

Transition management focuses on the development of broad societal transitions. Over the past decades various Dutch scholars have developed this theory and brought this into practice at various transition experiments within the Dutch government (Loorbach, 2007; Rotmans, 2011; Rotmans et al., 2001). Transition management is a framework for the development of interaction between government, market and society in order to facilitate (sustainable) technological transitions within society. Through collaboration between stakeholders a long-term vision is formulated which acts as a guide for the creation of short-term goals and policy.

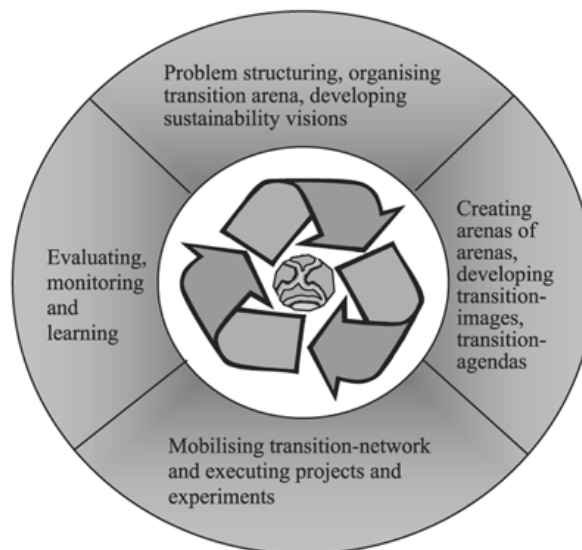


Figure 5-1: Transition management activities (Loorbach, 2007)

Transition management builds upon the structures of transitions described in the previous chapter. Especially the ideas of the multi-level perspective (fig 5-1) are translated to an approach for governance. Key ideas of the multi-level perspective that have been incorporated into transition management are: the multi domain and multi-level thinking, the need for a large playing field (keeping multiple options open, and both developing long term and short term ideas (Rotmans, 2001).

The translation from the multi-level perspective can be seen in the core activities of transition management. The approach of transition management has split into four different types of activities that are relevant to the development of

these societal transitions (fig 5-1): Problem structuring (strategic); Creating arenas (tactical); mobilizing transition-network and executing projects and experiments (operational); evaluating, monitoring and learning (reflexive). These four activities are continuously active and interact to stimulate the transition (Loorbach 2007).

The first three activities of transition management (strategic, tactical, operational) are closely related to the different levels of the multi-level perspective. Both in focus, time scale and level of the activities shown in table 5-1. Strategic activities deal with long term envisioning and shaping of the landscape to enable bottom up development. Tactical activities develop structures on the regime level, and operational activities relate to the niches in which a wide playing field aims at executing larger number of experiments to select the promising ones (Rotmans, 2001).

Table 5-1: Scope of transition management activities (Loorbach 2007)

Transition management types	Focus	Problem scope	Time scale	Level of activities
Strategic	Culture	Abstract/ societal system	Long term (30 years)	System
Tactical	Structures	Institutions/ regime	Mid term (5-15 years)	Subsystem
Operational	Practices	Concrete/ project	Short term (0-5 years)	Concrete
Reflexive	Adaptation		Continuous repetitive	System/ Subsystem/ Concrete

The fourth group of activities are reflexive of nature and deal with the evaluating and learning processes. This activity differs from the other three activities in all aspects and cannot be related to the multi-level perspective but has its roots in the transition pathways (fig 4-2) (Rotmans, 2001). The reflexive activities are designed to deal with the uncertain behavior of a transition and the differences that exist during the various phases of a transition (Loorbach, 2007).

5.2 Strategic

Strategical activities focus on the development of long-term goals, strategic discussions and norm setting. All activities mainly deal with the 'culture' of the societal system as a whole. There is room for the innovative and radical ideas. One of main focus of the strategic part of the transition management framework is the institutionalization of the visioning process within the existing policy process as there is currently no structured place in policy making.

The strategical activities take place within a transition arena, a small network of frontrunners and experts with various backgrounds and perception on the problem. The transition arena should represent various societal groups like government, business science and civil society, but rather than representing their organization the individuals should participate on a personal background. The interests of the existing regime should be represented, but the individual participants should be able to think autonomously outside the current regime regulations. Over time the transition arena itself will change as people will be

replaced and new ideas come to the front, as do the visions that have been developed.

Strategic activities focus on the long-term goals of the transition. It deals mainly with vision formulation and the setting of collective goals, norms and values. It is focused on the culture of a system. One of the main strategic policy examples is the transition arena. A transition arena is a small network of actors with a variety of backgrounds and perceptions. Key to the performance of the transition arena is the assembling of innovative individuals or frontrunners that are not hindered with the interests of the incumbent regime. The goal of a transition arena is to come to a joint perception of problem and vision of the future (Loorbach, 2007, 2010).

5.3 Tactical

Within the tactical sphere activities are deployed to develop and change dominant structures that steer the transition towards the vision. Changing the rules and regulations, developing programs, infrastructures and routines. The central concept in the tactical sphere is the transition arena. This transition arena consists of a group of individuals that are engaged in that section of the transition and define and execute the direction of the transition. The focus will be mainly on a sublevel of the system, achieving goals within a specific context rather than the whole societal system.

The activities that are covered by the tactical activities aim at influencing the dominant structures, patterns, rules, regulations and organizations. The activities take place at the level of individual actors and generally have a time horizon of 5-15 years. The development of transition paths can be seen as an activity at the tactical level. Transition paths are routes to a specific part of the larger transition where intermediate steps are formulated. This can be done for a sub sector or an individual organization. The goal of activities at the tactical level is to translate the transition vision into an agenda for individual organizations (Loorbach, 2007, 2010).

5.4 Operational

The shortest timespan are covered by activities at the operational level. This relates to individual projects and programs, both in business, industry, politics or civil society. These activities compare to the development of innovation in niches as it is seen in the multi-level perspective. Transition experiments can be derived from the intermediate goals in transition paths. There is usually considerable risk involved in the transition experiments; the contribution towards the sustainable transition can also be large (Loorbach, 2007, 2010).

5.5 Reflexive behavior

The fourth group of activities relates to reflexive behavior. This entails activities that deal with evaluating, monitoring and learning. Within transitions the process of using the new knowledge for adjusting to the new situation is vital to the development of a transition. As main focus in this thesis the subject of reflexivity will be discussed in a separate chapter.

Monitoring and evaluation of the progress made are part of the reflexive activities of transition management (Loorbach, 2007, 2010). These activities are

essential to the transition as they allow for adjustment and the prevention of lock-in (Unruh, 2000, 2002). It therefore should be an integrated part of the governance of transition trajectories. Reflexive activities need to be continuously present and part of the governance itself. These activities are used for the articulation of further steps in the process (Voss and Bauknecht, 2006).

5.6 Conclusion

Transition management is an approach for governmental guiding of transitions. Using a top down envisioning process and a bottom up execution the approach aims at generating a process towards a general direction rather than a process directed at fixed goals. In this chapter I have discussed the transition management approach in the context of the multi level perspective. I have discussed the four core activities of the transition management approach and indicated the different nature of reflexivity compared to the other three. The structure of the core activities of transition management will be used in further parts of this research for analysis of application. The concept of reflexivity will be further explored in the following chapter.

6 Reflexivity

In the previous chapter I have demonstrated the different character of reflexivity compared to the other core activities of transition management. Furthermore I have shown the significance of reflexivity in the application of the transition management approach. In this chapter the concept of reflexivity will be defined. In order to be able to analyze the reflexive nature of the proposed method of assumption based planning for reflexivity a set of characteristics will be identified that are required for reflexive exercises.

6.1 Deep reflection

“(reflexivity is) a mode of steering that encourages actors to scrutinize and reconsider their underlying assumptions, institutional arrangements and practices”
John Grin (2007)

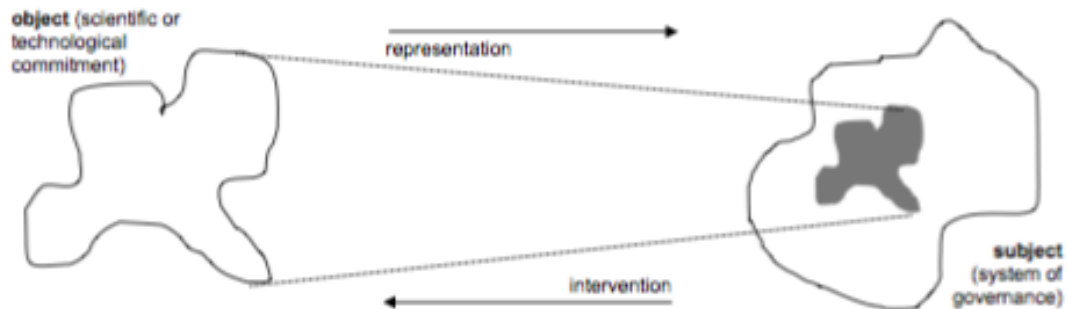
Reflexivity is a key concept in the methodology of transition management. It is the main part of one of the four activities and creates a feedback loop continuously evaluating and improving the transition (Loorbach, 2007, 2010). The concept of reflexivity is closely related to that of reflection in the sense that it encompasses historical events for future learning. Reflexivity however goes beyond reflectiveness in a way that it incorporates the notion of the complex nature of the system and the dependency of subject itself within the system (Stirling, 2006).

From the perspective of sustainable transitions two different modes of reflexivity are identified. Distinction between the so-called ‘first’- and ‘second-order reflexivity’ lies in the self-reflectiveness involved (Meadowcroft, 2007; Voß and Kemp, 2005). Both of these modes of reflexivity should be taken into account in the development of reflexive exercises.

In first order reflexivity there is a close relationship between the concepts of reflection and reflexivity (Voss and Bauknecht, 2006). Crucial in both modes of governances is the ability to take into account the environment and context in which the governance is taking place. Consequences of policies, both intended as well as possible unintended consequences are analyzed and incorporated into policy proposals. Governing with reflective behavior aims at minimizing the scope for ‘unintended consequences’ for any kind of intervention while maximizing the results of the intended consequences (Stirling, 2006).

Reflexive governance goes beyond this point of consideration of the possible consequences. The notion that ‘the subject itself forms a large part of the object’ is a critical addition in reflexive governance (Stirling, 2006), it understands itself as to be part of the dynamics of the system it is governing (Voß and Kemp, 2005). This added self-awareness creates a ‘recursive loop’ which Stirling (2006) describes as: ‘Reflexivity thus requires attention not just to the ‘representation’ of the object to the subject, but also to the way in which the attributes of the subject help constitute the representations themselves can help

Reflection – ‘deep, serious consideration’ extends to all salient aspects of the object of attention (full representation, aspiration to ‘objective synoptic’ basis and focus for intervention),
eg: “let’s take account of all possible consequences, before using the chemicals”.



Reflexivity – attention simultaneously encompasses and helps constitute both subject and object (recursive mutual conditioning of subjective representations and interventions),
eg: “the consequences depend on our point of view and our expectations of use”.

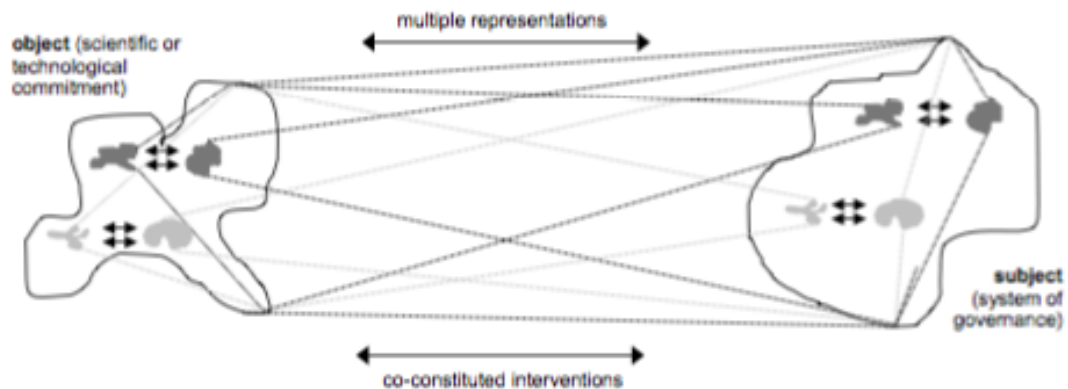


Figure 6-1: Schematic representation of the concepts of reflection and reflexivity (Stirling, 2006)

recondition the subject.’ A schematic representation of the main deeper self-awareness present in reflexive governance is shown in the figure above.

Within the wider context of sustainable development two different meanings of reflexivity can be distinguished. Though both are related their respective focus is separated. The first meaning that can be accompanied to reflexivity is the effect of modernization dealing with its side effects. Modernization solves existing problems and creates new ones attached to those solutions. This loop of self-confrontation by modern society is an example of first order reflexivity (Voß and Kemp, 2005).

The knowledge of this first order reflexive mechanism creates a second order reflexivity. The understanding of first order reflexivity and the development of analytical tools create new ways of dealing with the first order consequences. A regime that arranges new paradigms for handling problems through critical assessment of the problem solving methods itself shows the characteristic features of reflexivity (Voß and Kemp, 2005). The application of analysis not only of the problems, but on the working of the analysis itself represent second order reflexivity. Voß and Kemp (2005) describe second order governance as ‘a procedural approach towards reflecting the interdependencies, understanding aggregate effects of specialized concepts by establishing links,

organizing problem-oriented communication and interaction among distributed activities.'

6.2 Reflexivity in transition management

The transition management cycle is based on four phases, which independently occur throughout the transition. Major emphasis amongst scholars is put on the 'monitoring, evaluating and learning' process as the duration of a transition call for continues monitoring and adjustment. The continues process of doing, learning and improving is key within the uncertain environment in which transition management is applied (Kemp et al., 2007a; Loorbach, 2007, 2010).

It is in this phase of transition management that reflexive governance is advocated most. The guiding philosophy behind transition management is the adjustment of society and ongoing societal developments towards a set of collective goals (Loorbach, 2007). The changing environment constantly needs to be taken into account with the development of policies and should be reflected in the set of collective goals. Not only reflecting upon the (un)-intended consequences, but also on the modes of governance itself.

6.3 Characteristics of reflexivity

Reflexive exercises are an important part of the transition management approach. A way of identifying the reflexive nature of other methods is by looking at the characteristics expressed in reflexive exercise. In order to be able to evaluate the behavior of methodologies and define the expression of reflexivity a list of characteristics of reflexivity and reflexive governance has been formulated. Table 6-1 shows the list of characteristics.

Table 6-1: characteristics of reflexivity

Characteristic		
Reflective	Use past experience and learn from developments	Grin 2007
Responsive	Be able to be adaptive in the strategies	Laurie 2011
Receptive	Include the knowledge of engaged actors	Laurie 2011
Self confrontation	Include the effect of unpredicted consequences related to progress	Voß and Kemp 2005
Self inclusive	Include the effect of own behavior on the development	Grin 2007, Meadowcroft 2007

This group of reflexive characteristics will be used in further analysis for the evaluation of reflexive behavior. The expression of these characteristics can be seen as conclusive for a reflexive exercise.

6.4 Conclusion

Reflexivity is a form of deep reflection in which the complex nature of the system and the subject within the system are taken into account. In this chapter I have elaborated on reflexivity and its application in transition management. Based on the literature a set of required characteristics for reflexive exercises has been derived. On the basis of this set of requirements the proposed method of assumption based planning will be assessed in the following part of the thesis.

Requirement analysis

In this thesis I propose the use of assumption based planning as a reflexive exercise in transition management. In the requirement analysis I will analyze the assumption based planning methodology according to the requirements of reflexive exercises stipulated in chapter six and the structures of transition management stated in chapter five. For this analysis I first introduce the future planning as a set of methodologies that specific set of goals. I will discuss assumption based planning as a future planning approach. Based on the discussion of assumption based planning I will analyze the interfaces that exist between assumption based planning, transition management and reflexivity.

A way to enable reflexive behavior is the use of future planning activities. Future planning allows for applying the knowledge of past and current operations for the development of possible futures (Schoemaker, 1995). Current plans and operations can be adjusted or prepared for the future on the basis of the future scenarios.

A methodology that uses future planning building upon existing plans is assumption based planning (Dewar et al., 1993). Developed for the use within a military environment this method identifies possible weaknesses in the existing plans (identifying important assumptions, identifying assumption vulnerabilities), and develops strategies for the monitoring (define signposts), mitigation (shaping) and preparation (hedging) of the maturing of these weaknesses (Dewar et al., 1993).

After this part I have discussed the general ideas of future planning approaches and discussed assumption based planning. Based on the discussions on assumption based planning, transition management and reflexivity I have argued that assumption based planning is a reflexive methodology and that it is well suited for use in the transition management context.

7 Future planning

Assumption based planning is a methodology within the group of future planning approaches. This chapter provides the context in which assumption based planning and other future planning approaches are applied. I will discuss the main characteristics of future planning and the specific feature of using scenarios for developing strategies.

The characteristics related to reflexivity incorporate past experiences to adaptively address new challenge. A group of strategic approaches that include the uncertainty related to the future and builds upon current experience are the future planning approaches.

Future planning is all about thinking of the future and the threats and opportunities that lie ahead (Van der Heijden, 2011). Thinking about the future has been done for centuries, but the development of methodological future thinking and the development of strategies accordingly started after the Second World War. Within the United States military RAND organization the “future-now” strategy was the first of many future planning strategies. It has since been popularized due to the successful use by companies like IBM, General Motors, and perhaps most notably Shell. After a streak of success during the 1970’s the popularity of future planning diminished. In the early 1990’s the scenario approach revived and has since been an important tool in many uncertainty related exercises (Chermack et al., 2001). Over the past decades many methods for future planning have been developed. Regardless of the chosen methodology various key components can be identified.

In the further sections of this chapter I will discuss two aspects of future planning approaches. First the common goals and structures that are used in future planning. And secondly I will discuss one of the key features of many future planning approaches, the scenario building.

7.1 Strategy of future planning

Future planning approaches develop strategies which are able to cope with the uncertain future developments. Plans that are generated by future planning approaches are preferably both robust and adaptive (Walker et al., 2013). The design of future strategies incorporate knowledge that the future is uncertain and that it is possible to manage the uncertainty, it is not possible to avoid uncertainty all together.

By creating strategies that work in a large set of situations, or can be adapted to different types of futures, planners can accept the uncertainty without the risk of failure. This can be done by aiming for either dynamic or static robust strategies, or a combination of both (Walker et al., 2013).

Within the future planning approaches the creation of scenarios or future worlds is a well-known method. By creating possible futures possible risks and vulnerabilities can be visualized. The following paragraph will go into more detail on the development of scenarios.

7.2 Scenarios

Presenting a single definition of a scenario has proven to be difficult. Within the most prolific literature there is not a clear single definition agreed upon of what scenarios actually are (Chermack et al., 2001). From “an internally consistent view of what the future might turn out to be (Porter, 1985)” to “that part of strategy which relates to the tools and technologies for managing the uncertainties of the future (Ringland and Schwartz, 1998)”. Although a common definition is difficult to find, a key concept of developing various stories that challenge the current paradigms and highlight aspects that are currently overlooked (Schoemaker, 1995).

Scenarios are not concerned about getting the future right. It is rather about telling a story about a possible future. In these stories various variables are changing and the joint impact of different forces is explored (Schoemaker, 1995). Thus it aims at exploring the effects of major deviations for key outcomes and capture new states that might develop. The outcomes of such stories are focused on clusters and patterns that occur rather than on specific details (Schoemaker, 1995).

Scenario types

While there are a lot of different techniques and methods for scenario development two distinct types of scenario analysis can be distinguished: exploratory and normative approach (Bradfield et al., 2005). The main difference between both approaches is the use of probability. Exploratory models tend to focus on creating insight in the developments and are used for learning and adaptation. Normative models are more associated with the identification of the most likely scenario and are usually applied to study the effects of policy and strategy (Rounsevell and Metzger, 2010).

The exploratory approach to scenario analysis is based on the intuitive-logic model in which plausible, but alternative socio-economic outlines are developed. Differences in assumptions lead to diverging outcomes over long time horizons. The use of exploratory models is to generate images of the future to be able to grasp possible developments without being right (Rounsevell and Metzger, 2010). Their application is most in the learning and adjusting and can be used as a recycling exercise.

Normative scenario analysis come are related to the French school of scenario development, ‘La prospective’. The aim of the normative scenario approach is to identify the most likely scenario together with several bandwidths around the most likely scenario (Rounsevell and Metzger, 2010). Their application lies in the analysis of policy implementation and are most one-off exercises.

Applied method

In this thesis the scenarios are used for the development and adjustment of future strategies. In that way they are used as providing insight in the possible developments. For this purpose the use of an exploratory approach is the most convenient. The scenarios support the development of strategies and are aimed at being plausible futures that trigger the ideas of the decision maker rather than concluding on the possible outcomes. A more detailed description of the used scenario approach will be discussed in the case section of this thesis.

In this chapter I have shown the main characteristics of future planning approaches. In the following chapter the future planning methodology of assumption based planning will be discussed. Assumption based planning acknowledges uncertainty in the future and uses scenarios for the development of future strategies.

8 Assumption based planning

This thesis proposes the use of assumption based planning (Dewar et al., 1993) as a reflexive exercise in transition management. In this chapter I will discuss the methodology of assumption based planning. First I will discuss the main idea of assumption based planning, the origination of assumption based planning and its appeal to transition management. The second section of this chapter will discuss the main concepts (table 8.1) of assumption based planning. The third section discusses the assumption based planning framework (fig 8.1), which continues in the final section of this chapter where I will propose a breakdown of the framework into two separate sections (fig 8.2). In the following chapter this discussion will be combined with the previous chapters on transition management and reflexivity to analyze the application of assumption based planning in a transition management environment.

8.1 Introduction to assumption based planning

Assumption based planning has been developed in the 1980's, and as such is one of the earlier future planning approaches. The foundations of assumption based planning have been laid in the RAND cooperation. It has been developed and used as a planning tool for the United States military. As such it has been used for the development of strategies to deal with an uncertain future.

The central idea of assumption based planning revolves around the plans and operations of an organization. In order to create those plans the organization has to make assumptions on future developments. Assumption based planning aims at identifying these assumptions and finding associated vulnerabilities that, if matured, impact the goals of the organization. Based on the identified assumptions and vulnerabilities, assumption based planning develops flexible and adaptable strategies in order to allow the organization to react to changing circumstances. The scope of the plans that assumption based planning aims to analyze exceeds 30 years.

Assumptions and vulnerabilities

When making plans, assumptions on the future are made. One could think of organizing a beach party. While not explicitly stating this, the notion of a future event implies assumptions associated. An assumption related to a beach party is most likely 'having good weather'. The assumption of 'having good weather' for a beach party is probably a significant assumption as 'not having good weather' will impact the experience of the party.

A specific vulnerability of the assumption of the assumption 'having good weather' could be 'rain'. If there is 'rain' this will violate the assumption of 'having good weather' and will impact the goal of having a beach party.

Based on the key concepts of assumption based planning and transition management various aligning remarks can be made. Without further analysis it can be shown that the concepts of both approaches are similar. Transition management starts with the creation of a future outlook, where assumption based planning analyzes the future plans of an organization. Both approaches have a scope of multiple decades. And both approaches explicitly deal with uncertain futures. These three aligning concepts make assumption based

planning an appealing tool within the transition management approach. To what extend this appeal is justified will be analyzed in future chapters of this thesis.

8.2 Main concepts of assumption based planning

The main ideas of assumption based planning involve a limited number of key concepts. In this section I will introduce the key concepts of the assumption based planning approach. An overview of the key assumptions in assumption based planning is shown in table 8.1.

The subject of an assumption based planning analysis are the plans and operations of an organization. An organization refers to a structured and manageable group of people that are in pursuit of common goals and objectives. The plans and operations of an organizations are the ways and means to achieve the objectives and reach the common goal. By analyzing the plans and operations, assumption based planning is analyzing the core of an organization.

One of the main objectives of assumption based planning is the identification of assumptions in the plans and operations of an organization. Assumptions are assertions about some characteristics of the future that underlie the plans and operations of an organization. Where there are will be numerous assumptions, assumption based planning focuses on identifying the important assumptions. Important assumptions are the assumptions that, once violated, have a significant impact on the operations of the organization. Aspects that allow the assumptions to fail, refer to as vulnerabilities. Vulnerabilities are changes in the world that have a negative effect on the related assumption.

In the future oriented phase of assumption based planning the concepts of signposts, hedging actions and shaping actions are of importance. Signposts are indicators that signal change. For assumption based planning the signposts signal change in the vulnerability of an assumption. Signpost thresholds can be defined for the activation of a hedging action related to the challenged assumption. Hedging actions are plans that are prepared that activate on the failing of an assumption and mitigate the negative consequences of the failed assumptions. Shaping actions do not depend on the failure of an assumption, but actively shape the vulnerability preventing the failure of the related assumption.

Table 8-1 Main concepts of assumption based planning (Dewar et al. 1993)

Concept	
Organization	A social unit of people that is structured and managed to meet a need or pursue collective goals
Plans and operations	A set of actions and/or performance of a practical work to achieve a certain goal
Assumption	An assertion about some characteristic of the future that underlies the current operations of plans of an organization
Vulnerability	Any plausible change in the world that would cause an assumption to fail within the planning time horizon
Signpost	An event or threshold that clearly indicates the changing vulnerability of an assumption
Hedging action	An organizational action to be taken in the current planning cycle and is intended to better prepare for the failure of one of its important assumptions
Shaping action	An organizational action to be taken in the current planning cycle and is intended to control the vulnerability of an important assumption

8.3 Assumption based planning framework

The assumption based planning approach consists of five steps shown in figure 8.1. This section will discuss the individual steps of the framework. This discussion will followed by an review of the framework in which a breakdown into two separate parts is proposed.

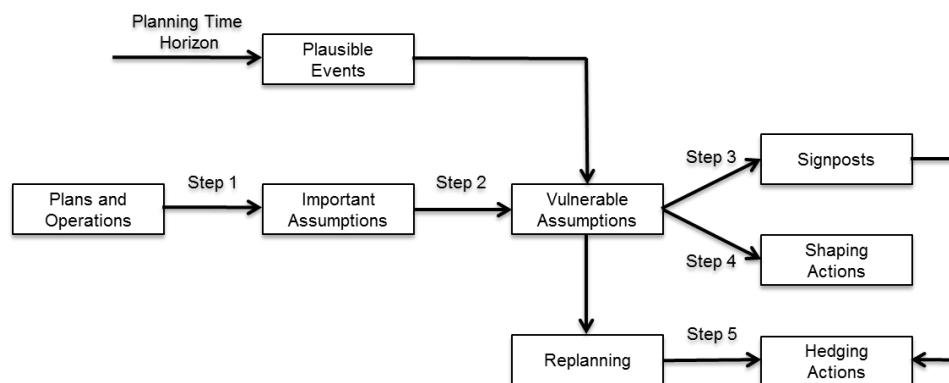


Figure 8-1: Assumption based planning framework (Dewar et al., 1993)

On the basis of assumption based planning lie the assumptions underlying existing plans. An assumption is defined as ‘the assertion about some characteristic of the future that underlies the current plans’. These assumptions could be both explicitly mentioned or implicitly described in the plans. Besides assumptions that are present in the plans of an organization, the organization itself possesses various assumptions on the future that could affect the way of dealing from the organization. Identifying these assumptions, both underlying the existing plans as well as the assumptions within the organization, is the first step in the process of developing a robust future strategy using the method of assumption based planning.

Many of the identified assumptions will fall in one of the following categories: failure of the assumption to mature will not affect the operations of the organization, or the maturation of the assumption will not become apparent within the timeframe set on the plans. The second phase of assumption based planning encompasses the identification of both important and vulnerable assumptions. An assumption is deemed important if its negation would lead to significant changes in the current operations of plans of an organization, whereas an assumption is vulnerable as there would be a plausible world event that would cause the assumption to fail within the planning horizon. When an assumption is both important and vulnerable it is an assumption the organization might take action on in order to deal with the negation of the assumption in the future.

The third step in the process is the identification of signals of changing vulnerabilities. Identifying signposts that indicate a changing vulnerability. Signposts are vulnerability specific but can be used for multiple vulnerabilities, as can a single vulnerability have multiple signposts. The process of signpost identification is combined with the development of a monitoring concept and determination of threshold values. Passing these thresholds triggers the activation of a shaping action (step 5).

Dealing with a vulnerable assumption can be done in two different ways that are based on the negated assumption and the activities related to this assumption. Either the organization takes a shaping action (step 4), it changes its current operations to increase the robustness of its operations in order to deal with a negated assumption, or it takes a hedging action (step 5), it prepares interventions in order to deal with the negated assumption when it occurs. Choosing either of them depends on the nature of the assumption or activities of the organization. Shaping action actively steer the future to prevent events happening that threaten the assumption. Hedging actions are reactive actions that are planned for situations that cannot be prevented and happen independent of the actions of the organization. The development of hedging actions can be assisted with a replanning exercise. Through the development of future worlds in which the vulnerable assumptions are challenged the weaknesses of the assumptions are exposed offering new insights for the development of hedging actions.

8.4 Framework review

The assumption based planning approach can be visualized using the framework shown in figure 8.1. Looking at the activities that are employed a separation can be made between the analytical section and an action oriented section. Here I will discuss this separation and argue for the separate execution (fig 8.2) of the sections for further use of assumption based planning.

The activities of assumption based planning can be clearly separated into either analytically oriented or action and future planning oriented. Step 1 and 2 of the approach concern the identification and selection of the important assumptions and the related vulnerabilities. These steps are based on existing plans and operations and analyze the current state of the organization. Steps 3, 4 and 5 relate to future planning and are action oriented. These steps use the results of step 1 and 2 as basis and develop new strategies based on the identified vulnerabilities.

Where step 1 and 2 result in the identification of vulnerable assumptions, step 3,4 and 5 build upon those vulnerable assumptions for the development of future strategies. The proposed separation of the framework is there for drawn along the vulnerable assumptions. Where it is the result of the first phase, the assumption identification, it is the start of the second phase, the future planning. This is visualized in figure 8.2.

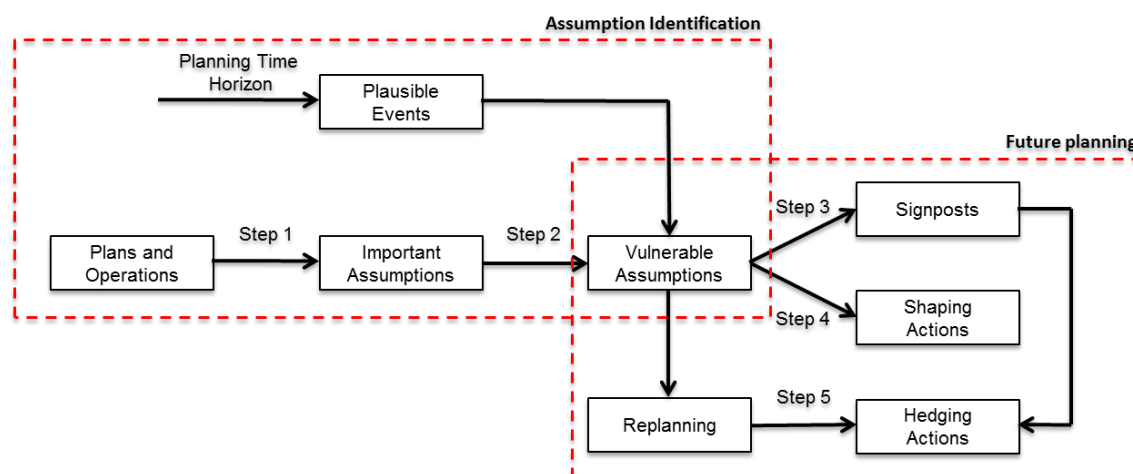


Figure 8-2: Breakdown of the assumption based planning framework into two separate phases

The separation of the sections allows for developing methodologies in line with the transition management framework. The assumption identification section can be oriented towards analysis of a large number of actors involved, while the second phase can be more oriented towards the strategically oriented actors.

Assumption based planning is a methodology that focusses on the vulnerabilities in the assumptions of plans and processes. In this chapter I have discussed this main idea and the framework of assumption based planning. Furthermore I have argued a breakdown of the assumption based planning framework into an assumption identifying section and a future planning section. In the following chapter I will argue the reflexive nature of assumption based planning and argue that the structure of assumption based planning suits transition management.

9 Assumption based planning and transition management

In the previous chapters I have discussed the transition management, reflexivity and assumption based planning. In this chapter I will synthesize those chapters and argue that assumption based planning is both a reflexive methodology and that assumption based planning is well suited for use in transition management.

Transition management is used as a mode of governance for the stimulation of transitions. In transition management the notion of reflexivity is an important idea for government to deal with the unexpected behavior of a system in transition. In practice the expression of reflexive behavior is lacking. Assumption based planning could be a method used within the transition management framework that induces reflexive behavior.

In the previous chapters I have outlined the individual ideas of transition management, reflexivity and assumption based planning. Combining the results of these individual chapters leads to two conclusions that highlight the opportunities for assumption based planning in the transition management framework. First the method of assumption based planning expresses reflexive behavior, and secondly the method of assumption based planning is well suited for the governance structure of transition management. These two conclusions lead to an overall conclusion that, based on literature research, assumption based planning could be used as an addition in the toolbox of transition management.

9.1 Reflexivity in assumption based planning

Assumption based planning is an example of a reflexive exercise. The characteristics associated with reflexivity as described in chapter 6 can all be identified in the methodology of assumption based planning. The combination of a reflective section in which vulnerabilities are identified, an action based section in which those vulnerabilities are tackled, and the inherent focus on the behavior of the organization itself create a methodology which can be identified as reflexive. In the two sections of assumption based planning the characteristics of reflexivity can be identified.

The process of identifying the vulnerable assumptions of the organization is in large part a process of reflection on organizational choices and experiences. The process consists of the reflection on choices made in the planning process, and in particular the assumptions that underlie these choices. This is combined with the experience of engaged actors on the development of the transition so far. Together identifying vulnerable assumptions is a process that is reflecting on the initial choices made and the development that has been made since.

The inclusion of engaged actors in the process of identifying the vulnerable assumptions indicates the receptiveness of the method. In the activity where the analysis of the situation is made, the experience of involved actors is used to identify and select the main vulnerable assumptions that are critical to the organization.

It is in this part of the process that there is a period of self-confrontation. Both the actor engagement and the expert interviews give room for anticipation of the effects of unpredicted developments.

Self-inclusiveness is expressed in both the process of identifying vulnerable assumptions as well as in the development of future strategies. During the identification of vulnerable assumptions the effects of the organization are included through both the expert interviews and the actor workshop. The experience of the experts and participants of the actor workshop in the process and their experience of the organization in the process will be included in the results. For the development of future strategies the impact of the organization is in the development of shaping actions. These identify changes in the organization to prevent vulnerable assumptions to fail.

The goal of the development of future strategies is to come to robust strategies that allow for the development to continue regardless of unpredicted events. The future strategies are designed to be adaptive to an unknown future.

Assumption based planning can be identified as a reflexive exercise. The combination of vulnerability identification and strategy development makes that this method expresses the key characteristics of reflexivity. The inherent focus on the organization itself, and the impact that the organization has on the development, makes that it is more reflexive than reflective.

9.2 Governance of assumption based planning

Transition management is a mode for governance of transitions. In this approach a government structures the development of a transition around network formation and future envisioning. Assumption based planning is a method that has the potential to deal well with the analysis of an organization that has a clear future outlook and a wide base of involved actors. The identification of vulnerabilities allows for the inclusion of large number of actors while the development of future strategies can be managed by the coordinating government body. The development of future strategies further allows for the adjustment of the future outlook rather than completely redesigning it. The concept of organization in both instances however need some consideration. The structure of transition management could conflict with the concept of the organization in assumption based planning.

The identification of the vulnerable assumptions is a process that consists of three different activities. Of those three activities a workshop is well suited for the inclusion of a large number of engaged actors without the organization of a large number of events. The workshop can be organized in as an iterative process in which large sections are done individually with data processing (by a researcher) in between. This allows for the engagement of a large number of actors without the need for difficult scheduling.

The process of developing future strategies can be performed by the government body coordinating the transition. The identification of vulnerable assumptions is a process that requires input that from a wide range of sources, the translation of this information to executable actions is a more detailed process that can be executed within the coordinating group. This allows the government to remain in control of the transition process while using the input from a larger group of actors.

Transition management starts with envisioning the future and creating the pathway that moves in the direction of that future. While this future is only a guiding image, it is an image that allows for the planning, support and funding of the process. Changing the image could prove to be difficult in the political arena. The future strategy approach of assumption based planning focuses on the adjustment of the future strategies rather than the development of completely new images. It is therefore well suited to be used in the environment of transitions that are uncertain and constantly changing.

Some consideration needs to be made regarding the structure of the organization. The concept of an organization in assumption based planning is closely related with the plans and operations that are at the core of the analysis. Transition management employs an organizational structure in which a small body manages the movement of a larger network. The plans and operations aim at moving the network towards a certain goal. Whereas the organization in assumption based planning is defined as a structured unit that pursues collective goals. Encompassing the entire regime as an organization conflicts with the management capabilities of the organization, whereas only defining the core transition body as the organization misses out on the collective structure of transition management.

The transition management approach and the political arena create structures that require a specific kind of analysis and action. Assumption based planning comprises both of an analytical section and an action based section that would fit well within the transition management framework and the political environment that transition management is executed in. Although consideration must be given to the notion of the organization and the relationship with the plans and operations.

9.3 Conclusion

Transition management is an approach that allows governments to push and thereby stimulate a beneficial transition. Transition management experiments have shown that this process gets interrupted due to a lack of reflexivity. In this section I have explored the opportunities that exist for the use of assumption based planning to induce reflexive behavior in the transition management approach. Analysis of the requirements for reflexivity, transition management exercises and the abilities of assumption based planning it can be concluded that assumption based planning would fit in the approach of transition management as a reflexive exercise.

The requirements for a reflexive tool in the transition management approach are trifold. First the exercise should express reflexive behavior, the process needs to include a form of deep reflection and learning in which the impact of the organization itself is central. Secondly the tool needs to be able to deal with the dynamics of a transition. The process should result in changes that are robust and adaptive to the future. And finally the tool must not be too rigorously in the alterations for it to lose political support. The political environment is one in which support is easily lost and hard to come by.

Assumption based planning is a method in which all three requirements are met. The process is one in which the organization is at the core of the analysis and reflection and learning are central. The final results are adaptive strategies that are developed to be successful regardless of the environmental

changes. From the perspective of political support the changes are developed within a coordinating body that allows for political aspects to be taken into account and changes are adaptations to existing images and plans.

Given these conclusions it is clear that assumption based planning is suited as a reflexive exercise in transition management. In the following part of this thesis I will explore the application of the assumption based planning methodology in the transition environment towards a biobased economy. I will argue that the development of a biobased economy is a transition managed using the transition management approach. I will develop a methodology suited for this specific situation that follows that assumption based planning methodology. I will apply this method and present and analyze the results with regards to the applicability of assumption based planning in transition management.

Case study

This thesis proposes the use of assumption based planning as a reflexive tool in the transition management approach. In the previous parts I have discussed the theoretical interfaces between the approaches. In the following part I will exemplify these interfaces with the use of a case study in which the assumption based planning is applied to the development of a biobased economy.

The first chapter will introduce the biobased economy and the activities of the biobased economy in the Netherlands. The transition towards a biobased economy involves the transformation of the chemical sector from using fossil resources to using biomass as a resource for the production of chemicals and materials. This transition involves the development of new biochemical processes, the development of new agricultural products and a new network of connections. The current position in the chemical, agricultural and logistical sector explains the interest of the Dutch government for the stimulation of a transition towards a biobased economy.

The justification of choosing the transition towards a biobased economy as a case is made through the comparison of the development of the biobased economy with the energy transition. This comparison shows parallels between the two transitions indicating the risk of governance failure in the near future. Applying a assumption based planning as a reflexive exercise could indicate the need for reorientation of the governance structure.

As the assumption based planning method describes a meta method a translation needs to be made for the practical execution within the department of the biobased economy. Chapter consists of the methodology used for the execution of the assumption based planning methodology. It describes the steps taken and the adjustments made.

The fourth chapter in this section consists of the assumption identification part of the assumption based planning methodology. The results are presented and discussed. The results of the assumption identification are separated along the lines of four different themes. The assumptions identified with these themes indicate a trend in globalization of the policies surrounding the biobased economy. A European approach is identified as a main development in the biobased economy.

The final chapter comprises the results and discussion of the future planning part of the assumption based planning method. Chapter 12 is executed as a thought experiment by the researcher. The focus in the future planning lie in the weaknesses in the European approach identified as main assumption. Strategies for preparation and mitigation are developed. The process of future planning due to its constant gathering and selection of the results creates a rather narrow set of strategies that however reflexive, might be ineffective for use in the broad development of the biobased economy.

10 Case selection: The biobased economy

The main goal of this part is the application and analysis of assumption based planning in practice. This requires a case in which the governance is based on the transition management approach. In this part I will apply assumption based planning to the case of the biobased economy. In this chapter I will justify the choice for the biobased economy in the Netherlands as an exemplifying case for the application of assumption based planning. To do this I will argue that the governance of the biobased economy is based on the transition management approach.

Before I will discuss the governance of the biobased economy and argue that it is based on transition management I will first introduce the concept of the biobased economy. The first section of this chapter will introduce the main idea of the biobased economy, developing an economy that uses renewable resources rather than fossil resources. The second section of this chapter will discuss the development of a biobased economy in the Netherlands. This section will focus on the opportunities that a biobased economy offers and the reasons for the Dutch government to apply a transition management approach of governance.

The governance of the biobased economy will be discussed in the third section. Here I will argue that the governance of the biobased economy is based on the transition management approach, and there for a suited case for application of assumption based planning

10.1 Biobased economy

Worldwide, economic activities are based on our ability to convert fossil resources into useful products and energy. Increasingly we are becoming aware of the disadvantages that are created with the use of fossil resources: the consequences of increasing the concentration of greenhouse gasses; risks related to geopolitical disturbances with regards to availability of fossil resources; the increasing contrast between wealthy countries seizing the fossil resources and the undeveloped areas of the world (Werkgroep Businessplan Biobased Economy, 2011). One way of mitigating these disadvantages is making a shift away from fossil resources and towards the use of biomass as the source of our economic activities, a biobased economy (Langeveld et al., 2012).

The concept of a biobased economy involves an economy that uses biomass for its economic activities rather than using fossil resources. With the use of technological advancements in agriculture, chemistry and biotechnology processes are developed that allow for the replacement of fossil processes. A future biobased economy will develop on technological progress in knowledge of genes and complex cell processes, the use of renewable biomass and efficient bioprocesses, and the integration of biotechnology in various economic sectors (OECD, 2009).

The development of the biobased economy aims at the creation of processes that not rely on fossil resources but use resources that can regenerate within years (Langeveld et al., 2010). Besides the development of a more renewable industry the development of a biobased economy opens up the

possibilities of new and more pure products. As the production process of biobased processes relies on biomass, of which abundant species are available, there is the possibility of developing new processes and products that exploit the genetic structure of the biomass. Furthermore the options of genetic engineering will allow for the development of specific process/product crops that perfectly match the downstream processing facilities and allow for improved products (Annevelink and Harmsen, 2010).

Developing a biobased economy has some major consequences for the economy as we know it (Zachariasse et al., 2011). Both on a local as on a global scale. Globally, the increased use of biomass as a resource will allow for other countries to enter the resource market as they possess large surfaces for biomass. For fossil resource rich countries this development could in the long run put pressure on their profitability of their resources. On the local scale various processes will need to change. The production scale of processes in the biobased economy will probably be smaller as the production of biomass is more widespread than the fossil based economy (Annevelink and Harmsen, 2010). There will be need for logistical solutions. Furthermore the production of resources will be done by farmers and foresters rather than by oil companies. The processing of the resources towards end products will still be done by chemical companies but processes need to be adjusted (Langeveld et al., 2012).

A biobased economy will effect various economic sectors both in a positive and a negative way (Langeveld et al., 2012). As the upstream process changes it shifts the resource production from a small group of oil companies towards a larger group of smaller farmers and foresters. The chemical companies need to develop new processes but larger investments are still needed and the current large chemical companies can provide those. As the production of the biomass will be more widespread and local there will be need for logistic solutions and this offers opportunities for the logistical sector.

I have introduced the main idea of a biobased economy and discussed the main challenges faced in developing a biobased economy. Now I will focus on the situation in the Netherlands and the decision of the Dutch government to actively stimulate this development.

10.2 Biobased economy in the Netherlands

The Dutch government has identified various economic sectors in which it wants to excel at an international level. These sectors include areas in which the economic or research level and potential are the greatest. The biobased economy encompasses several of these sectors and the development of a biobased economy has been marked as valuable for the development of these economic sectors.

The Netherlands, despite its relative small size, is among the top 25 in economic output. In order to maintain this position amongst the leading countries in the world the Netherlands has focused its resources on 9 sectors in which it has a leading position economically and/or in the academic world and that offers growth potential on the world economy (topsectoren.nl, 2015). Three of these main pillars for the future Dutch economy are amongst the main economic sectors involved in the biobased economy: the agricultural, chemical and logistical sector. These three sectors are most strongly involved in developing a biobased economy and are of importance for the dutch economy.

The opportunities that the biobased economy offers in these sectors have been identified and create the legitimacy for the stimulation of a biobased economy (Sanders and Van der Hoeven, 2008; Zachariasse et al., 2011).

The agricultural sector will be responsible for providing the biobased economy with its resources. Historically the Dutch have been farmers and due to the small surface of the country the efficiency of the Dutch agricultural is amongst the highest of the world (Bos, 2008). This efficiency combined with the production limitations on food and feed produce in place by the European Union causes Dutch farmers to limit their land use. The possibility of using their efficient production for industrial purposes allows them to fully use their potential (Sanders and Van der Hoeven, 2008).

Another source for supply of resources could be stimulated by the excellent logistics available in the Netherlands. With the main European port in Rotterdam and another important port in Amsterdam the Netherlands has access to biomass all over the world (Sanders and Van der Hoeven, 2008). Combined with an large logistical sector the it allows for serving a large proportion of the European main land with its goods.

The chemical industry could enable the potential that biomass offers as resource for industrial processes. The chemical sector in the Netherlands is a large part of the Dutch economy. Roughly 8% of the Dutch economic activity comes from the chemical industry (Zachariasse et al., 2011). There exists vast knowledge on (bio)chemical processes and there various highly rated knowledge institutes focus on the development of new knowledge of chemistry. With large chemical complexes in both ports already in place the Dutch government would like to stimulate the innovation in this sector (Sanders and Van der Hoeven, 2008).

Developing a biobased economy would not only stimulate several already strong sectors in the Netherlands it would also offer an opportunity for the development of the rural areas. The economic activity in the Netherlands is mainly located in the Randstad area. A biobased economy would allow for economic production near the agricultural sites thereby stimulating economic activity in currently areas where population and jobs are currently decreasing.

Besides the generic opportunities that a development of a biobased economy has to offer the Dutch economy has several factors that give the government an incentive to stimulate this development. The involvement of three major industries - agriculture, chemistry and logistics – and the prospect of developing smaller regions makes the Netherlands a location where the odds of success are high.

10.3 Biobased economy and transition management

The transition towards a biobased economy is an example of a transition governed with a transition management approach. The close relationship to the energy transition and structure of governance indicate the main concepts of transition management to be at the core of the biobased economy.

The biobased economy has a close relationship with the energy transition, the main component of the transition management approach. One of the transition arenas of the energy transition was focused on the development of bioenergy, both in the form of electricity and biofuels. The development of biofuels is a biochemical process that is similar to biochemical processes that are

currently associated with the biobased economy. In the process of the development of biofuels it was concluded that the development of biochemistry as a whole could cause an entire economic sector to transition from fossil to bio resources. The initial development of a biobased economy transition originated in the energy transition, and further development of the biobased economy has used the governance structure of the energy transition as a building block.

Besides the historical foundation of the biobased economy in a transition management approach, the governance structure is showing the core ideas of transition management. Important aspects in the development of the transition have been the creation of future images, and formation of a network of engaged actors. In order to stimulate the development of the biobased economy several future images have been created. These images range from future outlooks of the entire chemical sector to images of specific strategies and short term goals. The development of these images is in line with the transition management approach in which future images are used as inspiration in the development of new processes.

From the perspective of actor mobilization the biobased economy has made network formation a key aspect. The development of a network of engaged actors has been a main activity from early on. The focus for starting the transition has not been by approaching powerful actors and asking them to change, but rather connect and enable actors that are looking for opportunities in the changing environment.

While formally not a transition management experiment, the governance of the biobased economy deploys all the key components of transition management. With the historical relation to the energy transition I have concluded that the governance structure is similar to a transition management approach.

10.4 Organization of the biobased economy

The development of the biobased economy in the Netherlands is organized using the transition management framework. The transition is coordinated by a policy directorate from the ministry of economic affairs. Here I will discuss the structure of the biobased economy and consider the implications for the use of assumption based planning within this organization.

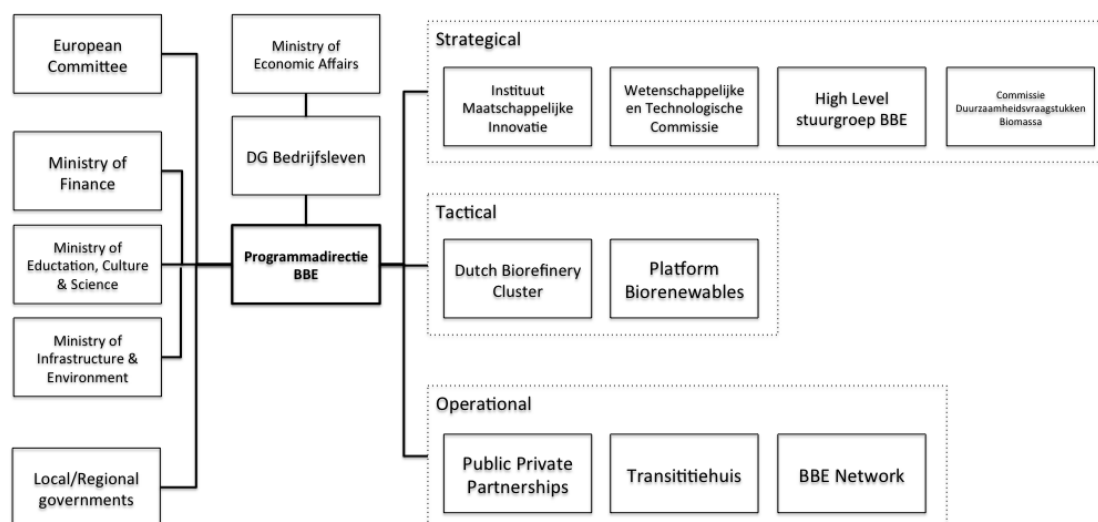


Figure 10-1: Organizational structure of the biobased economy in the Netherlands

The central body in the development of the bioased economy is the programmadirectie biobased economy. This policy directorate is part of the ministry of economic affairs and is responsible for the coordination of the transition. The programmadirectie is the connection between the policy development and the transition activities related to the biobased economy. Figure 11-1 shows the structure of the biobased economy in the Netherlands. The programmadirectie is the coordinating body of the transition. On the policy side the programmadirectie coordinates between the different levels of government (local, national and international), and within the four departments involved in the biobased transtition.(economic affairs, finance, EC&S, I&E). On the side of the transition management activities the programmadirectie coordinates all three types of activities.

From a perspective of assumption based planning and this case study uses the programmadirectie BBE as the organization in which the plans and operations are directed at the entire biobased economy. The goal of the programmadirectie is to develop the biobased economy using executing and managing the plans that have been developed for the biobased economy.

Having introduced the biobased economy, identified the transition management governance structure and elaborated on the choice of the biobased economy for the use of an assumption based planning experiment, the following chapter will continue with the assumption based planning multi method approach itself.

11 Assumption based planning methodology

Assumption based planning is a framework in which a series of methods leads to the identification of vulnerable assumptions and the development of future strategies based on these assumptions. This chapter will discuss the framework, the methods of choice, the scope and the limitations of the approach.

To exemplify the proposed use of assumption based planning the use of this method is analyzed in the environment of the biobased transition. The goal of assumption based planning has been discussed in chapter 8. The vulnerable assumptions of the organization are identified and future strategies are developed to manage those vulnerable assumptions. The assumption based planning approach attempts to identify the vulnerable assumptions in the governance of a transition and develop strategies to tackle those vulnerable assumptions.

In this chapter the proposed methodology will be discussed from the perspective of a transition management approach. This will be focused on the biobased economy in chapter 12. First I will discuss the research framework and indicate the distinct phases of the research. After that both of the distinct phases and the activities that they consist of will be discussed. During the method discussion I will elaborate on the relevance of the method; the specifics of the used method; and the known weaknesses of the method.

11.1 Research framework

In chapter 5 I have discussed the transition management approach. Here I have discussed the research framework and argued a breakdown into two separate phases (fig 5-2). In this section I will describe the research framework for the case of the biobased economy. Based on the framework of assumption based planning and the requirements of transition management a set of methods and deliverables is created for each of the two phases.

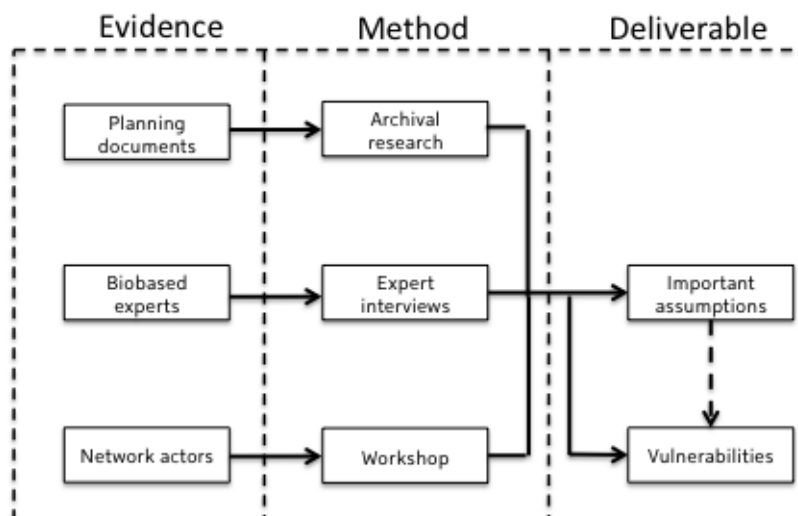


Figure 11-1: Research framework for the assumption identification (phase 1)

Assumption based planning can be broken down into two distinct phases, a reflection oriented phase of identifying vulnerable assumption (assumption identification), and an action oriented phase that designs strategies that deals with the identified vulnerable assumptions. The goal of the first phase is to identify the important assumptions and their vulnerabilities. There are three distinct sources in transition management that can provide for information for on the development of a transition, namely: planning documents, transition experts, and network actors. Planning documents contain the original ideas and assumptions made at the start of the transition, experts have deep knowledge of the central structure and the governance of the transition, and network actors are involved in the grassroots development of the transition. The chosen methods for utilization of each of the sources are: archival analysis, expert interviews, and a workshop.

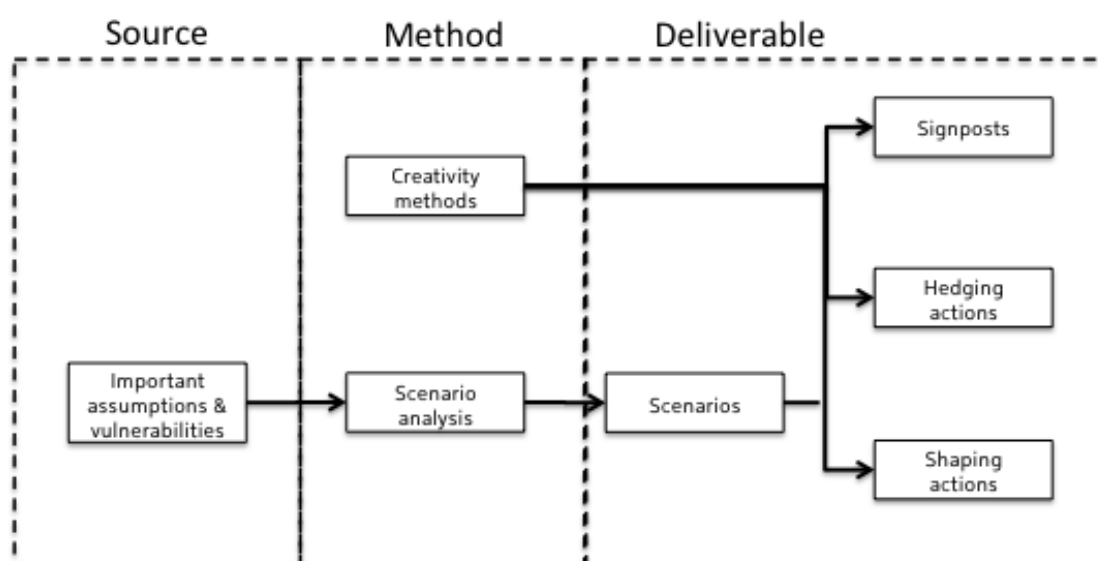


Figure 11-2: Research framework for the development of future strategies (phase 2)

The second phase of assumption based planning is action oriented and uses the identified assumptions and vulnerabilities to adapt and design future strategies. The goal of this phase is to identify signposts and develop two types of future actions, hedging or shaping. Using scenario analysis, future images will be developed which will be used for the identification and development of signposts and future strategies.

In this section I have operationalized the assumption based planning methodology for use in the context of a transition. In the following sections the two phases will be discussed and the individual methods will be illustrated.

11.2 Phase 1 methods

The first phase of the research is the identification of the important assumptions and the corresponding vulnerabilities. These steps are conducted through literature analysis, expert interviews and a workshop. This process uses the information from the original long-term plans, and the experience of actors involved. This process results in the identification of the vulnerable assumptions in the plans. These vulnerable assumptions will be further used during the second phase where strategies for these vulnerabilities are developed.

The basis for the first research section are the plans for the development of a transition management experiment. This information is both present in governmental literature as well as in the manner in which current activities are planned and executed. In order to use both sources of information for obtaining the main assumptions and vulnerabilities three types of data gathering have been used. A literature study using both sources from the initial plans as well as the most up to date versions mainly focused on the identification of assumptions. Expert interviews are used for incorporating the experience of the actors on a more coordinating level with vast knowledge of the transition in general. Resource intensive interviews allow for using the large amount of knowledge present in a small group of actors. Finally an interactive workshop is conducted to include the experience of actors involved in the transition experiments. They have deep knowledge on small parts of the transition and by using a workshop this knowledge can be extracted. The combination of the three activities leads to the identification of a limited number of important assumptions and related vulnerabilities that could threaten the progress of the organization.

Assumption identification process

The process of identifying important assumptions and vulnerabilities involves a sequential process that is similar in all three methods used. First a list of assumptions is generated based on the plans of the organization. If you organize a summer beach party the following assumptions can be made:

- *There will be guests*
- *The weather is nice*
- *Everyone likes the beach*
- *etc...*

From the list of assumptions the important assumptions are identified. These are assumptions that are both have an impact on the organization and can be impacted within a specified timeframe. This selection is highly subjective and dependent on the situation. Depending on the location the assumption of nice weather might be an important assumption. A beach party in the Netherlands will be subjective to the possibility of changing weather, but the weather in Southern Europe could well be highly predictable in the summer and is more susceptible to change over longer periods due to changing climates. For the beach party in the Netherlands having nice weather is certainly an important assumption.

The next step in the process is identifying vulnerabilities that are related to the important assumptions. The goal of the vulnerability identification is to identify vulnerabilities that are viable and violate the assumption. In the example of the summer beach party and the assumption of nice weather the following vulnerabilities could be identified:

- *Rain and/or lightning*
- *Low temperature*
- *Fierce winds*

Document analysis

Document analysis is conducted to identify assumptions underlying the original plans of the organization. Analysis of the list of identified assumptions results in the identification of a limited number of vulnerable assumptions. Document analysis focuses on identifying assumptions early in the development

of the transition, those that are made by stakeholders involved in the planning of the process.

Using document analysis in the transition management context is a promising option. One of the fundamentals in transition management is image building. These images are used to develop plans and operations. Developing future images is a process filled with assumptions. Documents related to those images and the plans of the organization are likely to contain vulnerable assumptions. Document analysis for the use in assumption based planning looks therefore very attractive.

From the perspective of reflexivity content analysis aims to be both reflective and self-inclusive. The identification of assumptions in the planning of the organization looks back on the original ideas, whereas the focus on organization itself is included due to the source of the information.

The method used for document analysis is content analysis. Content analysis is a method for the analysis of written, verbal or visual communication messages. It is a systematic and objective means of describing and quantifying phenomena (Krippendorff, 2004). The results derived from the content analysis are further analyzed using the criteria related to impact and vulnerability as described in the assumption based planning methodology.

The use of content analysis is not without weaknesses. Vulnerabilities of content analysis lie in reliability and validity. These are however vulnerabilities already associated with future planning and assumption based planning in particular. The experience of the researcher in the field of study is a relevant factor in the analysis of the result. To enhance the reliability and replicability of the results of content analysis stringent coding schemes are used (Elo and Kyngäs, 2008).

Expert interviews

The second method used in the identification of vulnerable assumptions is expert interviews. Expert interviews are used to gain insights in the developments of the plans so far (Bogner et al., 2009). They are assumed to have a vast amount of knowledge on the plans and the execution so far and can give an overview of the main developments in the transition. The focus of the expert interviews is both past, present and future developments.

Transition management highlights the development of networks and autonomous organizations that are inspired by a central image creating and development enabling organization. While the structure is relatively flat there will be central actors that either play a central role or oversee the developments of the transition. These actors are targets for expert interviews.

Expert interviews were reflexive in multiple ways (Alvesson, 2003). The involvement of engaged actors makes it a receptive method. Especially the use of key actors in the field allows it to gain insights in the core development of the transition. The focus of the interviews on past, present and near future events makes it both reflective and self-confrontational. The developments, impact and adaptation of the transition to the progress made are aspects of reflexivity involved in the expert interviews.

The expert interviews are mostly open in structure. The focus is on the experience of the interviewee with guided questions to the developments of the

transition. A section of the interview will be related to the identification and illustration of assumptions, their impact and vulnerabilities.

Workshop

The third activity in the identification of vulnerable assumptions is a workshop. The workshop might be the most important of the three activities as it uses the experience of actors in the transition. By using an approach derived from the assumption based planning methodology (Dewar et al., 1993) a future oriented workshop aims at identifying the important assumptions as experienced by actors in the transition.

Together with image building, network formation is a core activity of transition management. As this network consists of actors convinced of the transition it is a very valuable source for adaptive planning. Using a workshop allows for the input of a large number of participants with limited resources and with careful design without putting a strain on their time as well.

Using a workshop is a way of receiving input on the development and organization of the transition. It is a self-confrontational and receptive approach in the light of reflexivity. Though the workshop is focused on the future, the experience of the participants will be reflected in the results.

The workshop design is derived from the methodology of assumption based planning, and is adapted for the use in a time and resource constraint environment. Through a series of steps, both individually and collectively the goal of the workshop is to identify a limited number of main vulnerable assumptions that are related to the transition. These steps could be summarized as: imagine the future, identify assumptions, and select the important assumptions. Each of the individual steps will be discussed shortly below, and in more detail in chapter 12, case conduct.

The workshop starts with an individual exercise, performed prior to the workshop, in which the creativity of the participants is stimulated by making them think about the future situation of the transition. The main goal of this exercise is to generate important aspects in the development of the transition as experienced by the participants. Another aspect of this initial exercise is to engage the participants in the workshop. Giving them the opportunity to work on the first exercise at their own terms makes them think about the objective of the workshop without the pressure that could exist in a group setting with a time limitation.

Based on the results of the first exercise a shortlist of statements is made by the researcher for further use in the workshop. While the process of selection by the researcher is not an optimal situation due to possible biases, this was unavoidable due to a limited available time. An extra feedback loop with the participants might be a more sound solution. The other activities take place collectively in a single workshop session, starting with the assumption identification.

With the shortlist of the most important or vulnerable concepts of the future selected the collective part of the workshop starts with the identification of assumptions related to those concepts. For each of the statements assumptions are identified. This allows participants to think about the fundamentals of the most important developments ahead.

The process of assumption identification is a multi-round process (Dewar et al., 1993) in which participants constantly add assumptions based on their own ideas or based on input from other participants. The goal of the assumption identification is to generate as much assumptions that are related to the statements. For further use in the workshop the list of assumptions need to be summarized. In smaller groups participants combine and summarize the found assumptions to come to a limited number of assumptions per statement.

The final part of the workshop is used to select the most important assumptions. Based on their individual experience participants are asked to rank the identified assumptions per statement based on importance and vulnerability. This process leads to the identification of the important assumptions for the development of the transition.

11.3 Important assumptions and vulnerabilities

The three different activities, document analysis, expert interviews and workshop, each use different sources of information to identify important assumptions underlying the development of the transition. Combination of the results of the three individual activities aims at identifying a shortlist of important assumptions. Based on the important assumptions vulnerabilities are identified.

This combination might have three possible outcomes. Either the vulnerable assumptions related to the early stage of the transition (document analysis) still exist and are still considered to be main threats to the development of the transition. Otherwise early stage vulnerable assumptions are not identified as such through the expert interviews and workshop indicating a shift in the transition highlighting new threats. Most likely it will be a combination of the two with both existing and new vulnerable assumptions that are perceived as such.

The important assumptions are both impactful to the development of the transition and vulnerable within the next 20-30 years. For the identification of vulnerabilities the results of the workshop assignment (imagine the future) are used. The questions that are identified relate to changes that occur and are possible vulnerabilities to the identified assumptions. A list of possible vulnerabilities is generated using these results and expert opinion.

As any threat to an assumption is a vulnerability, it is difficult to verify whether the list is complete. This research relies on the experience and judgment of the researcher for the identification and selection of the most important vulnerabilities. Using the rule of thumb from the assumption based planning methodology the number of important vulnerabilities will be limited to not more than five.

11.4 Phase 2 methods

The development of future strategies is the second phase of assumption based planning. While the first phase was focused on the analysis of the current situation, the second phase is action oriented with the development of future strategies. Based on the vulnerable assumptions, identified in the first part, future scenarios are developed. Combining the future scenarios and the vulnerable assumptions involves the identification of signposts and development of future strategies. These future strategies are adjustments to existing plans or

preparation actions to minimize the effect of failing assumptions. In the following chapter I will discuss each of the steps in the development of future strategies and elaborate on the goal that is to be achieved.

Future strategy process

Once the important assumptions and vulnerabilities are identified, strategies can be developed to prevent the negation of the assumption. In the development of strategies three activities are used. These are scenario building, signpost identification and strategy development. A violation of the vulnerability is visualized with the development of a scenario. This allows for the creation of an image in which a series of plausible events leads to the violation of the vulnerability and the negation of the assumption. For the previously introduced example of a beach party one could develop a scenario in which the day of the party started off nicely but during the day weather would quickly change and rain could ruin the party.

The identification of signposts focuses on finding indicators that could suggest a failing vulnerability. The appearance of clouds could be required for rain to come, but it does not necessarily mean that it will. It is therefore important to identify signposts that are both clear (if there is rain clouds have arrived) and unambiguous (if there are clouds, there will be rain), though this might be difficult to achieve. Multiple signposts could be used for the identification of a failing vulnerability. Checking the weather forecast could be another signpost.

Future strategies come in two forms. Either they hedge against a failing vulnerability, or they shape the situation that the vulnerability and negated assumption do not affect the goal any more. To shape a beach party in a way that rain does not affect the party, one could organize the party indoors. If there is rain it will prevent nice weather, but does not spoil the party. A hedging strategy based on a sudden shift in weather could be to bring tents to the party. When signposts indicate a change in weather the tents can prevent the weather from spoiling the party.

Scenario development

The development of future scenarios is an activity that supports the development of future strategies in assumption based planning and are exploratory of nature. It is an optional activity that is used for enhancing the vulnerability and impact of the assumptions. Nonetheless, the creation of a future image that differs from the existing image could be used to induce discussion and adaptation of the existing vision. With the goal of developing future strategies a scenario allows for the visualization of weakness of the assumption and is in this respect useful for thinking about strategies to prevent this.

Scenario development shows parallels with the image building of transition management. Both develop future images that allow for planning and organization. The differences lie in the nature of the images. Where transition management images show a preferable situation, scenarios for assumption based planning highlight the weaknesses of the organization. In that way

assumption based planning oriented scenario building complements the image building of transition management.

While scenario development is used as a tool for the development of future strategies, from a reflexivity point it can be seen as a self-confrontational exercise. It shows the impact of events and shows how this affects the progress of the transition.

The starting points for the development of future strategies are the important assumptions and their vulnerabilities identified in the first part. The scenarios challenge the assumptions and create an image that focuses on possible impacts of a challenged assumption. The concepts of challenged assumption and impact on the transition are the key components for the development of scenarios in assumption based planning and should be clear and well understood.

While the scenarios challenge fundamental ideas of the future must not linger into stories that are completely out of this world. The goal of a scenario is to gain a grasp of the possibilities when fundamental ideas are challenged, without being all out fantasy. Therefore it is important to develop the scenarios in an environment that is both plausible and has some historic anchoring. Enhancing the effects of current events might already lead to the failure of certain assumptions.

For a scenario to be useful for the use in assumption based planning it must fulfill both of the aforementioned characteristics. To ensure this, the following aspects are identified as the start of the scenario development process: Challenged assumption, related vulnerability, key event impacting the assumption, and historical event giving the scenario legitimacy. But first and foremost the scenario development should support the identification of signposts and future strategies, and should be developed with this in mind.

Creativity methods

The identification of signposts and the development of future strategies build upon the identified assumptions and developed scenarios. Using a variety of creativity methods the new strategies and adaptations to current plans are devised.

The development of future strategies is largely the process of using the gained knowledge on the assumptions and vulnerabilities and translating that knowledge into actions. The main resource for this translation is the scenario analysis. Combined with creativity methods like brainstorming, mind mapping, and other creative processes (Ogot and Okudan, 2007), future strategies are developed.

The process of using creative strategies is one of divergence and convergence (Hartman, 2016). First a large number of associations that relate to the assumption, vulnerability and scenario are identified. This later converges to a limited number of viable strategies for dealing with the vulnerabilities.

11.5 Phase 2 deliverables

Using the methods described above results in the identification of signposts and the development of future strategies. Figure 11-2 shows the deliverables of the second phase of the case. In the following section I will discuss the deliverables of this part of the research.

Signpost identification

The identification of signposts is a crucial aspect in the effectiveness of future strategies. A proper signpost can signal the moment in which a vulnerable assumption passes a threshold and when a hedging action is to be executed. A signpost that is too broad might trigger when the vulnerable assumption has not been broken, while a signpost too narrow might miss the changing of another part of the assumption entirely. The identification of a signpost focuses on how clear of an indicator the signpost is. A signpost can be called a clear indicator when it is both unambiguous and genuine.

The reflexivity section of transition management describes a continuous feedback loop of reflecting, learning and adapting. The monitoring of progress of the transition is a significant part of this loop. The monitoring of signposts for vulnerabilities does not directly monitor the progress of the transition, but does fit in the transition management approach as a monitor for the environment of which the transition is part.

In a reflexive sense, signposts allow for responsive behavior. They are the trigger for adaptation of the organization and the execution of the plans that have been developed. It is therefore important that the trigger is justified as well as that the response is adequate.

The identification of signposts is a process that revolves around the characteristics of the signpost. Ideally a signpost is both unambiguous and genuine. Genuine in the sense that it does violate the assumption, and unambiguous that it does change the assumption and is not a single outlying event. While an indicator might be completely clear, most likely there will remain some doubt to one or both of the characteristics. This can be solved in two different ways, either by adding a form of judgment to the signpost, or by identifying multiple signposts for a single assumption.

When a signpost is not a completely clear indicator a form of judgment might add to the clarity. By formulating a specific number of occurrences can be considered a violation of the vulnerability a signpost can become more useful. Another option is identifying a number of not completely clear signposts that combined can give a clear indication of the changing assumption. After the signposts are identified they are checked for misrepresentation. To what extent are they vulnerable for deceiving.

Along with the identification of the signposts also a form of monitoring should be established. Creating a scheme in which both the monitoring body and the type of monitoring is mentioned. The entire process of creating a clear indication of the change of the assumption consist of signpost identification and control, and the formulation of the monitoring process.

Future strategies

In order to deal with the vulnerable assumptions an organization has two different types of strategies it can deploy. Which of these is preferred depends on the answer to the following question: Can this organization control the vulnerable assumption? If the organization is able to control the vulnerable assumption, (shaping) actions should be taken to direct the vulnerable assumption in the preferred direction. If the organization cannot control the vulnerable assumption, preparations (hedging) should be taken to deploy when the vulnerable assumption is violated.

Future planning actions are adaptations and preparations to the current operations. Either they add to the current operations, put emphasis on current operations or call for abandoning current operations. This falls within the transition management approach as a recurring learning and adaptation approach.

Future strategies are the responsive part of the assumption based planning approach. They are either responsive to the current operations (shaping), and are implemented directly. Or are responsive to future developments with the preparation of strategies (hedging).

The development of future strategies is a creative process of development of alternative solutions to the weaknesses in which the scenarios are used as resources. In this research the development of future strategies is based on the experience of the researcher. The approach of each of the two types of strategies is discussed below.

The development of future strategies based on assumptions and vulnerabilities has two main weaknesses. The first is related to the scope of the strategies, the second is related to the resource requirement. The scope of the strategies is limited as they only apply to specific situations, this is emphasized in the hedging actions as they require a certain event to occur. In the light of a transition, which are prone to uncertainty this could be a pitfall. Secondly the input required for the development of hedging actions, which may not occur could be burdensome for the organization that is already limited in resources.

When an organization has the opportunity to control the vulnerability of an important assumption it can deploy shaping actions to direct the vulnerability in the desired direction. With this type of actions the organization can prevent the assumption to be violated. This requires the adaptation of existing plans and operations. Either by adding extra activities, or by changing the direction of existing ones.

While shaping actions can prevent a vulnerable assumption to be violated, there is nothing to say that without the shaping actions the vulnerable assumption will be violated. An important emphasis of the development of shaping actions lies in the identification of preparation time and implementation time. To what extent can the violation of the assumption be foreseen and how long does it need for the shaping action to be implemented.

If the vulnerability of the assumption is out of the control of the organization the only option is to prepare for the violation of the assumption. Where shaping actions are success oriented, hedging actions are failure oriented. What actions are needed to be taken when the assumption is violated. To develop hedging actions it is needed to visualize the situation when the assumption is violated. This is done with the developed scenarios. The strategies developed are based on the envisioned situation and focus on the changes to be made within the organization to deal with the changed situation.

When a vulnerable assumption is not violated the hedging action is not executed and the preparations made are wasted. To minimize the efforts spent in preparations hedging actions can only be viably be prepared for a limited number of vulnerable assumptions. The identification of the most important vulnerable assumptions is crucial.

Assumption based planning is a method that combines the analytical identification of vulnerable assumptions with the action oriented development of

future strategies. The various aspects of this process allow for the inclusion of a range of sources, the identification of fundamental risks to the organization and the development of a robust future strategy in which uncertainty is taken into account.

11.6 Conclusions

In this chapter I have discussed the mixed method approach for an assumption based planning experiment in the biobased economy. The approach is separated into two distinct sections, assumption identification and future planning. The combination of the two sections leads to a reflexive approach that could have a position in the transition management toolbox. In the following chapter I will discuss the case conduct.

12 Case conduct

In this chapter the case conduct will be discussed. For each of the methods used in the case the methodology and decision schemes will be discussed. For the methods used in the assumption identification section (first phase) of the case the sources of evidence and their context to transition management will also be elaborated on. The first section of this chapter will discuss the assumption identification process, while the second section will be focused on the scenario- and future strategy development.

12.1 Assumption identification

The assumption identification process consists of three different methods and lead to the identification of the main important assumptions and vulnerabilities related to the development of the biobased economy. In this section the conducts of the three methods will be described and choices made will be explained. First I will discuss the methods and the evidence used in the context of the biobased economy and transition management. I will then proceed with discussing the conducts of the individual methods.

Case evidence

In this case three methods using different sources of evidence have been used. The choices for the combination of sources and evidence have been based on the different levels of transition management and structure of the transition towards a biobased economy. The structure of a transition management approach uses four types of activities of which the reflexive activities are incorporated throughout the other activities. The remaining types of activities (strategic, tactical and operational) are executed in different sections of the organization. The aim of the different methods has been to incorporate each of the types of activities in the research.

The activities on the strategical level consist of outlining a future image of the biobased economy and creating a vision of the transition. These images have been documented in various publications describing the opportunities and challenges for developing a biobased economy in the Netherlands from various perspectives. The creation of these documents has taken place during the early stages of the biobased economy.

Tactical activities relate to the creation of short-term strategies and creation of different transition platforms. These activities have been coordinated from a small governmental body. The main knowledge on the coordination of the tactical activities lies with the people in this body. In depth interviews with several of the staff involved incorporates the experience from the tactical level.

The operational level activities are transition experiments and the grassroots developments. In the biobased economy there is a well-coordinated network of people and companies involved at the operational level. Using an actor workshop is an efficient way of incorporating the experience of a large number of the network actors. Following the identification of the evidence for the case the following sections will describe the conduct of the methods in the assumption identification process.

Archival analysis

The archival analysis uses various future image document related to the development of the biobased economy. In the process of the archival analysis three steps can be identified: Document selection, assumption identification, important assumption selection.

Document selection is a rather subjective process. For the biobased economy there have been several vision documents created of which 'De keten sluiten' (2007) and 'Een punt op de horizon' (2011) have been the most well known in the community. Both have been developed sanctioned by the programmadiirectie biobased economy. To develop an idea of the integration of the biobased economy in the broader organization of the Ministry of Economic Affairs also the 2011 policy agenda has been included in the document list. Although it could be argued that this deviates too much from the biobased economy.

Table 12-1: Archival analysis documents

Title	
De Keten sluiten	BBE 2007
Een punt op de horizon, aanzet voor een intersectoraal Businessplan	BBE 2011
State budget Economic Affairs	EZ 2012
Beleidsagenda Economische zaken	EZ 2012

Assumption identification focuses on both explicit and implicit assumptions in the planning documents. For both of the types of assumptions a list of keywords has been developed to find the assumptions. As the keywords are rather general and possibly not all-inclusive there is a certain extent in which judgment is required. A list of keywords for assumption identification can be found in table 12-2.

The selection of important assumptions requires the experience of the researcher and his assessment of the impact of the assumptions on the development of the transition. When the assumption is determined to have significant impact on the development and has a possible chance of failure within the timeframe of 25-30 years the assumption is listed as an important assumption. Based on the occurrence and emphasis on the assumption in the documents a ranking is made, requiring judgment of the researcher.

Expert interviews

The development of the biobased economy is been ongoing for several years. In order to analyze the progress that has been made biobased experts have been interviewed. These experts are involved in the coordination of the development and from a perspective of a transition management approach are located in the tactical sphere.

Table 12-2: Consulted biobased experts

Biobased experts	
Peter Besseling	Policy advisor research and innovation, BBE
Paul Boeding	Senior advisor biobased economy RVO
Roel Bol	Policy advisor BBE
Edith Engelen	Special envoy green growth, former director BBE
Marten Hamelink	Senior policy advisor green growth and BBE
Irene Mouthaan	Program leader BBE

The expert interviews served multiple goals. As they have been conducted in the early stages of the research they have served as a source of general information on the development of the biobased economy. This resulted in an interview protocol (table 12-3) that both included questions regarding their activities in the biobased economy as well as specific questions regarding assumptions, vulnerabilities and future developments. As the first part of the interviews did not directly has been associated with explicit assumptions this section of the interview has been analyzed using the archival analysis protocol. The second part of the interview generated explicit assumptions and required no further analysis.

The generated assumptions have been grouped and combined and based on the occurrence of the assumptions and emphasis in the interview the assumptions have been rated. This results in a limited number of important assumptions that are of influence in the development of the biobased economy.

Actor workshop

In transition management the activities on the operational level are the most experimental, diverse and unpredictable. New ideas are developed and tested. Gaining access to the experience of this source of evidence generates ideas on the most recent developments in the transition.

The development of the biobased economy has been strongly focused on network formation. The building of a strong network of engaged actors has been one of the main aspects of the early developments. This source of evidence is served using a workshop.

To extract information from the network this thesis proposes the use of an actor workshop. The conduct of the workshop is based on the example from assumption identification in Dewar et al. (1993). In collaboration with two discussion experts the process has been adapted for the use in the biobased economy (figure 12.1). This resulted in a multi round workshop aiming to identify important assumptions concerning the biobased economy.

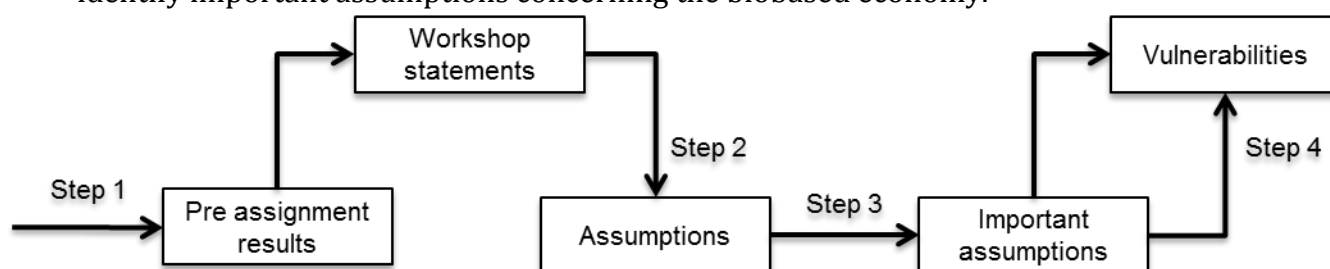


Figure 12-1: Research framework for the identification of important assumptions vulnerabilities

Step 1 of the workshop existed of an open questionnaire that participants had to submit prior to the workshop. This exercise aimed at both engaging the participants for the workshop and identifying statements for use in the workshop. The questionnaire consisted of a single question in which the participants were asked to formulate ten questions given the following statement:

*You have been asleep for the last 30 years. You know nothing about the world at this point. You are asked to guess how the biobased economy has developed over the last 30 years. Before you answer you may ask 10 questions about today's world. Each question must have a yes or no answer, and none can be contingent to a previous question.
What is your list of questions?*

By limiting the number of responses the core issues related to the development of the biobased economy are submitted. Both issues that are important and/or uncertain are most likely to be part of the answers.

Identifying the future

As an exercise prior to the workshop, participants were asked to think about the future of the biobased economy. They had to come up with a list of questions to identify that future with only their current knowledge of the state of the transition. The results of one of the participants looked as follows:

- *Is the chemical industry >40% biobased?*
- *Is the Netherlands an important HUB in the biobased value chain?*
- *Does the Netherlands still have its edge in biobased technology development?*
- *Is biobased policy a European affair?*
- *Is there enough biomass for food, fuel, chemistry?*
- *Is there CO2 pricing?*
- *Does the CO2 pricing work?*
- *Are algae used as large-scale biomass?*
- *Are fossil resources still used on large scale?*

The questions indicate critical or uncertain developments in the biobased economy based on the experience of this participant. Based on the results of the complete exercise the statements used in the workshop have been prepared.

The questionnaire submissions are processed to develop four statements that will be further explored in the workshop. The processing consisted of compression and selection of the original questions. As it involved an open questionnaire comparing the results and identifying similarities requires the judgment of the researcher. Selection of the four topics to be further investigated was based on occurrence and the input from a biobased expert of the programmadirectie BBE to ensure a more objective take. The selected topics were translated into four statements related to the development of the biobased economy.

The workshop consists of three rounds of assumption identification (step 2) followed by a selection of the important assumptions (step 3). The workshop is concluded with the identification of vulnerabilities related to the important assumptions (step 4). The entire workshop is guided by two discussion leaders that control the discussion and maintain pace in the workshop.

Step 2 aims at identifying assumptions related to the workshop statements. This process consists of three rounds in which there is no limitation on the number of identified assumptions. The first round is an individual round of assumption identification in which the participants generate assumptions for one specific statement. In the second round the participants present their assumptions and the results are accumulated. During the final round the participants are allowed to add to the lists of assumptions where they are not limited to their statement in the first round.

Identifying the important assumptions from the accumulated assumptions (step 3) is a two round process. In the first round participants are divided amongst the workshop statements and collaborate to group together the identified assumptions into 3-8 groups of similar assumptions and identify the main assumption of the group. During the second round the participants are individually asked to identify the most important assumption for each of the workshop statements. This results in ranked list of important assumptions.

Based on the important assumptions step 4 consists of the same procedure as step 2 where in step 4 vulnerabilities are identified. Afterwards the list of vulnerabilities is expanded by the researcher for several of the other assumptions identified.

12.2 Future planning

The future planning section of assumption based planning aims at developing both hedging and shaping actions to mitigate the risk associated with the important assumptions identified in the previous section. From the previous section four assumptions and a related vulnerability have been identified to be used in this part of the case (table 13-2). In this section I will discuss the use of the identified assumptions for future planning and the execution of the future planning exercises.

Sources

The input for the development of future strategies are the identified assumptions and vulnerabilities in the first part of the case. Four main assumptions and a related vulnerability are used as reference in all of the exercises employed in this phase of the research. They are at the core of the scenario development, the vulnerabilities are the target for the signposts, and for both the hedging and shaping actions the mitigation of the vulnerabilities and reaction to failed assumptions are the goals of the actions.

Scenario development

The process of scenario development is a three round process that is based on a vulnerability challenging an assumption. In three rounds the scenario pattern is build followed by a translation into a compelling image in which an assumption fails.

In the first round of the scenario development the challenged assumptions and associated vulnerabilities are selected. As the identified vulnerable assumptions had mutual relations a combination of the assumption has been made resulting in two scenarios. Each scenario challenges two assumptions and its related vulnerability. In the second round the key event that allows for the challenging of the scenario is generated and selected. The selection of the key event takes into account plausibility and timeframe of 30 years. The final round

of the scenario building generates the forces exerted on the event and relates those to current and/or historic events to provide for a coherent image. After the third round the scenario exists of a framework of challenged assumptions, a key event and a pattern in which the scenario unfolds.

Based on the scenario framework a complete image is generated in which the events are described in a compelling way, which results in a complete story of the scenario. The story allows for envisioning a possible failure of an important assumption. In the future strategy development the scenarios can be used for the identification of signposts and development of hedging actions.

Identifying signposts

Signposts aim at signaling the changes of vulnerability and monitor a defined threshold value that signals the failing of the related assumption. The identification process aims at finding signposts that do indeed signal that change and develop a monitoring concept and associated threshold values. This process is a multi-round process that uses both creativity methods and the input from the scenarios.

The first round consisted of a divergent process of generating possible signposts for the related vulnerability. This process is about finding ideas related to the vulnerability. The process of generating possible signposts focused both on signposts within the transition, as well as international developments. Based on the important assumptions this had a focus on European developments. The second round is convergent in which the most genuine and unambiguous signposts for the specific vulnerability are identified. While this can result in a single signpost, in this case it resulted in a list of signposts that collectively allows for the monitoring of the vulnerability.

The final round of signpost identification is the development of a monitoring concept and threshold values. The monitoring concepts need to take into account the resources of the organization and effectiveness of the selected method. The determination of the threshold value relates to the deployment time needed for the hedging action.

Developing future strategies

Assumption based planning strategies either shape the vulnerability for prevention, or hedge against the failure of an assumption. For some assumptions both strategies could be developed, for other assumptions only one of the two strategies can be employed. Once a strategy is chosen a set of actions can be developed using creativity methods and input from the generated scenarios.

The process of developing future strategies for the biobased economy followed the approach described in chapter 11.5. For each of the assumptions it is determined whether it would be served with a hedging or shaping action (or both) and using several diverging and converging rounds new strategies have been developed.

While the identification of future strategies aimed at developing strategies suited for use in the biobased economy a rigorous control of practicality and related consequences of the strategies has not been conducted. Due to the exploratory nature of this research the conduct has been limited to an initial development of future strategies.

12.3 Conclusions

In this chapter I have discussed the selected resources for the case. I have described the conduct of the methods both for the assumption identification as for the future planning section of the assumption based planning approach and discussed remarks concerning the specificities related to the biobased economy. In the following chapter I will present the results of the case which will be discussed in the chapter following.

13 Case results

For the multi method analysis part of this thesis the approach of assumption based planning has operationalized and applied to the transition towards the biobased economy. In the chapter ahead I will discuss the main findings of this exercise. As the goal of the research is to explore the use of the assumption based planning method in a transition environment the results are aimed more towards the methodological use of assumption based planning rather than the actual outcomes of the exercises.

Comparable with the method of assumption based planning the results are presented in two separate sections. First the analytical part of the exercise in which the vulnerable assumptions are identified, and second the action oriented part where future strategies are developed. The results show the potential of the vulnerable assumption identification process as a method that includes a wide range of sources and generator of new insights. They also suggest that there is a limited use for the development of future strategies in a transition environment. This will be elaborated on more in depth in the discussion chapter of this section.

The first section of this chapter will present the deliverables from the assumption identification process of assumption based planning. The second section of this chapter will present the results that build upon the main important assumptions and include the scenarios, signposts and future strategies.

13.1 Assumption identification

The first part of the case consists of assumption identification. This section presents the deliverables of this process, the important assumptions identified and the main vulnerabilities associated with those assumptions. First I will present the main findings related to the identified important assumptions and conclude with the main important assumptions and the related vulnerabilities.

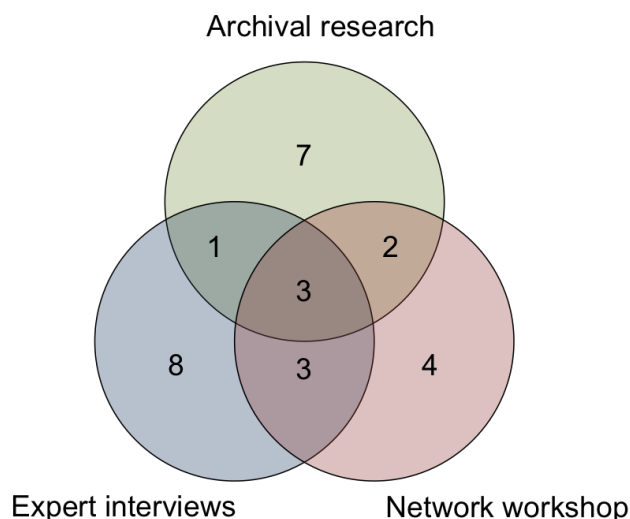


Figure 13-1: comparison of important assumptions between methods

The identification of important assumptions and related vulnerabilities comprised of multiple steps and using three sources of evidence. For each of the sources of evidence assumptions were identified and selected for their

importance, the impact and likelihood to occur within the next decades. This resulted in a list of 40 important assumptions over the three sources of evidence.

Comparison of the assumptions between the sources of evidence identified comparable assumptions. Figure 13-1 shows the spread of the important assumptions. Each of the three sources of evidence generated unique assumptions that have not emerged from the other activities as important assumptions. Three assumptions have been identified in all three of the activities. The majority of the assumptions identified in the network workshop are comparable to the assumptions identified in the other activities.

Important assumptions

Table 13-1 shows a comprehensive list of all the important assumptions identified. The assumptions presented in table 13-1 have been identified as important assumptions. Within the group of important assumptions several subjects can be connected to multiple assumptions. The notions of innovation, carbon emissions and international policy setting return in multiple assumptions.

The Dutch economic policy has a strong focus on innovation. For the development of a biobased economy in the Netherlands assumptions related to the innovation power of the Dutch economy are based on past experience and the current knowledge position of the Netherlands. While the current innovation policy is focused on a small group of potentially strong economic sectors the assumption of innovation bringing results is difficult to predict.

In the development of a sustainable economy the incumbent regime has the advantage of decades of technological development, economies of scale and unpriced carbon emissions. The idea of pricing and capping carbon emissions is seen as a crucial aspect for sustainable solutions to be economically viable. The prospect of such a system is there but the stakes for incumbents are high and their influence on politics is large. Assumptions related to the successful development of an emission system have been identified in multiple forms.

The focus of stimulating a biobased economy is national. On the other hand it is clear that investments in technology development and construction of industries are made on an international level. For the successful development of a biobased economy in the Netherlands it is largely dependent on international policy development. Plans and activities on a national scale are based on assumptions related to the international development of biobased policy.

A fourth subject that has shown in multiple assumptions are the use of resources. The biobased economy uses renewable resources, the type of renewable resources and the position regarding the resources is different in the three sources of evidence. The potential and requirement for aquatic biomass is well discussed in the workshop, while it hasn't been mentioned in the expert interviews and did not surface in the archival research.

Main assumptions and vulnerabilities

From the identified important assumptions four assumption have been selected as the main assumptions for the development of the biobased economy. For these four assumptions vulnerabilities have been identified. Table 14-2 shows the main important assumptions and the main vulnerabilities associated with these assumptions.

Table 13-1: Identified important assumptions (Evidence: 1-archival research, 2-expert interviews, 3-network)

Assumption		Evidence
Innovation is crucial	Innovation is critical for the dutch economy to be competitive in the world market	1
Focus on 8 topsectoren	The Netherlands only has the capacity and resources to invest in a limited number of economic sectors in order to become/remain leading in that specific sector	1
Biomass HUB	The Netherlands has the knowledge and infrastructure to become an important HUB for biomass, strengthening its position in the biobased economy	1,2,3
Economic opportunities	The development of the biobased economy towards a more sustainable future offers opportunities for the Dutch economy	1
Replacement of petrochemistry	The biosector will become a bigger factor in the economy compared to the petro chemical sector	1
Competing market	Advancements and economy of scale will allow the biobased economy to be able to compete with the fossil industry on price	2,3
European policy	Energy- and biotechnology sectors require an European policy approach	2,3
European sustainable policies	Policies related to sustainability will only be impactfull if related on a European or international level	1,2
Deregulation of agricultural sector	Deregulation of the agricultural sector will offer opportunities for the biobased economy	2
Economic development regions	There will be an increased influence of (cross border) economic development regions on policy setting	2
Bottom-up development	The focus for governmental policy setting will focus on the bottom-up development	2
Local initiatives	Local initiatives will become more impactfull than governmental coordinated projects	2
Focus on accountability	Government will increasingly focus on accountability leaving less room for experimentation and adaptation	2
Continuing transition	The developments of the biobased economy will continue regardless of governmental stimulation	2
Intrinsic driver	The Dutch economy has a strong intrinsic driver for the development of a biobased economy	3
Unpredictable consequences	The increase of CO2 in the atmosphere causes unpredictable climate change and leads to destabilization of ecosystems	1
Level playing field	Regulation of CO2 is an important step in the creation of level playing field with regard to the fossil industry	1,2
Emission regulation	Regulation of emissions will offer a boost and opportunities to the development of the biobased economy and sustainability in general	1,2,3
European CO2 system	CO2 policy will be arranged on a European level	2
Innovation policy	Despite the development of a CO2 system, a innovation policy oriented system will remain necessary for the development of a more sustainable economy	3
Energy reliability	Energy reliability is a crucial aspect to the succes of an economy	1
Energy dependency	Due to its dependency on external energy sources the Netherlands is vulnerable for geo political behavior	1
Resource efficiency	The efficient use of resources will be an important aspect for competitive sustainable economies	1,3
Biomass availability	There will be enough biomass available for the energy, biobased and food applications	1,3
Bulk sugar	Deregulation of the agricultural sector will provide large quantities of affordable sugar to the biobased economy, offering new opportunities	2
Resource scarcity	Increasing resources scarcity will persuade governments to intervene in the marketprocesses	3
Aquatic biomass	For the development of a sustainable biobased future development of the aquatic biomass is crucial	3

Based on the importance of the assumption, the ordering of the assumptions during the workshop and the emphasis on the assumptions in expert interviews and archival research resulted in four main important assumptions for the development of the biobased economy.

Table 13-2: Identified main important assumptions

Main important assumption	Vulnerabilities
The Netherlands will develop into a <i>biomass HUB</i> for European biomass transfer	Availability of free trade, does the scarcity of natural resources force governments to inhibit the international trade Open European borders, external forces force nation states to enforce permanent border controls inhibiting central HUB function
Biobased policy will develop <i>on a European level</i>	Socio-economic stability in Europe, increasing nationalistic governments create a disfunctioning European Union inhibiting the development of coherent policy Willingness to transfer the policy authority, lack of authority on economic issues prevents Europe to regulate and enforce sustainable policies
A <i>European CO2 market</i> will increase the level playing field	Implementation of ineffective policies, due to difficult negotiations and nationalistic interests created policy is ineffective No European collaboration, lack of international collaboration prevents policies to be implemented Influence of incumbents on the policy process, the influence of lobbying by incumbent firms prevents the development of policy
There will be <i>enough biomass available</i> for food, energy and biobased economy applications	Availability of fertile lands, degradation of land and bad management of the arable lands decrease the availability of farmlands Protectionism of biomass, increased use of biomass leads to resource scarcity increasing the availability and prices on the international market Climate change, effects of climate change puts pressure on regular harvest and causes stocks to fluctuate making availability of biomass insecure

Main assumption identification

The results of the actor workshop, archival research and expert interviews resulted in a comprehensive list of important assumptions (table 13-3). Sorted along the identified themes the list of resource related assumptions consisted of: Energy reliability, Energy dependency, Resource efficiency, Biomass availability, Bulk sugar, Resource scarcity, Aquatic biomass. While the identification of multiple of these assumptions might justify adaptations in current operations, this research focused on identifying a single assumption as most critical.

Using occurrence in the different research, scoring in the workshop and the criteria for a critical assumption a single assumption has been identified as a main assumption. For the resources related assumptions the biomass availability is identified through archival analysis and in the actor workshop where it resonated as a major influencing assumption. Furthermore the discussion of use and availability of biomass could have a significant impact on the development of the biobased economy when biomass is increasingly used for industrial uses.

Based on the results of the three research activities and assumption criteria the availability of biomass has been identified as one of the main assumptions that are of critical importance for the development of the biobased economy.

The vulnerabilities shown in table 13-2 are the result of the vulnerabilities identified in the workshop, expert interviews and archival research, supplemented with discussions with individual participants of the workshop. Compared with the assumptions the vulnerabilities have been identified in the context of the discussion.

This section of the research has identified four main important assumptions related to the development of the biobased economy. For each of the four assumptions the main vulnerabilities have been identified. In the following section these assumptions serve as a basis for the development of scenarios, identification of signposts and development of future strategies.

13.2 Future strategies

The development of future strategies builds upon the identified vulnerable assumptions and related vulnerabilities in the first section of the milt method approach. Based on the four main vulnerable assumptions two scenarios have been created that each allow for two assumptions to be challenged. The vulnerable assumptions allowed for the combination of them one scenario, if the assumptions where to wide spread four different scenarios needed to be developed making it a long process. The resulting scenarios where used for the development of future strategies.

The development of future strategies consists of developing hedging or shaping actions to allow for mitigation or preparation of a failed assumption, and the identification of signpost monitoring the development of the vulnerable assumption. Based on the identified vulnerable assumptions and the scenarios challenging the assumptions hedging and shaping actions are developed and accompanying signposts are identified. The resulting strategies are adaptations and additions to current activities that allow for a more robust future regardless of unknown developments in the future.

Scenarios

Scenarios have been developed based on the four assumptions. For each of the assumptions a single vulnerability has been selected to be challenged. As the assumptions could be connected two scenarios have been developed each challenging two assumptions.

Table 13-3: Scenario analysis outline

Scenario analysis 1	
Timeframe (years)	25-30
Main assumption that is challenged	Biobased policy will develop on a European level
Vulnerability	Socio-economic instability
Sub assumption being challenged	The Netherlands will develop into a biomass HUB for European biomass transfer
Vulnerability	Availability of free trade
Key event	collapse of the european free market
External forces	geopolitical changes drive more fugitives to europe
Internal forces	members of nation states increasingly see the european institutions as a undemocratic and undesired part
Historic anchoring	uprise of anti eu parties, increasing fugitive problem, seperation between eastern and western europe installment of border controls
Scenario pattern	external forces creates european problems that require difficult choices, increasing the support for the internal forces of anti eu parties. The exit of the first nation state creates a domino effect and an increasingly nationalistic behavior The European economic block is disbanded and free trade will only occur due to bilateral agreements. It is increasingly difficult for the rest of the world to trade with the European block. The Dutch position as port to Europe is no longer
Scenario analysis 2	
Timeframe (years)	25-30
Main assumption that is challenged	A European CO2 market will increase the level playing field
Vulnerability	Lobbying of incumbent fossil industry
Sub assumption being challenged	There will be enough biomass available for food, energy and biobased economy applications
Vulnerability	Effects of climate change
Key event	Failure of a CO2 market mechanism
External forces	Decreasing CO2 regulation in other markets
Internal forces	Input of anti CO2 regulatory industry Increasing nationalistic governments protecting existing industry
Historic anchoring	The existing policy process in the European Union is opaque and not accesible to the public The current CO2 mechanism allows for low carbon prices and no incentive for behavioral change
Scenario pattern	There will be an acknowledgement that the current system is not functioning as expected. Adjustments to the regulatory framework are held up by the influence of incumbent firms, both on the policy process as on national leaders threatening to abandon local production facilities. In the long run there not be a functioning carbon system while incumbent firms do obide to carbon regulations

Table 13-3 shows the outline of the two scenarios. Each of the scenarios had a main and secondary assumption to be challenged, based on the context of the scenario. Related to the assumptions, both scenarios have a strong international character.

Table 13-4: Signposts and future strategies

Vulnerability	Signpost (SP), Shaping (SH), Hedging (H) action
<i>The Netherlands will develop a biomass HUB for European biomass transfer</i>	
Availability of free trade, does the scarcity of natural resources force governments to inhibit international trade	SP: Fluctuation in biomass/resource prices H: Limit the dependency on geopolitically unstable resources
Open European borders, external forces force nation states to enforce permanent border controls inhibiting central HUB function	SP: Number of European border controls SP: Average transport times on certain predetermined trajectories SH: Stress the importance of a European market H: Create preliminary arrangements on border controls with neighbouring states
<i>Biobased policy will develop on a European level</i>	
Socio-economic stability in Europe, increasing nationalistic governments create a disfunctioning European Union inhibiting the development of coherent policy	SP: Number of EU-related referenda SP: Number of nationalistic seats in national parliaments H: Prepare preliminary bilateral biobased policy agreements
Willingness to transfer policy authority, lack of authority on (sustainable) economic issues prevents Europe to regulate and enforce sustainable policies	
<i>A European CO2 market will increase the level playing field</i>	
Implementation of ineffective policies, due to difficult negotiations and nationalistic interests created policy is ineffective	
No European collaboration, lack of international collaboration prevents policies to be implemented	
Influence of incumbents on the policy process, the influence of lobbying by incumbent firms prevents the development of policy	SP: Number of fossil related lobbyists SP: Money spend on fossil lobbying SH: Generate awareness of lobbying influence SH: Push for transparency regulations
<i>There will be enough biomass available for food, energy and biobased economy applications</i>	
Availability of fertile lands, degradation of land and bad management of the arable lands decrease the availability of farmlands	
Protectionism of biomass, increased use of biomass leads to resource scarcity increasing the availability and prices on the international market	
Climate change, effects of climate change puts pressure on regular harvest and causes stocks to fluctuate making availability of biomass insecure	SP: Climate science literature SP: Amount of extreme regions in the world SH: Stimulate in climate agreements and enforcements H: Increase spending in GM crops H: Identify processes dependent on endangered crops

Signposts and future strategies

Identification of signposts and the development of future strategies followed from the scenarios and the use of creative method thought processes. The process of identifying signposts and developing future strategies resulted in signposts, hedging and shaping actions for each of the main assumptions and associated vulnerabilities. These are presented in table 13-5.

The process of developing future strategies not always resulted in both shaping and hedging actions. In some cases the (lack of) influence of the organization on the vulnerability prevented development of viable shaping strategies. The development on nationalism in the political sphere of European

nation states cannot be influenced. For these vulnerabilities hedging the risk of maturation of the vulnerability is the only viable option.

Adjusting the biobased strategy

One of the key components that have been identified for a successful development of a biobased economy the creation of a CO2 market. The results of a CO2 market will increase the level playing field for sustainable companies compared with their fossil based counterparts. The creation of such a market is taking place in a European perspective. An important vulnerability in the development of a CO2 market is the influence of incumbent industries on the policy process.

In the light of increasingly more nationalistic behavior of nation states it is likely that the influence of large (job creating) industries weighs in more than their smaller developing counterparts. Using the future strategy approach a shaping strategy is developed to lower the influence of lobbying.

While it is difficult and possibly unwanted to prevent lobbying, making the lobbying more explicit could force more sustainable policy. With consumers becoming increasingly more aware of the environment and sustainability, providing them with information regarding the policy process allows them to make decisions regarding these subjects.

A more open lobbying process could also lead to changes from the perspective of the incumbent firms. I might defer incumbent firms from influencing the policy process as it could affect their image with the customers.

Having identified the influence of incumbent firms on the European policy process as a vulnerability in the successful development of a biobased economy, it would be beneficial for the programmadirectie BBE to stimulate lobbying awareness nationally and push for a more open lobbying process on a European level.

Many of the shaping actions address the focus of the organization. They point toward focal points that could alter the current state and prevent the occurrence of the vulnerability. The influence of the incumbents on the policy process is difficult to prevent, but focusing on their influence and raising awareness of their influence could lead to more substantiated policy development.

This chapter has showed both aspects of the assumption based planning approach in an exemplifying case. Both the assumptions and vulnerabilities were identified, and future strategies have been developed. The last section of the results builds upon the identified assumptions in the first section. Scenarios were developed and used for identification of signposts and future strategies. The context of these results and the use of assumption based planning in transition management will be elaborated on in the discussion of this thesis.

14 Case discussion

The application of assumption based planning in the environment of the biobased economy has been an exploratory case. In this discussion I will highlight and elaborate on findings that are specific for this case. Chapter 16 is a discussion from a more generalized perspective and will elaborate on the findings in the context of transition management.

The aspects of the case that I would like to discuss in this chapter are the selection process of the important assumptions. This process is based on the occurrence of the assumptions, which could prove to be biased towards global assumptions while specific assumptions could be of great importance as well. The second remark I will make concerns the execution of the case and the lack of participant feedback due to changing scope of the research after completion of the practical research.

Important assumptions

In the first phase of the exemplifying case of the biobased economy four assumptions have been identified as main important assumptions. These four assumptions are different in the subjects they address, but have a common denominator in the focus on the international setting of the biobased economy. This is in contrast to the focus of the program and activities of the biobased economy, which is mainly focused on the development of the biobased economy in the Netherlands.

It is clear that the international context is important in the development of the bioased economy. In a policy perspective this is related to the maintenance of a competitive environment compared to neighboring countries. From a business perspective the European market is more important than the Dutch market. The efforts of the Dutch government of stimulating the development of the biobased economy are focused on national developments.

During the analysis of all three sources of evidence the international context showed up. This might be the case due to the impact that the international setting has on the whole. While on an individual basis these concerns might be small, a large number of small concerns are more evident than the more impactful individual assumptions on the development of the biobased economy. This especially could be the case in broad concepts of sustainable transitions as the individual assumptions of actors could be very diverse, and therefore not be noticed in the amount of initial results.

More research would be necessary to determine the effects of the funneling of the results throughout the process. However I can imagine that a form of weighing of the assumptions from the start in both the workshop and the expert interviews could be a way of increasing the emergence of individual assumptions.

Case execution

The goal of the case has been to explore the application of assumption based planning in a transition environment. Where the results of the case suggest that assumption based planning could have its use as a reflexive tool, the

execution of the case itself should also be considered. Here I will discuss the case execution with a focus on the workshop section, as it has been the most experimental part of the case.

The protocols for the archival analysis and expert interviews have shown to result in a sufficient number of assumptions. While it is impossible to check for a conclusive amount, I am confident that both the selection of sources and execution of the methods gives way for good results. Reviewing the expert interviews using the archival analysis protocol did result in several implicit assumptions, but those have generally been of the less important assumptions.

The most experimental section of the case has been the workshop. The development of the methodology based on the description in Dewar et al. (1993) resulted in sufficient numbers of assumptions and vulnerabilities. The process consisted of two main parts. First there was an individual pre assignment, and secondly there has been an interactive workshop.

While a participants review would add to the research on the experience of the workshop, a changing scope of research did forgo the opportunity to execute such a review. The focus of this research on the application of the assumption based planning approach has been added following the execution of the workshop and internship of the researcher. As such it has not been possible to execute a review process of the workshop.

In this chapter I have discussed two aspects that are case specific but do have an influence on the research for the general application of assumption based planning in a transition management environment. In the next part of this thesis I will discuss the impact of assumption based planning in a transition management environment and conclude this thesis.

Conclusion

In this final section of this thesis I will summarize my findings and reflect on the results. In the first chapter of this section I will summarize the arguments given in this thesis to formulate my conclusion. The second chapter consists of the discussion of the results. The third chapter contains the conclusion of the thesis and in this chapter I will present an answer to the research questions as stated in the introduction. In the final chapter of this thesis I will reflect on the research and provide suggestions for further research.

15 Argumentative summary

In this thesis I have explored the use of assumption based planning as a tool in the transition management approach. This chapter starts with the recapitulates the main findings of both the literature review and the multi method analysis within the biobased economy.

15.1 Literature review

The literature review served two main purposes, first for the review of existing literature on transition management, reflexivity and assumption based planning. And second it aimed at establishing the hypothesized interfaces between reflexivity and transition management on one hand and assumption based planning on the other. The literature review shows that there is reason to believe there are interfaces between the methods and that there is potential for assumption based planning in the transition management framework.

Reflexive transition management

While the identification of interfaces between transition management, reflexivity and assumption based planning has been the focus of the literature review, analysis on the reflexive orientation within transition management highlights the need for research on this topic. Where on a theoretical level the emphasis on evaluation and learning is strong (chapter 5), the (lack of) implementation and execution of this process is identified as problematic to the success of the approach (chapter 2). The ill translation from theory to practice is mainly dedicated to political and cultural reasons in government, but I would suggest that the transition management as a method is also not without fault.

The approach of transition management as a prescribed method is most extensively elaborated by Loorbach (2007). And though there is an emphasis on the aspect of evaluation and learning, the description differs from the other aspects of transition management. The ideas of problem structuring, arena creation and actor mobilization introduce new concepts and approaches that are an integral part of the transition management approach. But the reflexive section of evaluation and learning points only to areas of interest and possible types of activities. This loose integration of the evaluation process makes it not a crucial aspect of the functioning of the transition management approach, while crucial to its success.

Reflexiveness of future planning

Comparison of the properties of assumption based planning (chapter 8) with the objectives of reflexivity (chapter 6) suggest that assumption based planning can be used as a reflexive exercise. The combination of vulnerability identification and future planning expresses the characteristics associated with reflexivity. Where the first part of assumption based planning is focused on reflection and learning, the second aims at adaptation and responsive. Though the combination of the two sections includes all the characteristics of reflexivity, the vulnerable assumption identification process by itself ticks most of the boxes.

In a broader perspective one can view the objectives and approach of future planning in general. As analyzed in chapter 7, they can be seen as reflexive of nature.

Assumption based planning and transition management

Transition management is applied in multi actor environments in which the government aims at stimulating a certain (sustainable) transition. While this is radically different than the original design of assumption based planning, used for a single hierarchical organization, paragraphs 9.2 & 9.3 show that there are arguments for the use of assumption based planning in a transition management setting.

The two phases in assumption based planning of identification of vulnerable assumptions and the development of adaptive strategies allows for application in a multi actor environment. Especially the desired approach of transition management with central coordination and a bottom up action approach. Assumption based planning allows for using this broad network as a source in the vulnerability identification process and the central coordination for the development of adaptive strategies. Involving the network in the adaptation of existing plans allows for gradual changes in the plans and support from the base.

Besides the organizational interfaces that exist between the assumption based planning and transition management there might be political arguments for using assumption based planning. In the problem description the possible mismatch between the political arena and transition arena have been described. Though not directly part of the research question the approach of transition management appears to offer a contribution to solving that issue. The adaptation of plans rather than redesigning them could fall within the existing borders of authority supplied with the original plans. While the change in nuances could help overcome the changing cycles of the political arena.

15.2 Case study

The second section of this thesis consisted of a case study of assumption based planning on the transition towards a biobased economy. In the multi method approach I explored the effectiveness of the assumption based planning approach at identifying the weaknesses in the development of the biobased economy and the development of future strategies. The results of this analysis will be discussed based on the design of the approach, the identification process of vulnerable assumptions and the development of future strategies.

Adaptive design

The framework of assumption based planning allows for adaptation in the methods used in the research. Especially in the identification of vulnerable assumptions there a flexible approach can be taken depending on the research environment. The future planning section of assumption based planning is more rigid in the methodologies as there is a strong connection between the methods.

In the methodology chapter (12) the translation from research framework to methodology is made using the interfaces identified in chapter 9. In the process of vulnerable assumption identification both the existing plans, experts and existing network can be utilized. The approach of three distinct methods is well suited for the use in the biobased economy and there is no reason to believe

that this design will not be a suitable starting point for the use in other transition management experiments. The structures and activities of the biobased economy are similar to other transition management projects.

The future planning framework is based around two types of adaptive activities, pro-active (shaping) or reactive (hedging). These are supplemented with the identification of signposts. The process of developing strategies is further supported with the creation of scenarios that highlight the identified vulnerabilities.

Identification of vulnerable assumptions

The process of identification of vulnerable assumptions (chapter 13.1) resulted in the identification of four main vulnerable assumptions. While this is in range with the intended number of main assumptions to be identified, several unforeseen results showed up during the execution of approach. The unforeseen results, and the possible extend of their influence on the results will be discussed after some brief remarks on the main findings.

The design of the workshop, in which a preparatory exercise introduced the workshop, allowed for the acquiring of results in an efficient and timely manner. First the pre assignment allowed for selection of the results and a more focused session on topics that are important for the participants. Secondly it allowed for participants to become familiar with the design of the workshop which increased the effectiveness of the workshop itself. Whether or not there is a cultural aspect at hand, as Dutch people are usually rather direct and straight forward, has not been part of the analysis but might have had a positive influence on the resulting workshop.

The main findings during the identification of vulnerable assumptions are in line with the intended goal of the research. The findings throughout the three methods showed similar results (table 13-2, 13-4 & 13-7) and it where those similarities that were among the highlighted in the workshop as important assumptions (table 13-7 & 13-9).

During the process of identifying the vulnerable assumptions data had to be compressed and summarized for use in further steps of the analysis. During the pre-assignment of the workshop four main themes naturally emerged out from the results. Applying the themes on the results from the expert interviews and archival research allowed for comparison amongst the various methods. While unintentional this method of selecting and sorting the results worked remarkably well.

In general the identification of vulnerable assumption worked out well, the main findings correspond give other insights but do not bring forward radically new weaknesses. The combination of multiple methods allows for comparison and gives an idea of the progress of the transition. Finally this approach is easily applicable for practical execution, is easily incorporated into the transition environment and can be used in larger groups of workshop participants.

Scenario development and future planning

The process of scenario development and future planning has been separated into the development of scenarios, signpost identification and development of future strategies. All activities are designed to aid the development of future strategies for specific important assumptions. The

specificity of this part of the assumption based planning approach requires further research.

The use of scenario developing in the context of assumption based planning is used for aiding the process of future planning. The images generated in the scenarios reflect a possible future in which a limited number of assumptions fail. The scenario shows the possible consequences and changes that could occur. The process of developing hedging actions could benefit from the scenario development.

The future planning process of identifying signposts and developing hedging and/or shaping actions focuses on individual assumptions and a related vulnerability. The specificity of this approach requires careful judgment on the selection of assumptions before dedication of resources. With more system oriented assumptions, as in the case study, future planning could add to the process of creating a more robust future. Taking into account the discussion on the selection of important assumptions and the possible bias towards more system global assumptions, while underestimating the other important assumptions, the efficient application of future planning requires further research.

Assumption based planning and transition management

The goal of the multi method analysis was to explore the application of the assumption based planning in a practical situation. The results of this research show that the process of identifying vulnerable assumptions can be easily adapted for use in the biobased economy and suggest that this is the case for other transitions as well. On the other hand the use of these findings in scenario development and future strategies is an aspect that does not easily translates to the situation of the biobased economy. The results of the future planning indicate that this will be the case for general complex systems as transitions.

The limitations that exist in the future planning part of assumption based planning currently make it not viable for practical use. Only using the assumption identification part in transition management could however add to the process of reflection and learning but will not include the adaptive part as identified as a reflexive characteristics. In that sense only using the first section of assumption based planning cannot be considered a reflexive exercise. Though in the broader idea of a recurrent learning and adapting process it could be considered useful in the transition management approach.

16 Discussion

In this thesis I have investigated the application of assumption based planning as a reflexive exercise in the context of transition management. In the previous chapter I have recapitulated on the results of this thesis. In this chapter I will discuss several other issues that are related to this research and came up during the execution of this thesis, and that are of interest in the further development of transition research.

This chapter discusses three topics related to transition management and assumption based planning. In the first section of this chapter I will discuss the concept of reflexivity in transition management. Here I will discuss my ideas on reflexivity in transition management and the impact on transition management experiments. Section two discusses the application of assumption identification on the in a transition environment. The final section of this chapter discusses the application of future planning and scenario analysis within a transition context.

16.1 Transition management and reflexivity

Reflexive behavior is a core concept of transition management. In the literature review of this thesis I have identified the impact of (the lack of) reflexivity on the transition management approach. Furthermore I have proposed the use of assumption based planning as a methodology for inducing reflexive behavior in transition management. In this discussion I will discuss my ideas on the concept of reflexivity in the framework of transition management

Transition management consists of four core activities. Of those four activities reflexivity differs, as it is more process oriented and is implemented throughout the other activities. In chapter five and six I have discussed the concept of reflexivity and its context in transition management. Where the concepts of strategical, tactical and operational activities are well formulated and discussed in the transition management literature. Reflexivity is a concept incorporated within each of the activities, without explicitly being formulated.

Without the explicit formulation of reflexive activities the notion of learning and adjusting can be easily overlooked in the application of transition management. This is supported in the findings on vulnerabilities in transition management. Transition experiments have showed that the strategical, tactical and operational activities are well executed, but reflexive actions are easily overlooked.

The adjustment of plans is also interesting in the context of the governmental institutions. Governmental institutions increasingly deal with accountability of expenses. This is associated with an increasingly strict formulation of targets and activities. In the context of transition management this leaves ample room for adjustment or early stoppage of unsuccessful experiments.

Transition management would benefit from developing the concept of reflexivity in a more explicit way. By creating examples of reflexive structures and activities this could be more easily translated into the transition management experiments.

16.2 Assumption identification

The conclusions of this thesis are based on literature research and an exemplifying case. This thesis analysis the application of assumption based planning in the context of transition management. Here I will discuss results of the exemplifying case in the context of the application in the transition environment in general. In this section I will discuss the process of assumption identification in a transition management context.

The assumption identification section of the assumption based planning approach appears to add value to the reflection activities for the development of a transition. The analysis in chapter 9 suggests that this process is well suited for the application in a transition environment, and also the case offers ample evidence for a successful identification of the vulnerable assumptions. Here I will highlight three aspects of the assumption identification process. The first aspect is related to the deployment of evidence in the assumption identification process. The second aspect concerns the aggregation of the evidence in which the case shows results that need further research. The final remark concerning the assumption identification process is related to the results that are generated and the use of them in a transition environment.

Application of assumption identification

Assumption based planning is very successful in the deployment of the available evidence. Based on the literature and requirement analysis I have concluded that the process of assumption identification is well suited for the deployment of the main evidence available in a transition management approach. Vision and network development are key aspects in the transition management approach, as is the coordination of the transition using a small flexible (government) body. For reflection purposes it is crucial that these sources of evidence are deployed in the analysis.

The assumption based planning approach offers the opportunity of using various sources of evidence and allows for the aggregation of these sources using the identified assumptions. The results of the case suggest that the use of different methods for the various sources of evidence does not hamper the aggregation of these results. Based on the literature and requirement analysis I would conclude that assumption identification is well matched with the structure of the transition management approach. The results from the case suggest equally.

Assumption aggregation

The second aspect of the assumption identification process that I will discuss, is the combination of the results of the three methods into a selection of main important assumptions. This process combines the results of the individual methods and identifies similar results that are identified as important assumptions. While this might be the most sound approach of selecting the most important assumptions, I would like to critique this approach in the context of the development of the transition.

In the exemplifying case three sources of evidence have been analyzed. These sources are selected to form a complete image on the development of the biobased transition. The context of transition management structures is

incorporated by using evidence from all three levels of activities. Also the development of the transition in time is covered.

While similar results in the three methods identify assumptions that have been important throughout the transition, assumptions that are only identified in the most recent sources of evidence could suggest the emergence of new and unforeseen weaknesses in the development of the biobased economy. By making the decision to identify similar results as the most important assumptions this could eliminate important changes in the transition to be overlooked. Results from the expert interviews regarding sugar production or the importance of aquatic biomass identified in the workshop might be important developments that have not been emphasized in the early plans.

Changes in the selection of the most important assumptions might have led to the identification of other assumptions as most important. Consequently this would have had its effect on the development of future strategies. During a process of reflection the (ranked) result of all of the identified important assumptions might be more effective for the learning process than a limited number of most important ones.

Results of assumption identification

The results of the assumption identification process consists of a list of assumptions and related vulnerabilities that are of importance for the development of the organization. These results are further used in the assumption based planning approach for the development of future strategies. The results itself however might also be useful in the context of a transition as indicators for vulnerabilities.

The usefulness of the results of the assumption identification process can be seen in relation to the differences in organization between the assumption based planning approach and the transition management environment. As analyzed in chapter 9.2 concept of an organization of the assumption based planning approach does not align with the organization of a transition management approach. Where the assumption identification section is well suited for the broader transition organization, the development of future strategies will be limited to the core organization that manages the transition. In the next section I will discuss the limitation that are caused with the development of future strategies. The results of assumption identification process might also be used as indicators for the broader organization of the transition.

Where the core organization uses the identified vulnerabilities for the development of future strategies and the adjustment of the future plans, individual network actors could benefit from the perceived vulnerabilities from the transition environment as a whole. As the results of the assumption identification process reflect the weaknesses of the transition an individual could reflect the results of an transition wide assumption identification on their own operations. This thesis did not intend to develop this knowledge and research these experiences but would suggest further research towards the effects of the assumption identification process.

16.3 Future planning and scenario analysis

The future planning and scenario analysis section of the assumption based planning approach is used for the development of future strategies based on the identified important assumptions and related vulnerabilities. In this section I will discuss the limitations of future planning section based on the required resources. I will also discuss the application of the future planning approach in a transition management environment.

Limitations of future planning

Future planning uses the identified assumptions and associated vulnerabilities for the development of actions to prevent or mitigate the impact of a failing assumption. The process of action development and further action preparation is based on an individual assumption and associated vulnerability. In the context of a broad sustainable transition the future planning might not always be as useful.

In assumption based planning scenario analysis is used as a method for the development of future strategies. The scenario approach is most successful when developing between 2-6 scenarios. In the context of an organization with clear goals and operations this approach could be sufficient. In the case of transition, and more particular sustainable transitions, I have not been able to device a clear answer.

Sustainable transitions are developments that have no set target and operations to execute. The organization of a transition is based on coordination of the actors and institutions involved and the goal of the transition is constantly adjusted to the current state of art. In the case of the biobased economy the developments span development on commodities, processing technologies, logistics, market entry and many more aspects of new market development. Like with the identification of the most important assumptions the development of scenarios is only able to contain a small set of the assumptions.

The effectiveness of the future planning is related to the discussion in chapter 14 in which the selection of the important assumption is discussed. When a sustainable transition requires the identification of broader and more specific assumptions future planning would be difficult to deploy with relevant resources. When more generic assumptions are identified the future planning approach could impact the entire transition and it could be worth executing. The future planning for the international assumptions identified in the case could have an impact on the entire transition. This research shows that future planning will be specific and could be executed for a limited number of cases, though further research on this section of the assumption based planning approach would be advised.

In this discussion I have elaborated on three different aspects of this thesis that require further analysis in the context of transitions and assumption based planning. The concept of applying assumption based planning in a transition management context shows signs of potential but require further analysis. In the following chapter I will answer the research question and conclude this thesis.

17 Conclusion

In this thesis an analysis is made of the application of assumption based planning as a reflexive exercise within the transition management framework. This thesis proposes that assumption based planning is a method that fits within the transition management framework and could be used as a reflexive exercise, though certain aspects of the method require further research or adaptation. In the first section of this thesis I have analyzed the requirements for a reflexive exercise in the transition management framework. Furthermore I have shown that assumption based planning fits both the requirements of reflexivity and the could fit within the framework of transition management. In the second section of this thesis the application of assumption based planning has identified several limitations of the method, which I argue to be impactful on the goal and effectiveness of the exercise. In the following section I will answer the research questions formulated in the introduction of this thesis. Following the sub questions I will formulate an answer on the main research question of this thesis.

17.1 Sub questions

In the introduction of this thesis I have formulated five sub questions related to the main research question. I will answer each of these question based on the information presented in this thesis.

What are the interfaces between reflexivity and assumption based planning?

In chapter 6 of this thesis I have formulated the characteristics required for reflexivity. In chapter 9 I have identified these characteristics of reflexivity in the assumption based planning approach. Based on this comparison I conclude that assumption based planning is an approach with reflexive characteristics.

How does assumption based planning fit within transition management as a reflexive tool?

Chapter 5 and 8 of this thesis describes the frameworks of transition management and assumption based planning. Chapter 9 compares both approaches and concludes that the deployment of evidence of assumption based planning matches well with the transition management approach. The goals of assumption based planning are also corresponding. Chapter 9 concludes with an analysis on the concept of the organization in which both approaches differ. When the differences in organization are acknowledged the assumption based planning approach would be a well suited tool within transition management.

What does an assumption based planning design look like?

Based on the review of the assumption based planning framework in chapter 8, chapter 11 describes an methodology for the application of assumption based planning in an transition environment. Using a combination of methods an analysis section identifies the main assumptions and vulnerabilities. For the development of future strategies a set of future planning and creativity methods are deployed.

How do the results of an assumption based planning approach relate to reflexivity?

The results of the case study in chapter 13 show that the reflective components of reflexivity are clearly expressed. Chapter 14 discusses several concerns regarding the selection of the important assumptions. This would

require adjustments to the methodology of the assumption identification process. The overall application of the assumption identification section clearly shows in the conduct and results of the case study.

The adaptive characteristics of reflexivity are expressed in the future planning section. The assumption based planning approach does address the vulnerability of the identified assumptions. In the discussion in chapter 16 the impact on the resources and the dynamic environment would require further research to what extent this is applicable to a broad transition environment. For specific instances this will provide proper results.

How does an assumption based planning approach fit within transition management as a reflexive exercise?

The case study suggests that the identified interfaces between assumption based planning and transition management exist. More so the use of assumption based planning within transition management allow for the inclusion of the major drivers of the transition in the analysis. The diverse approaches of assumption identification create an opportunity for reflecting on the ongoing transition from various perspectives. Using the important assumptions to adapt the current and future plans is a process that requires further research but would allow for a proper reflexive exercise.

17.2 Research question

This thesis investigated the possibility of the use of assumption based planning as a method to induce reflexivity in a transition environment. Based on the results of this study it can be concluded that there are opportunities for the application of assumption based planning in the transition management approach. The divergent process of vulnerable assumption identification is well suited for the use in the transition management approach both for its inclusiveness of information sources as well as the practical implementation within a large group of actors. The convergent process of identifying the main vulnerable assumptions and the process of developing future strategies will be highly dependent on the type of transition that is governed, and will only be applicable for a limited number of important assumptions.

Assumption based planning could be used as a method to induce the reflexive thinking with the identification of vulnerable assumptions, but might not always be suited for the use in the adjustment of strategies due to its time consuming process and limited scope.

18 Reflection

In the process of writing this thesis I have learned a lot. From the research itself, the process of adjusting and maybe most about myself. In this chapter I will reflect on the topics related to the thesis from a process perspective. I will start elaborating on the design of the thesis and the shift in focus in the process. I will discuss the limitation in the case, and the effects that this had on the results. Finally I will shortly discuss my learning experience during my internship and the process afterwards.

18.1 Process orientation

In preparation of this thesis I have been focused mainly on the topic of the research. My interests in biotechnology and the opportunities for sustainability have been key aspects during my academic and extracurricular experiences. When the opportunity came for an internship in the governance structure of the biobased economy this was an easy choice. The lack of a clear research question and topic, both from my side as well as from the governmental perspective created a situation in which the preliminary research design did not have a clear goal and methodology rather than the execution of assumption based planning in the transition towards a biobased economy.

During the internship several problems with the method of assumption based planning came up and the lack of a clear research description and design allowed for the process to become fluid and unclear. During this part I was unable to adjust to the situation and allowed the process to take control. The results from the case study were more brief than maybe expected and did not allow for substantive scientific analysis. The use of the methodology of assumption based planning in the context of transition management from a process side was however interesting. And though it allowed for the writing of this thesis the process of adjusting from a content oriented research to a more methodology oriented research was not without problems. I have been struggling to make the adjustment, and it made me realize that the design and clarity of research is more important than I originally envisioned.

18.2 Limitations

A large part of the adjustment problems originated during the case. Originally the case aimed at bringing forward the most prominent issues in the biobased economy. But rather it became a process of method development and testing. This did not allow for a broad execution of the experiment and limited the scope of the research.

While the case resulted in the identification of potential usefulness and weakness of the assumption based planning method, the scope of the case was limited. The lack of available practical methodology and experimental nature of the used method did not allow for a full scale case study using a broad group of participants. This led to the use of an experiment within the governance section. Though their experience in the field was clear, the case lacked the input from other engaged transition actors. This will have had its impact on the results of

the case study. However, here I will argue that it would not have impacted the resulting process to a larger extend.

The method of assumption based planning has been described by Dewar. This paper encompasses the philosophy of assumption based planning as well as the methodological approach. This is supported with the description of a practical execution in the case for which it was designed. The activities of that have been executed are well described, though the exact method used has not been available. For this research the activities and methodology has been followed as close as possible, but the method had to be defined exactly. The experimental nature of this process led to a situation in which it was not possible to execute this on a full scale experiment including all actors of the biobased economy. Instead an experiment using employees of the biobased economy department have been found available for the experiment. Their central position in the transition would allow them to identify vulnerable assumptions throughout the transition.

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