The use of narrative in the design of sustainable energy landscapes, a case study

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Preface

This thesis started with a fascination for landscape narratives and the idea to get involved in the PhD research of Renée attracted me. It became an explorative study with many uncertainties, which changed my expectations of the results. Dealing with these uncertainties was challenging for me and therefor I proudly present you the results of that study in this report. I hope you will enjoy reading.

I would like to thank my supervisors Renée and Ingrid for their critical and challenging feedback. I am also thankful for the daily 'gezelligheid' and support of the thesis students working in Gaia A204/5. The NRGlab was sometimes an inspiring place to see other people dealing with a thesis on energy transition. I would also like to mention Dirk Oudes, who helped me with the analysis of the energy system. Finally the mental support of my parents and friends was very helpful in the diffecult moments I experienced.

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Summary

Introduction

The energy transition from fossil sources to renewable sources will take place in the coming decades. It will be shaping the landscape and create new challenges for landscape architecture. More and more, energy transition is accompanied by an increase in public resistance. Especially wind turbines are frequently debated in literature, because the scale, form and noise of these is changing the landscape experience dramatically over a short period of time. The major changes in the landscape, without being able to influence or benefit from those changes, is evoking public opposition. The landscape is expressing certain stories or meanings, based on the genesis and the people's use. Important part of the landscape experience are these stories, that are legible in the landscape. Also interaction between people about these stories influences the landscape experience. People remember, interpret, dream and plan through stories. Narratives include both the story and the telling; the product and process.

The energy transition is transforming the landscape and the landscape experience. Possibly it influences the stories of people as well. Landscape architects are using narratives in their designs, but it is unknown how they do this exactly. For designing sustainable energy landscapes the five-step approach is available, but it has little attention for narratives. Possibly, working with narratives could support the design of sustainability energy landscapes by addressing socio-cultural aspects of sustainability. In this study the fields of landscape architecture, narratives and sustainable energy are brought together. The main research question is: *How can narratives be used in the analysis and the design of sustainable energy landscapes?*

For studying narratives an analytical framework is being used, which is part of the current PhD research of De Waal,. The analytical framework comprises the elements of a narrative (characters, events, settings and telling), combined with the elements of a design process (analysis and synthesis). It can be used as tool for analysis and design of narratives in sustainable energy landscapes (on paper or in the landscape).

The study consists of three parts: The first part is a research *on* designs to understand the use of narratives in state-of-the-art designs of sustainable energy landscapes and to explore the use of the analytical framework as analytical tool. The second part is using a research *for* design approach, which means the analytical framework is used to understand narratives in a project area. The findings of both parts are used in the third part: the design experiment. The analytical framework is used as a tool for design in this latter part and focusses on the use of narratives in a design.

Research on design: Eo Wijers Competition

For the research *on* designs four entries of the Eo Wijers Competition on the 'Veenkoloniën' were studied, because the design competition on regional scale is highly recognised in Dutch landscape architecture. The assignment asked specifically the use of stories and the design of renewable energy system. From the total of 36 entries, four were selected, based on their substantial attention for energy and because of being representative for the total variety of entries. A qualitative method with predetermined codes, based on the analytical framework, was used. A large variety of elements appeared, which were clustered and these clusters were classified into five themes: economy, landscape, energy, society and communication. It was also concluded that when characters appear in different clusters and themes, it is strengthening the story, because it is integrating stories (e.g. economy and energy stories), which makes them more credible.

Research for design: Wageningen

In the second and third part for the project area Wageningen is chosen, .
In Wageningen a public debate on wind turbines is taking place for about twenty years and since a few years the municipality wants to become climate neutral. First the narratives on energy transition were studied in newspaper headlines with a qualitative method, that is comparable to the one used for the Eo Wijers Competition. Five clusters appeared, which can be classified in three themes: economy, landscape and energy. Characters appearing in different clusters and themes, as it did in the Eo Wijers Competition, did not appear in Wageningen. Also important is to understand the role of authors. It seems important that the municipality and citizens are co-authors to ensure they have both a role in the narrative, which would enhance public support for the municipality's proposals, which is not the case at the moment.

Design experiment: Wageningen

In the design experiment, aims were formulated with an analysis of energy system, landscape and narratives. In the municipality a large variety of landscape types could be found, which is a quality of the area. Wageningen is generating very little energy at the moment, but the aim of the municipality is to become climate neutral and sufficient potentials are available to generate energy. Wageningen has to save energy and to start generating energy, which can have a major impact on the landscape. Based on the results of the research *for* design three aims were formulated:

- Citizens should benefit from generating energy.
- Citizens should stop debating on the need and location of wind turbines.
- A local sustainable energy system should be created.

In the design experiment a landscape design was made, to see whether narrative can be of use in a design process, based on the research results (elements, themes, connection between those and authors) and including renewable energy technologies with a major impact on the landscape. For expressing these aims, three design strategies are used:

- Connecting consumers/producers;
- Generating renewable energy with various sources;
- Strengthening the landscape characteristics.

This resulted in a transparent, integrated proposal in which the current debate on renewable energy within the municipality is taken into account.

Conclusion

Narrative is a complex concept, which can be studied in landscape designs and landscapes with the analytical framework, comprising of characters, events and settings. However the coherence between the elements and plots cannot be understood with the analytical framework. The research approach enabled to understand the use of narratives in state-of-the-art designs on a detailed level (research *on* design), to understand narratives in the project area with a comparable method (research *for* design) and to use the findings of the research in the design experiment (research *through* design). From the design experiment, it was concluded that landscape design can be seen as a form of storytelling, because the elements (characters, events and settings), themes, the connection between these (themes and elements) and co-authorship can be used to base the design on. It seems that conscious use of narrative in the design of sustainable energy landscapes can contribute to the socio-cultural aspect of sustainable energy transition, because the use of narrative would result in more transparent and integrated design.

Because narrative is a complex concept, an additional step within the method to study the coherence between elements and addressing the plots would be interesting in future research. The explorative character of this study, also results in some recommendations for improving the methods, like interviewing stakeholders/designers, the representativeness of narratives and using 'computer-aided' coding. Finally for the design experiment in the future, real design projects, consulting stakeholders and taking into account possible constraints such as competition of renewable energy generation with food production would be interesting.

Samenvatting

Introductie

De energietransitie van fossiele naar hernieuwbare energiebronnen zal de komende decennia plaatsvinden. Deze transitie transformeert het landschap en creëert nieuwe uitdagingen voor landschapsarchitectuur. In steeds grotere mate roept de energietransitie weerstand op bij het publiek. In de literatuur worden in het bijzonder wind turbines bediscussieerd, omdat de schaal, vorm en geluidshinder van deze wind turbines de landschapsbeleving in korte tijd drastisch veranderen. Grote publieke weerstand wordt opgewekt, doordat mensen weinig invloed kunnen uitoefenen op of kunnen profiteren van de grote veranderingen in het landschap. In het landschap komen bepaalde verhalen en betekenissen tot uitdrukking, gebaseerd op de ontstaansgeschiedenis en het gebruik door mensen. De verhalen, leesbaar in het landschap, zijn een belangrijk onderdeel van de landschapsbeleving. Ook de interactie tussen mensen over deze verhalen heeft invloed op de landschapsbeleving. Mensen herinneren, interpreteren, dromen en plannen aan de hand van verhalen. Narratieven omvatten zowel het verhaal als de vertelling: het product en het proces.

Door de energietransitie transformeert het landschap, de landschapsbeleving en mogelijk heeft het ook invloed op de verhalen van mensen. Landschapsarchitecten gebruiken narratieven in hun ontwerp, maar het is onbekend hoe ze dit precies doen. Voor het ontwerpen van duurzame energielandschappen is de vijf-stappen benadering beschikbaar, maar deze heeft weinig aandacht voor narratieven. Mogelijk kunnen narratieven een bijdrage leveren aan het ontwerp van duurzame energielandschappen door het adresseren van sociaal-culturele aspecten van duurzaamheid. In deze studie worden de velden landschapsarchitectuur, narratieven en duurzame energie bij elkaar gebracht. De hoofdonderzoeksvraag is: Hoe kunnen narratieven worden gebruikt in het de analyse en het ontwerp van duurzame energielandschappen?

Voor het bestuderen van narratieven is een analytisch raamwerk gebruikt, dat onderdeel is van het huidige promotieonderzoek van De Waal. Het analytisch raamwerk bestaat uit de basiselementen van een narratief (karakters, gebeurtenissen, achtergrond en vertelwijze), gecombineerd met de basis elementen van een ontwerpproces (analyse en synthese). Het kan worden gebruikt als instrument voor analyse en ontwerp van narratieven in duurzame energie landschappen (zowel op papier als in het landschap).

De studie bestaat uit drie delen: In het eerste deel wordt een onderzoek-*naar*-ontwerp benadering gebruikt om het gebruik van narratieven in uiterst geavanceerde ontwerpen voor duurzame energielandschappen te

begrijpen en het gebruik van het analytisch raamwerk als analyse instrument te exploreren. In het tweede deel wordt een onderzoek-*voor*-ontwerp benadering gebruikt, wat betekent dat het analytisch raamwerk wordt ingezet om de narratieven in een project gebied te begrijpen. De bevindingen van beiden delen worden gebruikt in het derde deel: het ontwerpexperiment. In dit deel wordt het analytisch raamwerk gebruikt als ontwerpinstrument en gefocust op het toepassen van narratieven in het ontwerp.

Onderzoek naar ontwerp: Eo Wijers-prijsvraag

Voor het eerste deel is de Eo Wijers-prijsvraag over de Veenkoloniën bestudeerd, omdat de prijsvraag op regionale schaal brede erkenning heeft bij landschapsarchitecten in Nederland. De opdracht van de prijsvraag benoemt specifiek het betrekken van verhalen en het ontwerp van een hernieuwbaar energiesystemen. Van de totaal 36 inzendingen zijn er vier geselecteerd, op basis van substantiële aandacht voor energie en een gezamenlijke representatie van de variatie aan inzendingen. Voor het onderzoek is een kwalitatieve methode met vooraf bepaalde codes gebruikt, gebaseerd op het analytisch raamwerk. Een grote variatie van elementen is tevoorschijn gekomen. De elementen konden worden geclusterd en geclassificeerd in vijf thema's: economie, landschap, energie, communicatie en maatschappij. Ook kon worden geconcludeerd dat het verschijnen van karakters in verschillende clusters en thema's de verhalen versterken, doordat ze gezamenlijk geloofwaardiger lijken te zijn (bijvoorbeeld economie en maatschappij).

Onderzoek voor ontwerp: Wageningen

Wageningen is gekozen als case voor het tweede en derde deel van deze studie. In Wageningen is al ongeveer twintig jaar een hevig publiek debat aan de gang over windturbines en sinds twee jaar wil de gemeente klimaatneutraal worden. Eerst zijn de narratieven omtrent de energietransitie in krantenkoppen bestudeerd met vergelijkbare kwalitatieve methoden als bij de Eo Wijers-prijsvraag. Vijf clusters zijn te voorschijn gekomen, die geclassificeerd konden worden in drie thema's: economie, landschappelijk en energie. De structuur in de Eo Wijers-prijsvraag, dat karakters verschijnen in verschillende clusters en thema's, was niet zichtbaar in Wageningen. Ook bleek het belangrijk de rol van de auteur te begrijpen. In de praktijk blijkt van belang te zijn dat de gemeente en burgers coauteurs zijn om ervoor te zorgen dat beiden een rol hebben in het narratief, wat niet het geval is op dit moment.

Ontwerpexperiment: Wageningen

In het ontwerpexperiment, zijn doelstellingen geformuleerd aan de hand van verschillende analyses: landschap, energie systeem en narratieven. In de gemeente kan een grote variatie aan landschapstypen worden gevonden, wat

een kwaliteit van het gebied is. Wageningen genereert zelf nauwelijks energie, maar de doelstelling van de gemeente is wel om klimaatneutraal te worden en er is voldoende potentieel om energie op te wekken. Wageningen moet energie besparen en met het opwekken van energie beginnen, wat grote impact kan hebben op het landschap. Gebaseerd op het onderzoek naar narratieven zijn drie doelstellingen geformuleerd:

- Burgers moeten profiteren van de energieopwekking.
- Burgers moeten stoppen met debatteren over het nut en de locatie van windturbines.
- Een lokaal duurzaam energiesysteem moet worden gecreëerd.

In het ontwerpexperiment is een landschapsontwerp gemaakt om te bezien of - gebaseerd op de resultaten van het onderzoek (elementen, thema's, de connectie daartussen en de auteurs) - narratieven kunnen worden gebruikt in het ontwerp, en hernieuwbare energietechnologie met een landschappelijke impact kan worden toegepast. Voor het tot uiting brengen van de doelstellingen in het ontwerp zijn drie strategieën gebruikt:

- Verbinden van consumenten/producenten;
- Opwekken van hernieuwbare energie met verschillende bronnen;
- Het versterken van de landschappelijke karakteristieken.

Dit resulteerde in een transparant en geïntegreerd ontwerp, waarin het huidige debat over hernieuwbare energie in de gemeente is betrokken.

Conclusie

Narratief is een complex concept, dat kan worden bestudeerd in landschappen en landschapsontwerpen aan de hand van het analytisch raamwerk, bestaande uit karakters, gebeurtenissen en achtergronden. Echter de coherentie tussen elementen en de plots kunnen niet worden begrepen met het analytisch raamwerk. De onderzoek benadering maakte het mogelijk het gebruik van narratieven in uiterst geavanceerde ontwerpen op een gedetailleerd niveau te begrijpen (onderzoek *naar* ontwerp), de narratieven in het projectgebied te begrijpen met vergelijkbare methoden (onderzoek *voor* ontwerp) en de bevindingen te gebruiken in het ontwerpexperiment (onderzoek *door* ontwerp). Uit het ontwerpexperiment kon worden geconcludeerd dat landschapsontwerp kan worden gezien als een vorm van verhalen vertellen, omdat de elementen (karakters, gebeurtenissen en achtergronden), thema's. de verbindingen tussen deze (elementen en thema's) en het co-auteurschap kunnen worden gebruikt als de basis voor het ontwerp. Het lijkt dat bewust gebruik van narratieven in het ontwerp van duurzame energielandschappen kan bijdragen aan de sociaal-culturele aspecten van duurzame energie transitie., omdat het gebruik van narratieven resulteerde in een transparanter en geïntegreerd ontwerp.

Omdat narratief zo'n complex concept is, is een additionele methode interessant om de coherentie tussen de elementen en plots te kunnen bestuderen. Het exploratieve karakter van deze studie resulteert ook in een aantal aanbevelingen voor het verbeteren van de gebruikte methode, zoals

interviewen van stakeholders/ontwerpers, valideren van bronnen voor het onderzoeken van narratieven en computerondersteund coderen. Tenslotte is het naar aanleiding van het ontwerpexperiment interessant voor het uitvoeren van projecten om in de werkelijkheid stakeholders te consulteren en mogelijke beperkingen in kaart te brengen, zoals de concurrentie tussen hernieuwbare energie en voedselproductie.

Picture: Renée de Waal

Part 1: Introduction

In the first part of this study, the topic is introduced, relevant literature discussed and the research approach described.

1. Introduction

1.1. Social issue

Due to the depletion of fossil fuels and climate change, an energy transition to renewable sources of energy is needed [Stremke, 2010; Stremke 2012-1]. With economic, political and environmental incentives the energy transition is stimulated [Pasqualetti, 2011-1]. The energy transition will shape the landscape, creating new challenges for landscape architects and spatial planners [Stremke, 2010]. To create a sustainable energy landscape, landscape architects should strive for energy-conscious designs on all scales, influencing selection of plant material on small scale to spatial organisation on regional scale [Stremke, 2010].

Renewable sources of energy are more economically profitable, but limitations in the energy transition are increasingly concerning the public; [Pasqualetti, 2011-1]. Public resistance against the energy transformation is appearing more frequently. The causes of public resistance to this transformation are getting more attention in literature [Brittan Jr., 2001; Cowell, et al., 2011; Devine-Wright, 2005; Devine-Wright, 2009; Krohn & Damborg, 1999; Pasqualletti, 2011-1; Pasqualletti, 2011-2; Selman, 2010; Van der Horst & Vermeylen, 2011]. Since sustainable energy landscapes concern sustainability in the environmental, economic, technical and socio-cultural sense [Stremke 2013; Selman 2008], it is important that public resistance is addressed in energy transition.

Frequently debated in literature are wind turbines [Brittan Jr., 2001; Cowell, et al., 2011; Devine-Wright, 2005; Devine-Wright, 2009; Krohn & Damborg, 1999; Pasqualletti, 2011-1], because this renewable source is economically the most profitable and it has a major impact on the landscape experience [Pasqualetti, 2011-1]. Because of the scale, form and noise of wind turbines, the landscape experience is changed dramatically over a short period of time [Brittan Jr., 2001; Pasqualleti, 2011-1]. The major changes in the landscape experience, without being able to influence or benefit from those changes, is evoking public opposition [Pasqualetti, 2011-1].

The landscape is expressing certain stories or meanings, based on the genesis and the people's use. Important part of the landscape experience are these stories, that are legible in the landscape [Vroom, 2005]. Also interaction between people about these stories influence the landscape experience. People remember, interpret, dream, and plan through stories. Narratives include both the story and the telling; the product and process [Potteiger & Purinton, 1998]. But what narratives express exactly and how these can be produced is still being discussed in literature [Potteiger & Purinton, 1998; Van Dijk, 2012; Throghmorton, 2003]. Although knowledge is fragmented,

landscape architects already deal (un)consciously with narratives [Potteiger & Purinton, 1998]. An example of this is Yttje Feddes, as being the advisor on landscape of the Dutch government (Rijksadviseur voor lanschap) arguing in 2009 that wind turbines need a landscape story. Landscape designs have to be made for the different Dutch landscape types that are expressing the story of the relation between landscape and wind turbines [atelier Rijksbouwme ester, 2009].

Because of the major impact on the landscape experiences of renewable energy, the landscape experience is strongly connected to narratives. Narrative is identified as a concept that can potentially support the energy transition and so the development of sustainable energy landscapes, though knowledge is still limited [Selman, 2010; Pasqualetti, 2011-1, Pasqualletti, 2010-2; Eo Wijers foundaiton, 2012].

1.2. Problem statement & knowledge gap

With economic, political and environmental drivers the energy transition will take place, have major impacts on the landscape and influence the landscape experience [Pasqualetti, 2011-1]. Landscapes can be understood through narrative and narrative landscapes can be designed [Potteiger & Purinton, 1998]. Possibly, working with narratives could support the design of sustainability energy landscapes by addressing socio-cultural aspects of sustainability [Stremke 2013]. However it is not clear yet how landscape architects can deal with narratives in the design of sustainable energy landscapes. This thesis will focus on that knowledge gap.

1.3. Questions & approach

Based on the knowledge gap a research question has been formulated as main question:

- How can narratives be used in the analysis and design of sustainable energy landscapes? (M)

The aim for this study is to explore the use of the analytical framework, being part of the current PhD research of De Waal. The analytical framework comprises the elements of a narratives (characters, events, settings and telling), combined with the elements of a design process (analysis and synthesis). It can be used as tool for analysis and design of narratives in sustainable energy landscapes (on paper or in the landscape).

The study consists out of three parts: The first part is a research *on* designs to understand the use of narratives in state-of-the-art designs of sustainable energy landscapes and to explore the use of the analytical framework as analytical tool. A content analysis with the analytical framework will be performed on a reference study, the Eo Wijers Competition 2011-2012.
The second part is using a research *for* design approach, which means the analytical framework is used to understand narratives in a project area Wageningen. Comparable methods will be used for the analysis of narratives

in the project area of design experiment, the municipality of Wageningen. The findings of both parts are used in the third part: the design experiment. The analytical framework is used as a tool for design in this latter part and focusses on the use of narratives in a design in the project area Wageningen. Three sub questions have been formulated for all three parts. The first two are research questions and the last question is a design question:

- *What narratives can be discovered in the Eo Wijers Competition? (1)*
- *What narratives can be discovered in Wageningen? (2)*
- *How can narratives be used in the synthesis of the design experiment? (3)*

1.4. Introduction to the cases of the Eo Wijers Competition and Wageningen

A reference study will be done on the Eo Wijers Competition 2011-2012 to answer the first question. After that a design experiment in the municipality of Wageningen will be performed to answer the second and third question. In this paragraph the reference study and design experiment will be introduced.

For the reference study four entries of the Eo Wijers Competition 2011-2012 will be used. The Eo Wijers Competition is one of the most prestigious design competitions in landscape architecture in the Netherlands [De Jonge, 2008]. The entries reflect the state of the art designs of Dutch professionals. The 9th edition of the competition focused on energy, water, agriculture and population shrinkage in the Veenkoloniën. Explicitly was mentioned that the experience and stories of the citizens of the Veenkoloniën should be used [Eo Wijers foundation, 2012].

Wageningen is selected as design experiment, because it is exemplary for the difficulties wind turbine projects face in the Netherlands. Since 1998 plans have been made in Wageningen to use wind turbines as a source for renewable energy. Already in 2003 detailed plans were presented, but due to a lack of public/political support the plans have never been executed. The municipality developed 'Route map Wageningen climate neutral 2030' in 2012. The discussion on wind energy has a new impulse with this route map [Windenergie Wageningen]. The route map describes that the wind turbines are essential to achieve climate neutrality in 2030 [Gemeente Wageningen, 2012]. A heavy public debate developed about the location of the wind turbines [de Gelderlander]. Although the ambitions are clearly formulated, a vision on the integration of renewable energy in the landscape is missing. The ambition in combination with the struggle about the landscape makes Wageningen interesting for the design experiment.

1.5. Outline of this thesis

This thesis is divided in five parts. The first part will give an introduction to the topic, discuss the theoretical framework and provide an overview of the used approaches and methods. The second part will present the results and

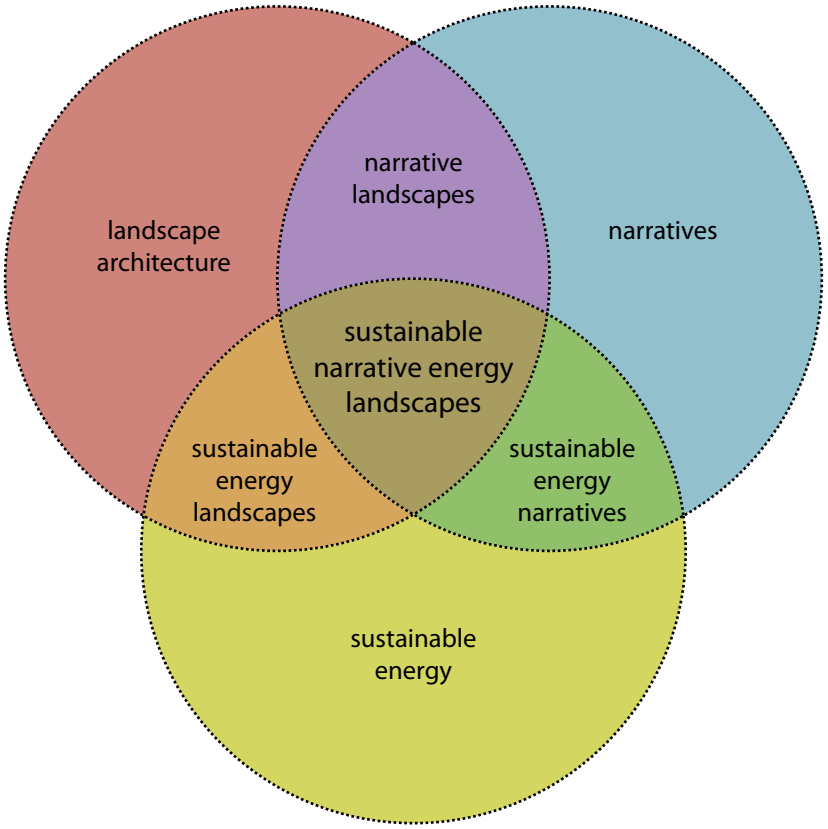
conclusion of the reference study on the Eo Wijers Competion. In the third and fourth part Wageningen will be discussed. First the research on the narratives will be presented and after that an overview will be given of the design experiment. In the last part of this study the discussion, conclusion and recommendations will be formulated. The main research question will answered in the conclusion.

2. Theoretical framework

This thesis is bringing together three fields of existing knowledge: landscape architecture theory, narrative theory and sustainable energy theory ***(see figure 2.1)***. About the combination of these fields little literature is available, though some literature discusses the concepts of landscapes narratives and energy landscapes.

Landscape architects, often working in multi-disciplinary teams or approaching the assignment from a multidisciplinary perspective, have an unique opportunity to combine the knowledge of narratives from the social domain with the technical knowledge of energy into the landscape design, contributing to an energy transition respecting the social impacts. This explains the focus of this study: narrative energy landscapes. The existing literature will be discussed as a starting point in this chapter.

Figure 2.1
Theoretical framework.



2.1 Landscape architecture

Landscape is the environment as experienced by people, created by the interaction between culture and nature [Vroom, 2005]. Landscape architecture is the discipline that concers itself with planning, management and design of landscapes [Deming & Swaffield, 2011]. In this thesis the focus will be on the design of landscapes.

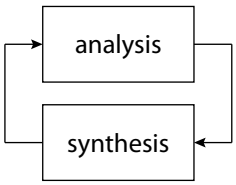


Figure 2.2
Design process [Vroom, 2005].

In every design process, analysis and synthesis are two important steps. For complex design cases the design process is cyclic, because the designer constantly has to reflect on decisions in order to keep an overview [Vroom, 2005; Deming & Swaffield, 2011]. During the analysis the study object is decomposed to several units in order to understand the situation. In the synthesis units are composed or added into a new proposal [Vroom, 2005]. Describing the complex design process by analysis and synthesis is a simplification suiting the purpose of this study ***(see figure 2.2)***.

Figure 2.3
Layer approach [Dauvellier; Vroom, 2005].

A landscape analysis is unwinding the biotic and abiotic components of the landscape with scientific methods in order to understand the potentials for developments in a project area. For the landscape analysis the layer approach is a well-known method. In the landscape several vertical layers are expressed. On a regional scale the following layers are mostly described [Vroom, 2005] ***(see figure 2.3)***:

- the occupation layer;
- the network layer;
- the underground layer.

2.2 Energy & sustainable energy landscapes

Energy is 'the ability or possibility to perform labour' [Leenaers, 2012]. Energy cannot be created or destructed, but is saved and converted constantly. During conversion the type of energy can change, like thermal, mechanical, electric, chemical, gravitational, kinetic and nuclear. All energy on earth can be traced back to a few sources: solar energy, geothermal energy and nuclear energy. Energy conversion may happen in many different ways [Leenaers, 2012]. Normally the unit used to describe the amount of energy is Joule. One Joule is the energy consumption for moving an object with the force of one Newton. Usually the numbers that describe the amount of energy expressed in Joule become fairly high, so some greater units are used, like terajoule (1TJ=1012J) or petajoule (1PJ=1015J) [Leenaers, 2012].

The 'trias energetica' is a three-step method to increase the sustainablity in an energy system: (1) saving energy, (2) sustainable enery and (3) efficient use of fossil fuels [Lysen, 1996] ***(see figure 2.4)***. The second step can also be diveded in two smaller steps: (a) using waste streams as sustainable source and (b) generate energy from sustainable source. The conecept is a robust instrument for urban design and is taking into account the environmental aspects. [Vandevyvere & Stremke, et al., 2012]. The Dutch national gouvernment uses the trias energetica as strategy stimulating sustainable building [Rijksoverheid; Leenaers, 2012].

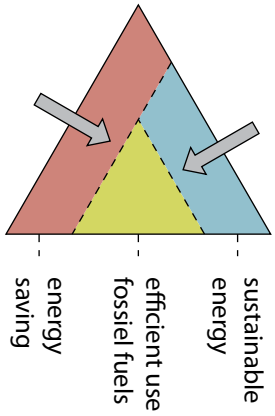


Figure 2.4
Trias energetica [Leenaers, 2012].

The current energy transition concerns the transformation of the energy system. The energy system is developing from a system based on fossil sources to a system based on renewable sources [Stremke, 2010; Stremke, et al., 2012-1]. Currently economic, environmental and political pressure stimulate the energy transition [Pasqualetti, 2011-1]; renewable energy is becoming economically feasible, the consequences of climate change for

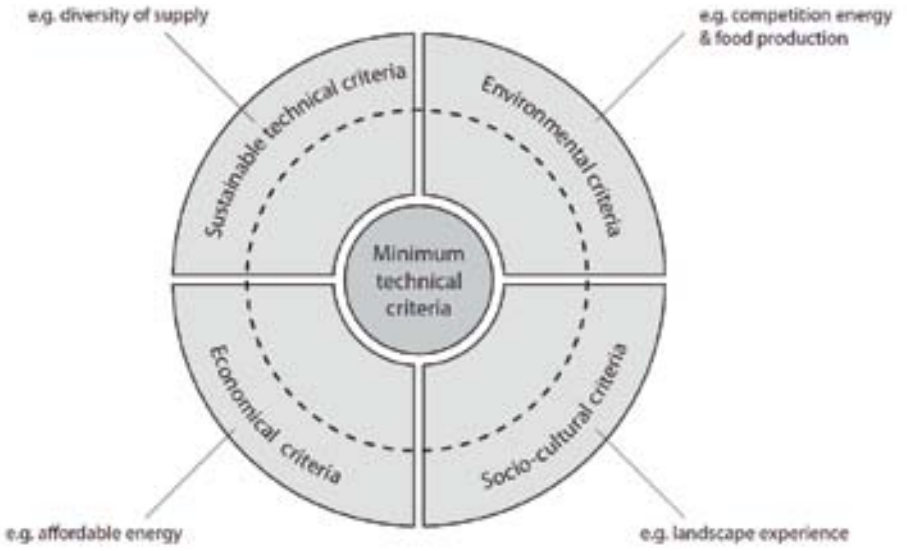


Figure 2.5
Criteria for sustainability in energy landscapes [Stremke, 2013].

the environment become clear and the politicians/public are increasingly aware of these processes. The energy transition has a major impact on the environment, that presents new challenges for landscape architects and planners [Stremke, et.al., 2012-1; Vandevyvere & Stremke 2012]. The use of renewable sources is not by definition sustainable, only when the sustainable technical, environmental, socio-cultural and economic criteria are taken into account ***(see figure 2.5)*** [Stremke, 2013; Stremke, 2010]. Sustainability concerns people acting in such a manner that current and future generations have possibility to be provided in their needs [Vroom, 2005].

Some approaches for designing sustainable energy landscapes are available in literature. The five-step approach has been developed to create an integrated vision for energy landscapes: analysing present conditions (1), mapping near future developments (2), illustrating possible fare futures (3), developing integrated visions (4) and identifying spatial interventions (5) ***(see***

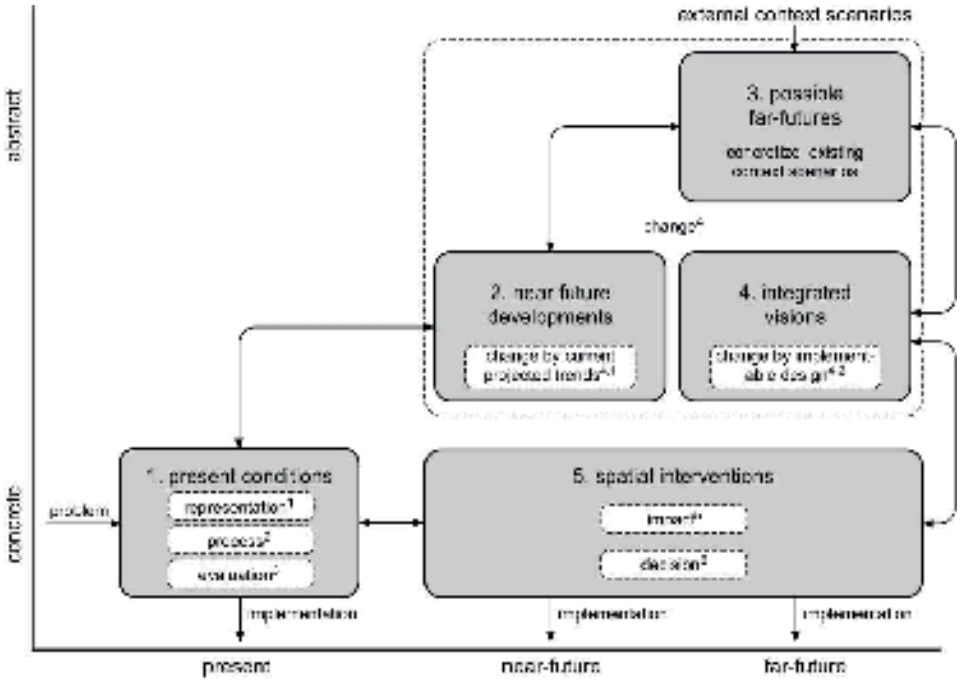


Figure 2.6
Five-step approach [Stremke, et al., 2012-1; 2012-2].

figure 2.6) [Stremke, et al. 2012-1; 2012-2].

Energy potential mapping is a method supporting spatial planning processes towards a more energy efficient urban or rural environment. With the method renewable energy potentials and demand can be quantified and mapped [Broersma, et al., 2013]. Based on basic information (e.g. topography, climate, underground, land use and energy system) the potential sources of energy are identified. Examples of potential sources of energy are wind, water, etc. Taking into account the limitations (technical, political, social, conversion, etc.) the energy potentials are defined. A potential is quantified for every form (heat, cold, electricity and fuel) and the potentials are mapped. [Broersma, et al., 2013].

The methods have a combination of landscape analysis and energy analysis (like analysing potentials and current system) in common. Though the methods have little attention for social aspects and no attention for narratives.

2.3 Narratives & narrative landscapes

Narratives are an important concept in many disciplines, e.g. anthropology, geography, law and history. Narratives contain two important elements: the story and how the story is told. The story includes characters, events and settings ***(see figure 2.7)***. Stories help people to remember, interpret, imagine and plan their life experience. The world is full of stories and stories shape our worlds. The telling is the method of expression or manifestation, e.g.

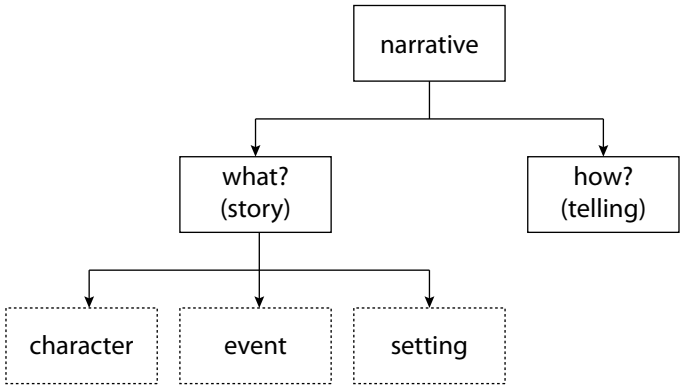


Figure 2.7
Narrative structure [Potteiger & Purinton, 1998, p.3].

verbal, film, dance or landscape. This concept of a narrative is shared by the disciplines [Potteiger & Purinton, 1998].

Since the '80s the attention for landscape narratives and meaningful landscapes has grown in literature. The focus on functionality that characterised Modernism was replaced by a focus on meaningful landscapes for users in the Postmodernism [Treib, 1995].

Potteiger & Purinton argue that landscape narratives have been employed frequently in landscape architecture, architecture and planning throughout history, but that a theoretical base is lacking. The term landscape narrative has been described by Potteiger & Purinton as "the interplay and mutual relation between landscape and narrative" [Potteiger & Purinton, 1998, p.5]. The

landscape is much more than a setting for a story; it can develop stories and be part of stories as a character or event (e.g. in case of a changing landscape). Narratives have an important role in place-making; people attach certain meanings to the space, creating a valuable environment. With narratives people are also shaping their environment. In their book, Potteiger & Purinton establish a framework for understanding elements, forms and process of landscape narratives, but do not give clear guidlines how thsi can be done [Potteiger & Purinton, 1998].

2.4 Sustainable narrative energy landscapes

The importance of narratives for sustainable energy landscapes is recognised by Pasqualetti and Selman [Selman, 2010; Pasqualetti, 2011-1, Pasqualletti, 2010-2; Eo Wijers-stichting, 2012]. In addition to the concept of sustainable energy landscapes in this study the conscious integration of narratives in the design process is explored; contributing to the socio-cultural aspects of sustainability in energy landscapes. Approaching this will start from methods to design sustainable energy landscapes; the five-step approach. These include a landscape analysis and energy analysis. For the conscious integration of narratives, an analysis of these narratives is needed. The analysis of narratives aims for analysing the elements of a narratives.

2.5 Analytical framework

Based on Potteiger & Purinton, 1998 an analytical framework was created within a current PhD research: Waal, R.M. de, Forthcoming, Shaping sustainable energy landscapes: the need for and elaboration of a narrative design approach. Wageningen: Wageningen University. PhD thesis. The analytical framework describes the narrative elements [Potteiger & Purinton, 1998]:

- *'characters':* objects, persons or (mental) constructions with certain characteristics relevant for an event;
- *'events':* the explanation of characters' experiences or activities;
- *'settings':* the environment in which events take place;
- *'telling':* how the story (characters, events and settings) is expressed.

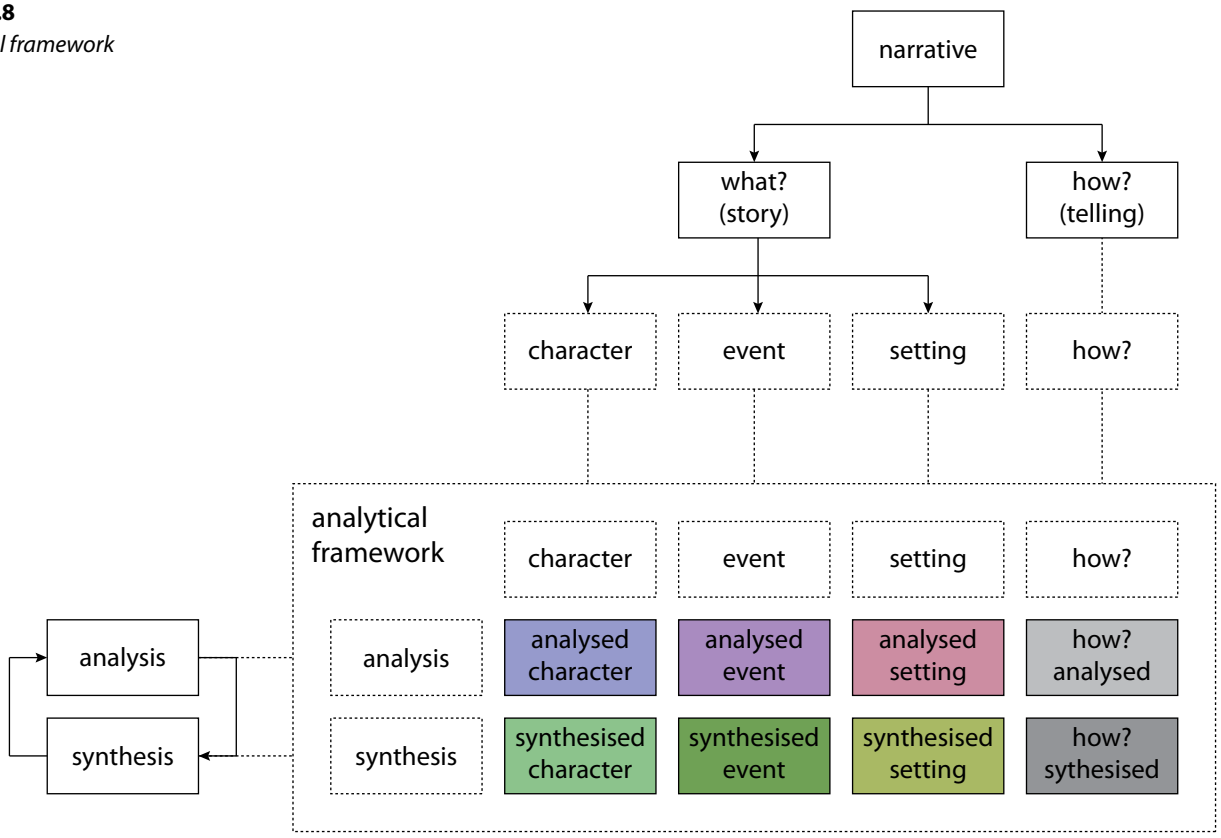
As landscape architects involve narratives in their design process, an analysis and synthesis of the narrative elements would also be the case for those narrative:

- *'analysis':* the decomposition of narrative elements to understand the narrative;
- *'synthesis':* the composition of narrative elements into aims for future narratives.

Combining these 'characters', 'events' and 'settings' with 'analysis' and 'synthesis' in a matrix, an analytical framework can be drawn (see figure). The result is a matrix that shows eight elements that can be studied in the designs (of sustainable energy landscapes) ***(see figure 2.8)***:

- *'analysed characters':* objects, persons or (mental) constructions with certain characteristics analysed by the designer as being relevant for an event;
- *'analysed events':* the explanation of characters' experiences or activities analysed by the designer;
- *'analysed settings':* the environment in which events take place analysed by the designer;
- *'how analysed':* how the designers tells the analysis story ('analysed' characters, 'analysed' events and 'analysed settings').
- *'synthesised characters':* objects, persons or (mental) constructions with certain characteristics synthesised by the designer as being relevant for an event;
- *'synthesised events':* the explanation of characters' experiences or activities synthesised by the designer;
- *'synthesised settings':* the environment in which events take place synthesised by the designer;
- *'how synthesised':* how the designers tells the synthesised story ('synthesised' characters, 'synthesised events' and 'synthesised' settings').

Figure 2.8
Analytical framework



3. Research approach & methods

3.1 Research & design approach

In this chapter the research and design approach and methods used for this study will be described. First the approach for this study will be discussed, including sub research questions and the role of reference study and design experiment. After that, the methods used to perform the reference study and design experiment are discussed. As earlier introduced the main question for in this study is the following design question:

- *How can narratives be used in the analysis and design of sustainable energy landscapes? (M)*

For answering this question a design experiment is performed, aiming for a sustainable narrative energy landscape in Wageningen. Before being able to perform this design experiment, a reference study will be performed to help validate the results of the analysis of narratives in the design experiment. Narratives are often used by landscape architects, and so in designs for sustainable energy landscapes, but literature on this topic is lacking [Potteiger & Purinton, 1998]. In the reference study a research *on* design approach will be used. This means the products of a design process will be analysed. Also for Wageningen an analysis of the narratives will be done. For this analysis comparable methods will be used for analysis of narratives. A research *for* design approach is used with this analysis of narratives in Wageningen. The sub research questions for the analyses of narratives are:

- *What narratives can be discovered in Eo Wijers Competition? (1)*
- *What narratives can be discovered in Wageningen? (2)*

For the reference study, four entries (posters & essays) of the Eo Wijers Competition 2011-2012 are being used, because these represent state-of-the-art design for energy landscapes. For the design experiment newspapers are being used as a data source. The assumption is being made that newspaper represent the stories that are relevant for a community. As explained in the previous chapter a content analysis with the analytical framework will be used for these questions. In the next paragraphs there will be elaborated on these methods. Next to an analysis of narratives, a landscape analysis and energy analysis will be made for Wageningen. As was discussed in previous chapter, methods in literature describe that these are important elements for the design of sustainable energy landscapes. These analyses together are being the input for the synthesis. As the narratives are the experimental part of the design process the following design questions is formulated for the synthesis:

- *How can narratives be used in the synthesis of in the design experiment? (3)*

A reflection will be made on the synthesis in order to answer this question. Together this will give sufficient information to answer the main question. The research and design approach is resumed in the figure below ***(see figure 3.1)***.

3.2 Methods for finding narratives in Eo Wijers Competition

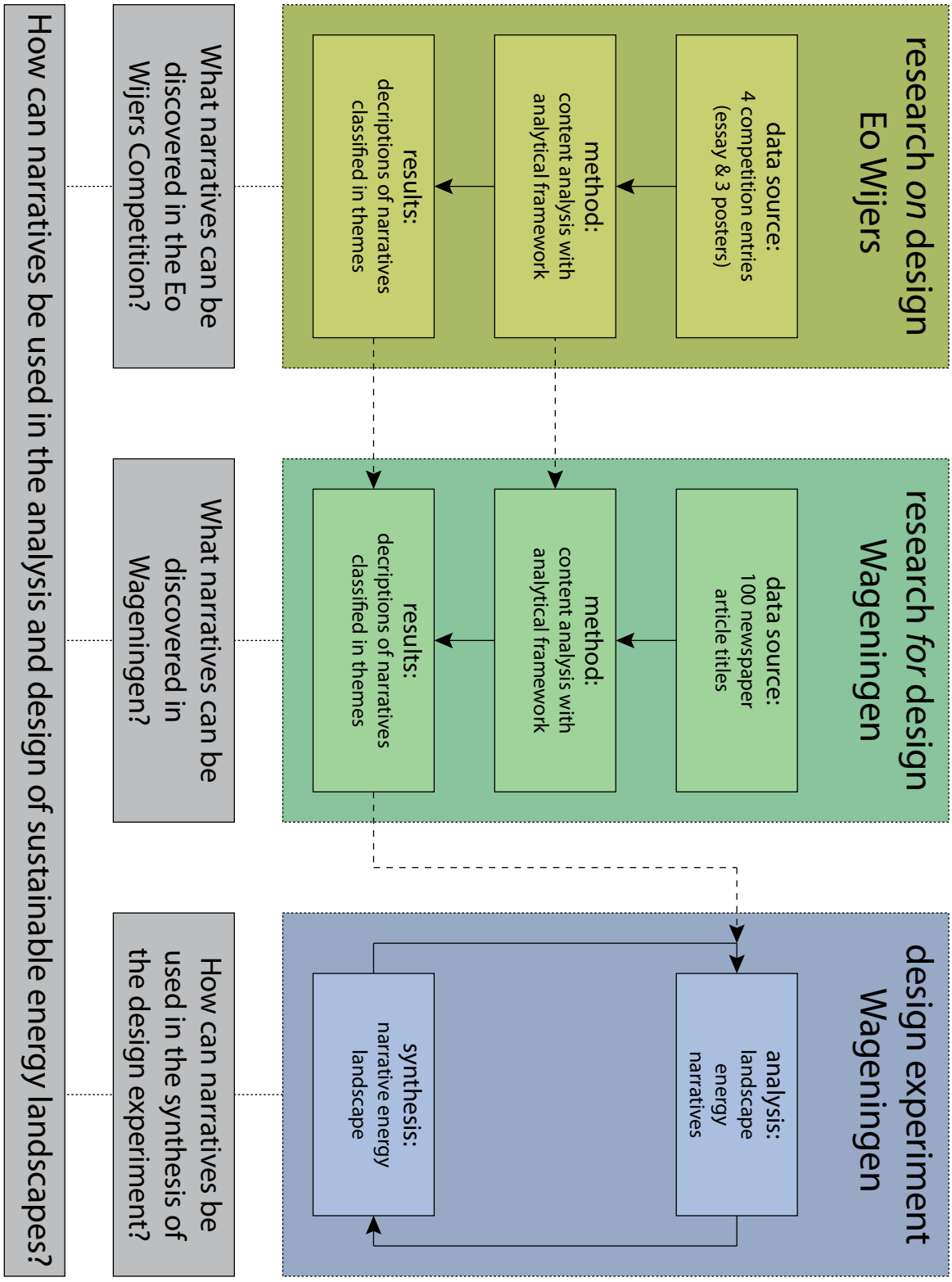
For the reference study the Eo Wijers Competition 2011-2012 was used as data source. This competition is a prestigious competition for landscape architecture in the Netherlands and organised about every two years. The 9th edition focused on the Veenkolononiën, a rural region in the north of the Netherlands. The official assignment for the competition was formulated as follow:

> *A. "Ontwikkel een methodiek voor duurzame waardecreatie om te komen tot 'regionale comfortzones' in de Veenkoloniën. Benut daarbij de identiteit en uniciteit van het gebied en de kansen in het energie-, landbouw- en watersysteem om de onafhankelijkheid en de kracht van bewoners en het gebied te vergroten". [English: "Develop a methodology for sustainable value creation in order to come up with a 'regional comfort zone' in the Veenkolonieën. For this utilise the identity and uniqueness of the area, and the opportunities in energy system, agricultural system and water system to increase the independence and force of the inhabitants and the area"].*
>
> *B. "Ga uit van de verhalen en ervaringen van de bewoners en gebruikers. Betrek deze nadrukkelijk in de ontwikkeling van de methodiek". [English: "Reason from the stories and experiences of the inhabitants and users. Involve these explicitly in the development of the methodology"].*
>
> *C. "Onderzoek en verbeeld uw ideeën over de mogelijke uitkomsten van de methodiek op drie schaalniveaus." [English: "Study and represent your ideas on the possible outcomes of the methodology on three scale levels"][Eo Wijers-stichting, 2011].*

The competition is relevant because the assignments explicitly requests the design of an energy system, and involvement of stories and experiences into a landscape design on different scales. In total 36 multi-disciplinary teams delivered an entry for the competition. Every entry consists of an essay, three posters and a free form.

With a quick scan and plan analysis of Kempenaar, et. al. four of total 36 entries have been selected for this study. Studying only four entries makes it possible to study the entries in detail and at the same moment have variety of entries included. These four entries have substantial information about the interaction between landscape and energy system and they present the variety of the entries [Kempenaar, et. al., 2012]. For this study the essays and posters will be analysed. The free form will not be analysed because these are very different in form, which makes comparison complex.

Figure 3.1
Research approach

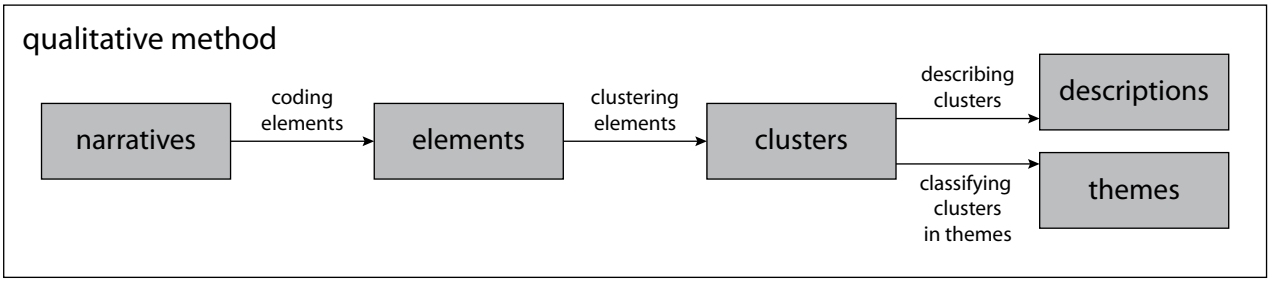


The four entries of which posters and essay are studied:

- *'Wat weet een boer van saffraan' (WWBS)*
- *'7sprong' (7s)*
- *'Verborgen kracht - Veenkoloniën 3.0' (VK 3.0)*
- *'Boeren, burgers buitenlui' (BBB)*

For studying the narratives in both posters and essays basically the qualitative approach as described by Creswell is used. With a qualitative approach concepts and phenomena for which variables and theories are unknown can be explored [Creswell, 2009]. Because this is the case for analysing narratives in the data of the reference study, a qualitative approach has been chosen. Investigators can have a theoretical lens to examine the concept of phenomenon [Creswell, 2009]. In the this study the analytical framework is that theoretical lens. Codes can emerge from the data, can be predetermined or a combination of both. Predetermined codes are mostly used to examine a theory, in this study this is the case the analytical framework. The eight elements in the analytical framework will be used as the predetermined codes. A traditional 'marker and paper' approach is used, because that is sufficient for this task. The final results of the process are 'descriptions', which are classified in several 'themes' [Creswell, 2009]. The following five steps are used ***(see figure 3.2)***:

Figure 3.2
Qualitative method used in this study [Creswell, 2009].



- *Step 1:* Getting overview: In this step has been read through all data for understanding the main idea of the competition entries.
- *Step 2:* Coding 'elements' in the data: In this step data is identified as being part of a narrative. This gives a systematic overview of the interpretation of the researcher. This results in a large number of 'elements', data that qualified for being one of the eight predefined codes as defined in the analytical framework.
- *Step 3:* Clustering 'elements': In this step the 'elements' recognised as being part of the same narrative are grouped together. The result are coherent groups of 'elements', the so-called 'clusters'.
- *Step 4:* Describing the 'clusters': In this step the 'clusters' are described in a short summary, the so-called 'descriptions'. The 'descriptions' are case specific results, that cannot be understood without the context of people and landscape in the region.
- *Step 5:* Classifying the 'clusters' into 'themes': The 'clusters' are classified into five to seven heading, the so-called 'themes'. These 'themes' are main findings are potentially applicable for different cases.

First the essays of all entries are studied one by one and then the posters one by one, because the essays only consisted of text and this is essayer to interpret than images. Steps were sometimes reviewed on a later moment with new insights or a fresh mind. Although the basic steps followed for both essays and posters were equal, a small adaptation has been made to the first step that differentiate the analysis of posters and essays. These adaptations were needed because the text and image demand a different approach.
In the first step for the posters notes (conversion to text) were made of the potential elements recognised in the images. With these the other steps could be performed equally. With the sequence of analysis (first essays than posters) made it possible to recognise the potential elements. A complexity with narratives is that characters, events and settings cannot exist without each other, because separately the elements does not mean anything. To overcome this problem in the third step notes were made from the elements, mostly originating from one sentence in the essay, to keep them together. These notes were grouped afterwards. With new insights on organising the data this was not needed anymore with the analysis of the posters. Although these small adaptations appeared to be necessary, the influence on the results of adaptations is limited.

3.3 Methods for finding narratives in Wageningen

For studying the relevant topics about the energy transition newspapers have been used as data source, because these are representative for the social issues in a community and it is an accessible source which seems to be commonly used in social sciences to study this social issues in communities. The newsworthiness of an issue depending on the cultural proximity, because the readers are more interested in issues in events happening in their close environment [Yasmeen, et al., 2014]. So regional newspaper seems to be an interesting data source for the local issues. Especially headlines are interesting, because readers are too busy and only read the headlines. Authors facilitate this by covering main messages in the headlines, and so these are representative for the social issues in a community [Yasmeen, et al., 2014]. Because there is also no design process involved, analysis and synthesis are not applicable for this. From the newspaper only characters, events and settings can be determined, because the telling is the newspaper itself. For searching articles the database Lexus Nexus is used, a database that includes articles of most Dutch national and regional newspapers. As search period is been used 01-01-2008 up to 01-09-2013. This period is sufficient to understand the recent narratives and development of those over the last years. The following search terms are being used:

- *Wageningen duurzame energie [English: Wageningen sustainable energy];*
- *Wageningen klimaatneutraal [English: Wageningen climate neutral];*
- *Wageningen windmolens [English: Wageningen wind turbines];*
- *Wageningen windenergie [English: Wageningen wind energy];*
- *Wageningen zonne-energie [English: Wageningen solar energy];*
- *Wageningen biomassa energie [English: Wageningen biomass energy];*

- *Wageningen biogas energie [English: Wageningen bio gas energy];*
- *Wageningen energiecentrale [English: Wageningen energy plant].*

The search with these conditions resulted in 95 newspapers articles that concerned the energy transition in Wageningen. The headlines have been used for the analysis, because these explain the main message. This enables analysing all articles. Although only titles are being used, the articles are being read in the first step to help understand the sometimes complex meaning of titles. For analysing the headlines the same basic steps have been used as in the reference study (described above). The steps result in descriptions, which are classified in themes. For the classification in themes, the themes of the reference study have been used.

3.4 Methods for the design experiment Wageningen

For the design, a simplified version of the five-step approach has been used. Because the approach does not have a lot of attention for narratives, an analysis of this is added. Though the approach is time consuming, in special the scenario building. In the design experiment analysis of the energy system, landscape and narratives will be used. The analysis of the energy system and landscape are already part of the approach. The narrative analysis is added to enable answering the sub research question for this part.

For the analysis of the landscape a layer approach is used, as described in the theoretical framework. This helps to understand the landscape characteristics, opportunities and challenges. Literature and maps are used to perform this analysis. Different types of maps have been studied:

- topographic map;
- soil map;
- map of altitudes;
- historical maps.

For the analysis of the system a combination of methods is used. The trias energetic is utelised to systematically understand the potentials for a future energy system. Energy Potential Mapping is used to understand the impact on the landscape of the different technologies for generating renewable energy in relation to their potential to supply. Both these methods are being described in the theoretical framework *(see p.20 for trias energetica and p.22 for Energy Potential Mapping).* Literature is used to study the energy system and the impact on the landscape.

Picture: Renée de Waal

Part 2: Research *on* design Eo Wijers Competition

In the second part of the study the reference study on the Eo Wijers competition will be discussed and includes three chapters. A research *on* design approach is used for the reference study. In fourth chapter the results of the analysis will be presented and in the fifth chapter conclusions will be made up. Those conclusions will be taken to the following parts of the study. The research question for the reference study is:

- *What narratives can be discovered in the Eo Wijers Competition? (1)*

4. Results: narratives in the Eo Wijers Competition

The results of the research *on* designs will be presented in this chapter. Four competition entries of the Eo Wijers Competition on the Veenkoloniën are studied with a qualitative approach as introduced in the first part.

The analytical framework enabled the identification of a large amount of elements in the different competition entries. It appeared that these elements could be grouped into five to ten clusters per competition entry and that these clusters could be classified in five themes: economy, landscape, energy, communication and society. In the tables below an overview of the results per competition entry will be given and every competition entry will be resumed, in order to help understanding the results. The attachments include the original data and the different steps of the content analysis ***(see attachments)***. The four entries of which posters and essay were studied:

- *'Wat weet een boer van saffraan' (WWBS)* ***(see figure 4.1 & 4.2)***
- *'7sprong' (7S)* ***(see figure 4.3 & 4.4)***
- *'Verborgen kracht - Veenkoloniën 3.0' (VK 3.0)* ***(see figure 4.5 & 4.6)***
- *'Boeren, burgers buitenlui' (BBB)* ***(see figure 4.7 & 4.8)***

Based on the presented table nothing can be said about the strength of either clusters or themes within one competition entry. Some of the descriptions are based on a large cluster of elements, but others on a rather small cluster. With the use of the 'paper and marker' approach the size of the clusters has not been quantified. The appearing frequency of the elements has not been counted. Though from intuitive perspective something can be said about it. In *'Wat weet een boer van saffraan'* (WWBS) the descriptions in the energy theme are important, but descriptions in the communication theme was completely absent. For *'7sprong'* (7S) the descriptions in the economy theme have a lot of emphasis, but the descriptions in the communication theme are weak. In *'Verborgen kracht - Veenkoloniën 3.0' (*VK3.0) the attention for the different themes have most balanced importance, though the descriptions in the society themes have quite some attention. Finally *'Boeren, burgers en buitenlui' (*BBB) has an emphasis on the descriptions in the communication theme.

In most cases the essays and posters are presenting different descriptions. Sometimes it appears that the designers have different purposes with the posters and essay and so present different or more clusters. Though mostly clusters are present in posters and essays, sometimes with the same message in other terms.

Resume 'Wat weet een boer van saffraan' (WWBS)

The designers stimulate farmers, as being vital force in the area, to transform to dynamic entrepreneurs, being the driving forces behind social economic and landscape transformation in the area. Their farms are transformed to 'energy barnyards', which are the centre of those developments. Farmers start to generate renewable energy and via 'energy companies' both farmers and local users can benefit from that financially. On the 'energy barnyards' also facilities and social activities are developed by the 'bionier', the farmer with its new tasks. The barnyards are expanding, respecting the landscape characteristics and have different typologies in the several parts of the Veenkoloniën. The barnyards become ingenious by matching social and energy demands. Their strength is further developed with thematic differentiation, e.g. focusing on health. All together this will create an attractive landscape, in which social, economic and renewable energy are generated [Eo Wijers-stichting, 2011].

Figure 4.1
Posters of 'Wat weet een boer van saffraan' (WWBS) [Eo Wijers-stichting, 2011].

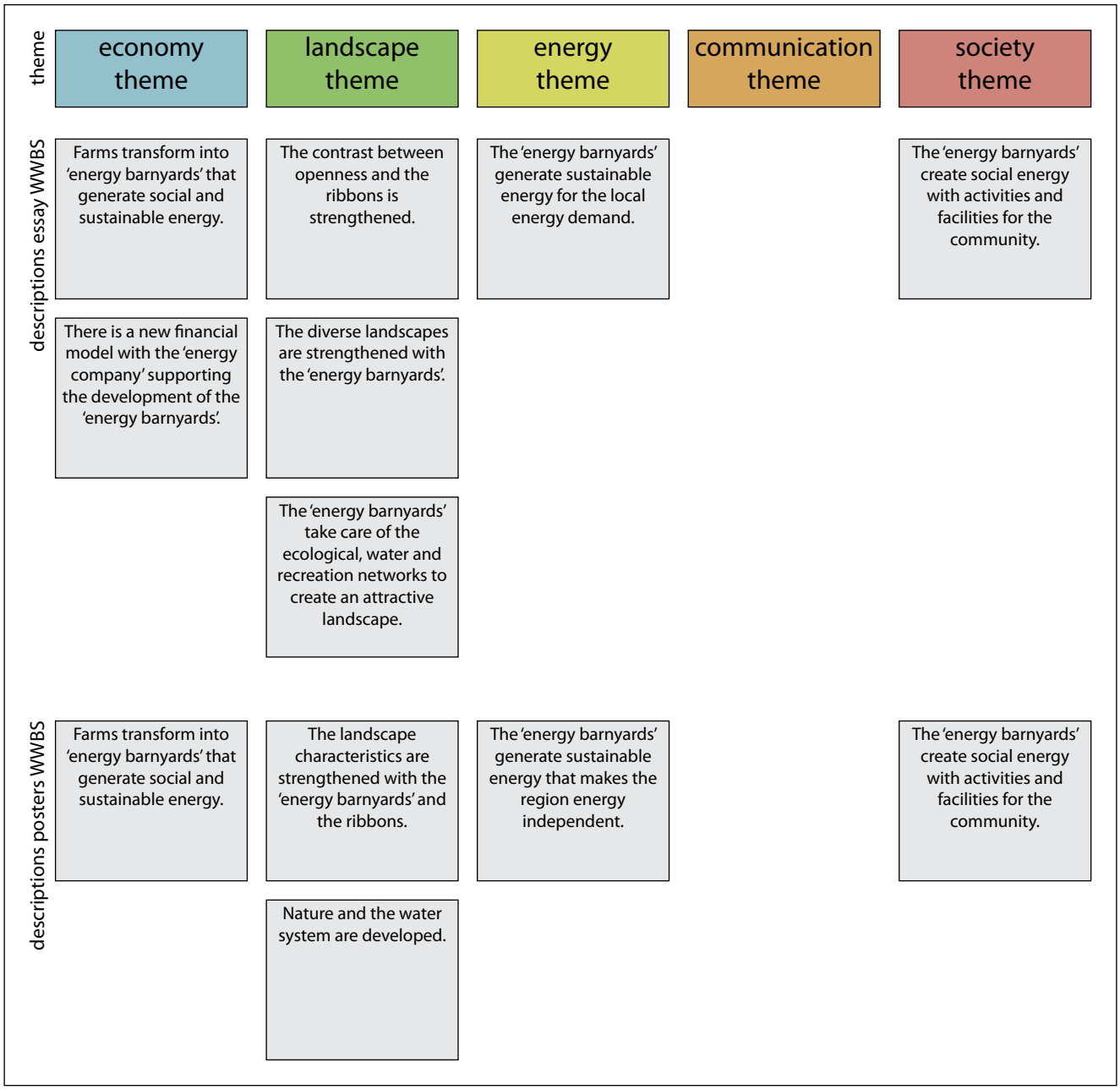


Figure 4.2
Descriptions of clusters, classified in themes in posters and essays of WWBS.

Resume '7Sprong' (7S)

Farmers are afraid that the EU agricultural subsidies will disappear and the citizens fear increasing costs and decreasing incomes. The sense of urgency and the entrepreneurial minds unite farmers and citizens in consumer-producer collectives. The EU agricultural subsidies will be maintained by using 7% of the agricultural plots for social purposes. Farmers will have new tasks, like energy generation and nature conservation, creating a new model of earning. Together farmers and citizens take care of the plots for social purposes; functions (like care, education, recreation) are combined. The landscape is attractive, because at the plots for social purpose a small scale landscape is developed. For the rest of the plots the function separation is continued, resulting in more efficiency. Energy is generated and consumed locally. Also citizens benefit from the collectives, because the local economy is keeping costs low and offers opportunities for new income. A good living climate is established [Eo Wijers-stichting, 2011].

Figure 4.3
Posters of '7Sprong' (7s) [Eo Wijers-stichting, 2011].

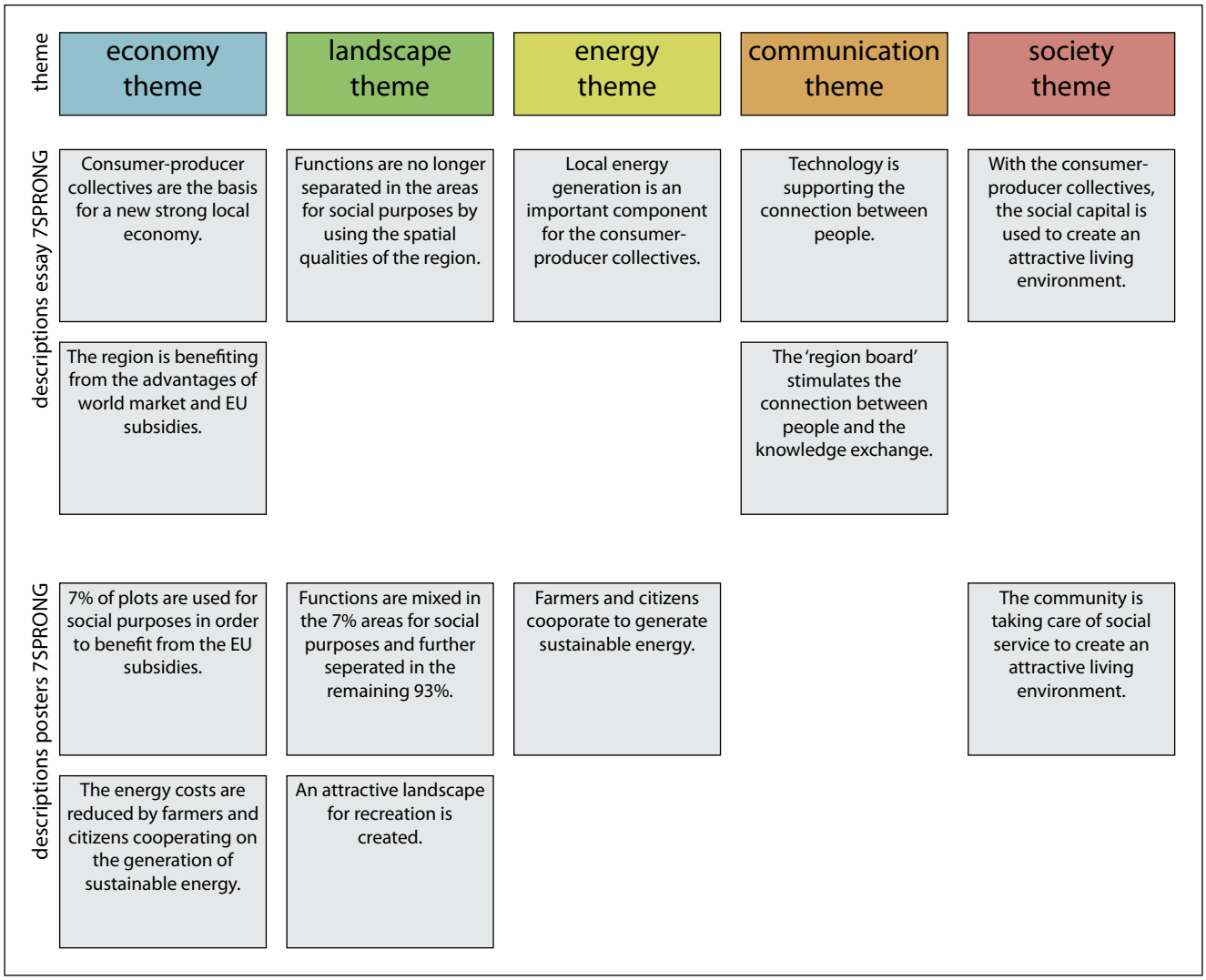


Figure 4.4
Descriptions of clusters, classified in themes in posters and essays of 7s.

Resume 'Verborgen kracht - Veenkoloniën 3.0' (VK 3.0)

In the past the Veenkoloniën have been a rich source of energy, but nowadays it has become completely dependent on fossil fuels and EU subsidies. The entry is focusing on rediscovering the hidden powers of the area by creating new energy and agricultural independence. The local and regional scale are connected in order to support the development of Veenkoloniën 3.0 and to create a bio based economy. The unicity and proudness of the locals is used to do this with local companies. The region is dealing with demographic shrinkage, but an attractive living climate is stimulated with suitable housing, facilities arranged on a regional scale and higher education on energy technologies in the region. Stakeholders have to be involved in the development of a vision, connected to each other and inspired with by project outside the region [Eo Wijers-stichting, 2011].

Figure 4.5
Posters of 'Verborgen kracht - Veenkoloniën 3.0' (VK 3.0) [Eo Wijers-stichting, 2011].

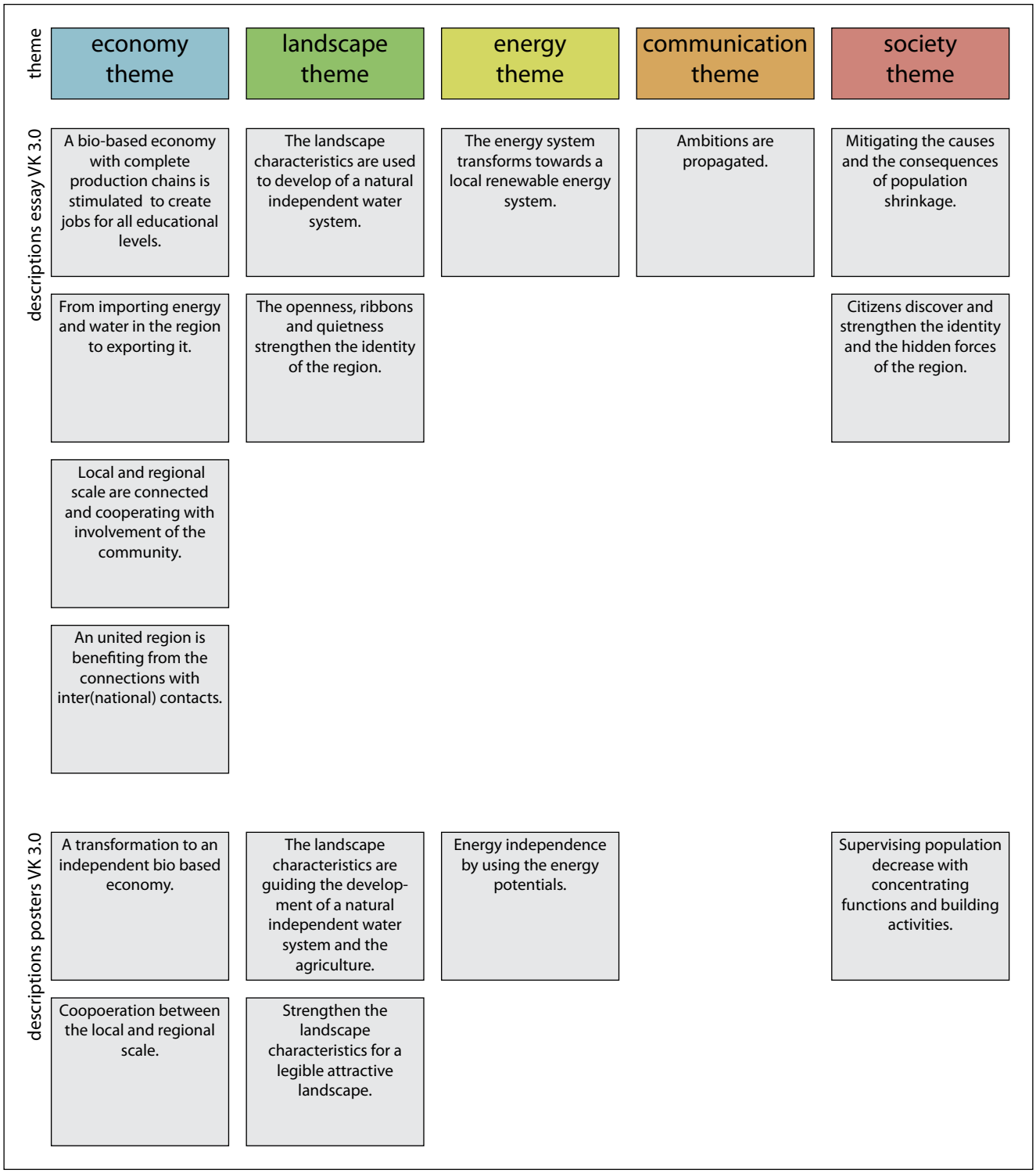


Figure 4.6
Descriptions of clusters, classified in themes in posters and essays of VK 3.0.

Resume 'Boeren, burgers en buitenlui' (BBB)

The Veenkoloniën are characterised by rest, space and geniality. It is a production landscape, supporting the city. Increasingly the city is attracting more people and request higher production from the rural areas. The human scale and young people are disappearing in the Veenkoloniën. The demographic shrinkage is seen as a chance for the area. The inhabitants are in general proud of descent and the landscape characteristics in the area. Their entrepreneurship has to be used, to keep young people in the area. Opportunities have to offered to develop a businesses on generating energy, in cooperation with villagers. The role of designers is limited, because a strategy is needed in which inhabitants support and execute the plans themselves. They have the main role in the story of the transformation process, which is presented in a cartoon. The traveling carnival (Index) and a digital interactive map support the transformation process. The aim is to connect energy cycles by local initiatives, using the entrepreneurial skills of the inhabitants, creating metabolism. Not only energy cycles, but also social and economic cycles have to be involved. Exchange appears at the notes of the different cycles. This creates an attractive environment based on public support [Eo Wijers-stichting, 2011].

Figure 4.7
Posters of 'Boeren, burgers en Buitenlui' (BBB) [Eo Wijers-stichting, 2011].

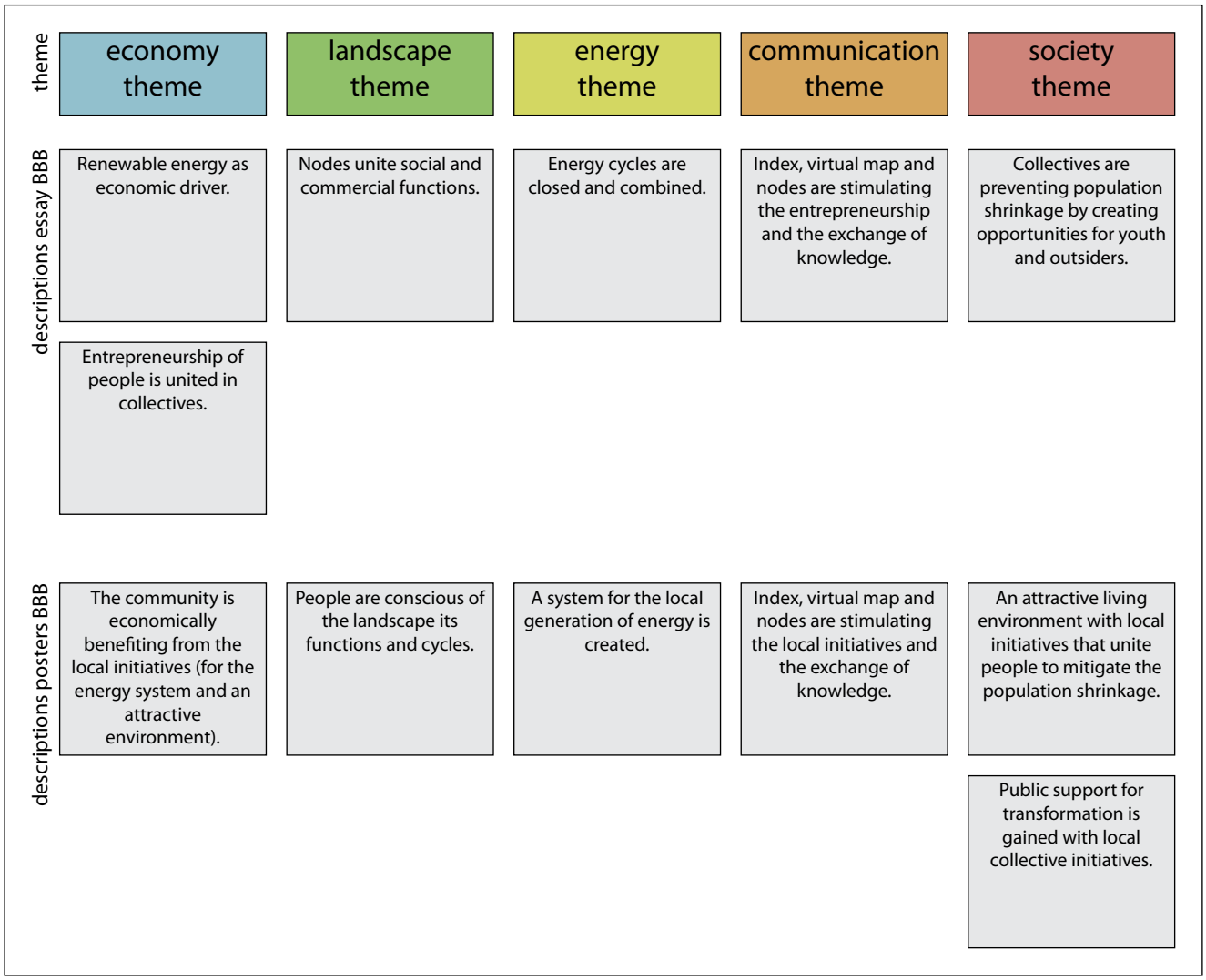
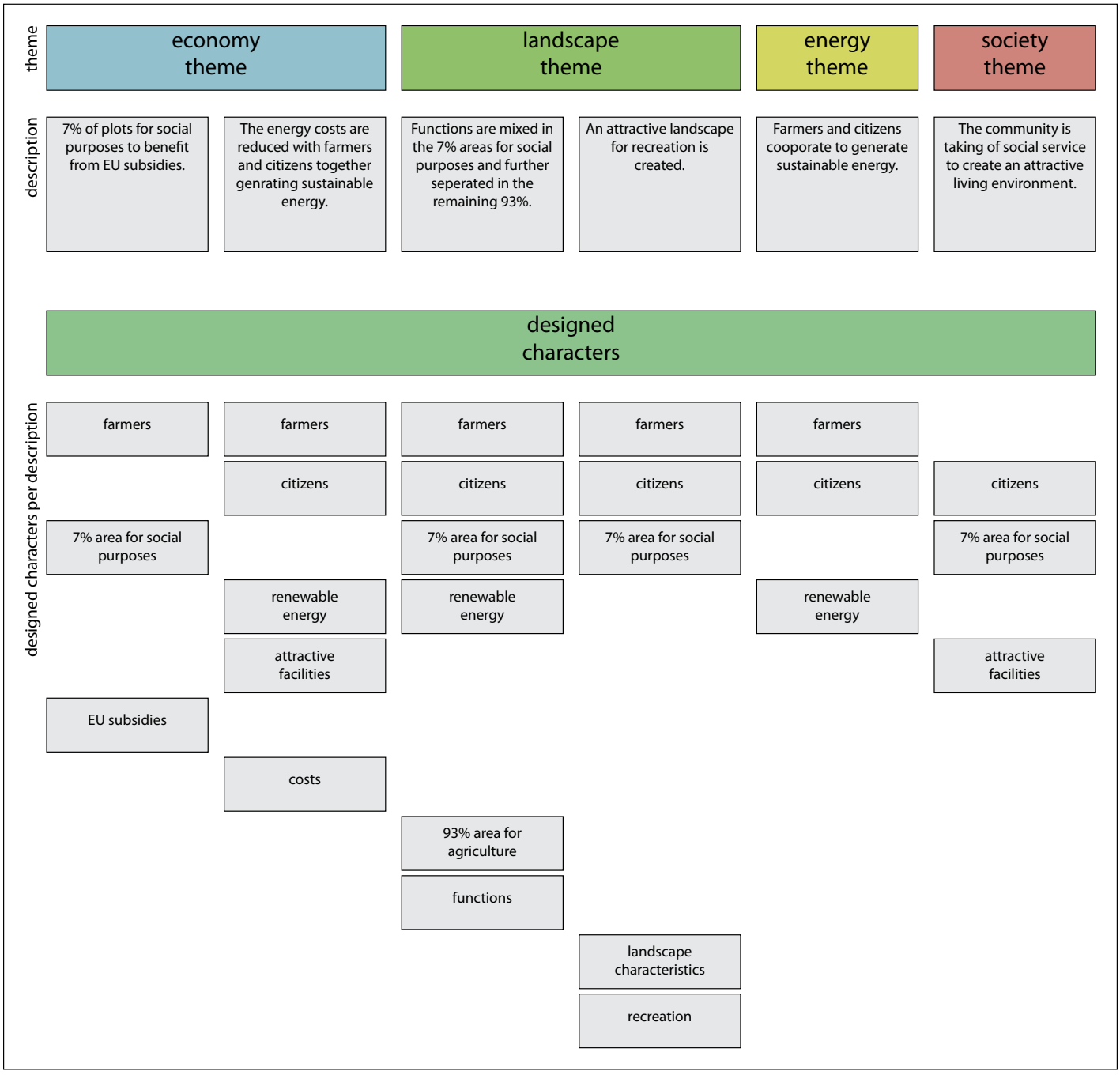


Figure 4.8
Descriptions of clusters, classified in themes in posters and essays of BBB.

Important characters and events per competition entry cannot be identified with the used 'paper and marker' approach, because the method does not enable to quantify data easily. Though from intuitive perspective something can be said about it. Most competition entries used a few characters and events that appeared in several clusters. With this connection of clusters, the clusters strengthened each other. Good examples of such characters are the 'energy barnyard' in WWBS and the 'farmers' in 7sprong, that are having roles in a variety of clusters and themes ***(see figure 4.9)***.

Figure 4.9
Example of characters in the posters of 7sporng appearing in different clusters and themes.



5. Conclusion: narratives in the Eo Wijers Competition

In this chapter the conclusions of the second part in this study will be discussed. The research question for this part is:

- *What narratives can be discovered in the Eo Wijers Competition? (1)*

A large number of clusters has been identified that could be classified in five themes: economy, landscape, energy, communication and society. Based on the descriptions the 'themes' have been defined as follows:

- *Economy theme:* Working of the system income and costs for individuals and regions, in both money and goods, and working of economic system on a regional scale/scale in relation to other scales.
- *Landscape theme:* Working of systems in the landscape (like water, recreation and ecology) and the role of characteristic elements and functions in the landscape.
- *Energy theme:* Working of the system of energy generation and energy consumption
- *Communication theme:* Working of communication systems between different individuals/stakeholders in the region and the tools/technology used for this.
- *Society theme:* Working of social systems, in special working of services, facilities and activities for an attractive environment, social cohesion or strengthening the identity.

These findings are in line with the findings of Curran's *"Feasibility, security, cost and employment are central elements of a country's energy profile and hence critical considerations in the design of its energy plans"* [Curran, 2012]. The themes ("main narratives" for Curran) for shaping renewable energy narratives that Curran has identified, have a strong relation with the 'themes' in this study. "Feasibility" is an expression of society and energy theme; gaining public support for energy transition. "Security" is clearly concerning the energy theme; enough energy for the future. "Cost" concerns mainly an part of economy theme, but can also be seen as part of landscape theme (costs for environment/earth). Finally "employment" is related to the society and the economy theme; having a job and its impact on the economy. Curran has less attention for landscape narratives, but Curran is not having a spatial/landscape background. The five themes are potentially applicable for other cases on design of sustainable narrative energy landscapes. Although the results are promising the analytical framework and methods include still some difficulties.

Although results cannot be quantified, from intuitive perspective two important conclusions are formulated. Characters appearing in different clusters and themes are connecting and strengthening stories. The connection of different stories made them more credible. Also it appeared that clusters include mostly incomplete narratives by only mentioning characters and events. Characters and events are the most essential elements for a story; settings can be used more implicitly. These are interesting conclusions in special to take into account for the design experiment.

Part 3: Research *for* design Wageningen

In the third part of the study the results of the research *for* design will be discussed. The design case is the municipality of Wageningen. The research *for* design is aiming to discover narratives on the energy transition in Wageningen. In chapter six the results of the analysis will be presented and in the chapter seven conclusions will be formulated. Those conclusions will be taken to the design, that is presented in the following part. The research question for this part is:

- *What narratives can be discovered in Wageningen? (2)*

6. Results: narratives in Wageningen

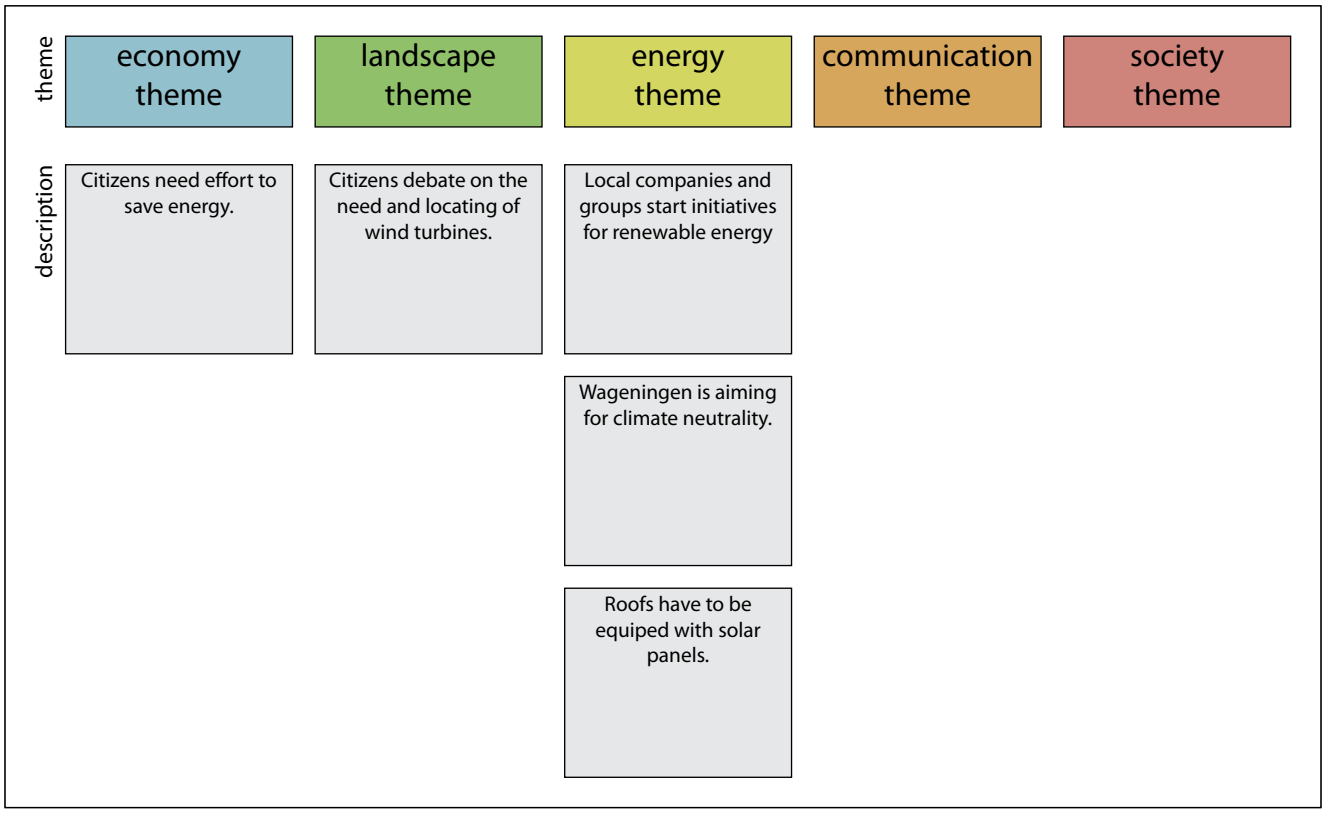
The results of the research *for* design will be summarised in this chapter. To help understanding the results examples of newspaper headlines are presented as well.

From the newspaper headlines five clusters appeared. Descriptions have also been formulated for these clusters, as can be seen in the figure below (see figure). Abstracting themes from only five clusters is not possible, though the clusters could be classified in three of the five themes, that have been discovered in the reference study on the Eo Wijers Competition ***(see figure 6.1)***. The attachments includes the original data and the different steps of the content analysis ***(see attachments)***. The number of clusteres is limited, because the amount of data was either limited.

'Citizens need effort to save energy': This cluster concerns the system working of income and costs of individuals and so can be classified in the economy theme. Five examples of headlines in this cluster:

- *" 'De meeste architecten hebben geen lef; ze durven het gevecht niet meer aan' " [English: Most architects have no guts; they do not dare to take part in the fight anymore]*

Figure 6.1
Narratives in Wageningen.



- *"Nieuwe subsidieregeling - Energie sparen met de buren"* *[English: New subsidy schemes – Energy saving with the neighbours]*
- *"Een stap verder dan energie besparen alleen"* *[English: A step further than energy saving alone]*
- *" 'Heel veel enthousiasme bij deelnemers' - wonen 2.0"* *[English: 'A lot of enthusiasm among participants' – living 2.0]*
- *"Energieneutraal kost tienduizenden"* *[English: Energy neutral costs ten thousands]*

'Citizens debate on the need and location of wind turbines': This cluster concerns working of the energy system in the landscape and so can be classified in the landscape theme. Five examples of headlines in this cluster:

- *"70 procent voor molens bij haven"* *[English: 70 percent for turbines at harbour]*
- *" 'Windmolens ja, maar niet in bos' "* *[English: 'Wind turbines yes, but not in forest']*
- *"Betuwse Wageningers vrezen dat zij met windmolens worden opgescheept"* *[English: Wageningers in Betuwe are afraid they will be saddled with wind turbines]*
- *"Eerst wel en dan weer geen windmolens in Wageningen"* *[English: First wind turbines would come in Wageningen, but now not anymore]*
- *"Kou uit de lucht, maar taboe blijft op molens"* *[English: Relation resolved, but the turbines stay taboo]*

'Local companies & groups start initiatives for sustainable energy': This cluster concerns system working of energy generation and energy consumption and so can be classified in the energy theme. Five examples of headlines in this cluster:

- *"Het energiebedrijf, dat is de Vallei zelf"* *[English: The energy company, that is the Valley itself]*
- *" 'Zwembad stoken op snoeihout' "* *[English: Prune wood to heat the swimming pool]*
- *"Alternatieve energiebronnen bij nieuwbouw - Stadsgracht als bron van verwarming"* *[English: Alternative energy sources in new buildings – City canals as sources of heating]*
- *"Warmtenet bedient de hele regio"* *[English: Heat network serving whole region]*
- *"Tankstation groengas bij Nudepark"* *[English: Green gas station at Nudepark]*

'Wageningen is aiming for climate neutrality': In Wageningen climate neutrality is an issue in newspapers and for politicians, but in the Veenkoloniën this was not the case. The design assignment in the Veenkoloniën this was not mentioned and this did not appear to be an issue for that community.

Climate neutrality has major impact on the working of the energy system, so this cluster has a strong relation with the energy theme. Five examples of headlines in this cluster:

- *"Tips aan Wageningers om energie te besparen"* *[English: Hints for Wageningen inhabitants to save energy]*
- *"Wageningen op zoek naar beste klimaatidee"* *[English: Wageningen searching for best climate idea]*
- *" 'Gemeente klimaatneutraal in 2030' "* *[English: 'Municipality climate neutral in 2030"]*
- *"Beleid milieu onbekend"* *[English: Environmental policy unknown]*
- *"door Stella Efde - Trots op inspanningen voor het milieu"* *[English: by Stella Efde - Proud on efforts for environment]*

'Roofs have to be equipped with solar panels': The active attempts to stimulate and force implementation of solar panels of the municipality are appearing. It is mostly related to proper working of the energy system and so is classified into the energy theme. Five examples of headlines in this cluster:

- *"Zonatlas voor Wageningse daken"* *[English: Solar atlas for roofs Wageningen]*
- *"Wageningen is Solar City 2013"* *[English: Wageningen is Solar City 2013]*
- *" 'Wat krijg ik nou op mijn dak?' - Acht ton voor zonnepanelen"* *[English: 'What is happening on my roof?' – Eight hundred thousand euros for solar panels]*
- *"30.000 vierkante meter zonnepanelen"* *[English: 30.000 square metre solar panels]*
- *" 'Zonnepanelen verplicht bouwen' "* *[English: 'Obligation to build solar panels']*

From the last description can clearly be seen that the author of the narrative is important. In the case of the solar panels and climate neutrality the municipality is the author of the narratives. In the other tree clusters citizens are much more the author.

Also the size of the clusters is varying. The clusters on solar panels and wind turbines are pretty large. These topics have been major issues in the newspaper in the last years. The other three clusters are rather small and got less attention ***(see figure 6.2)***.

Figure 6.2
Narratives in Wageningen.

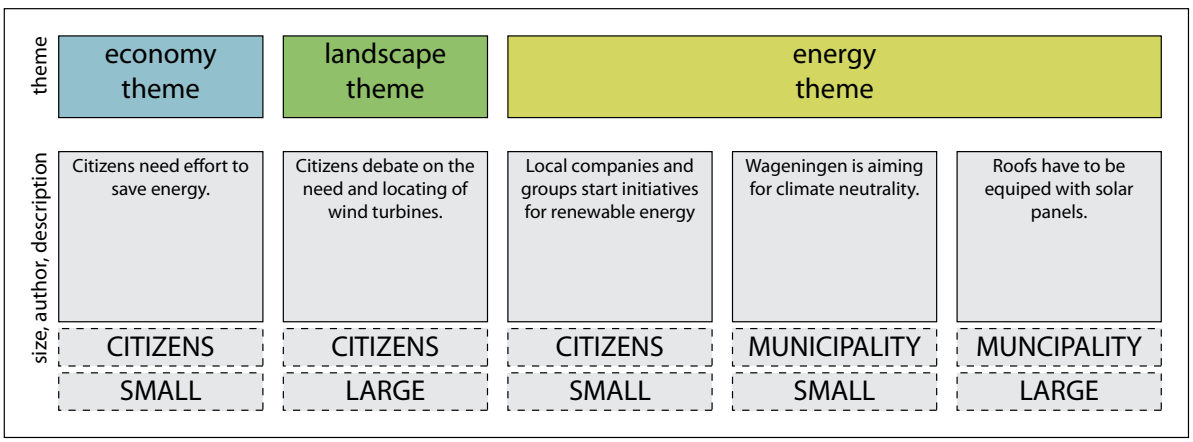
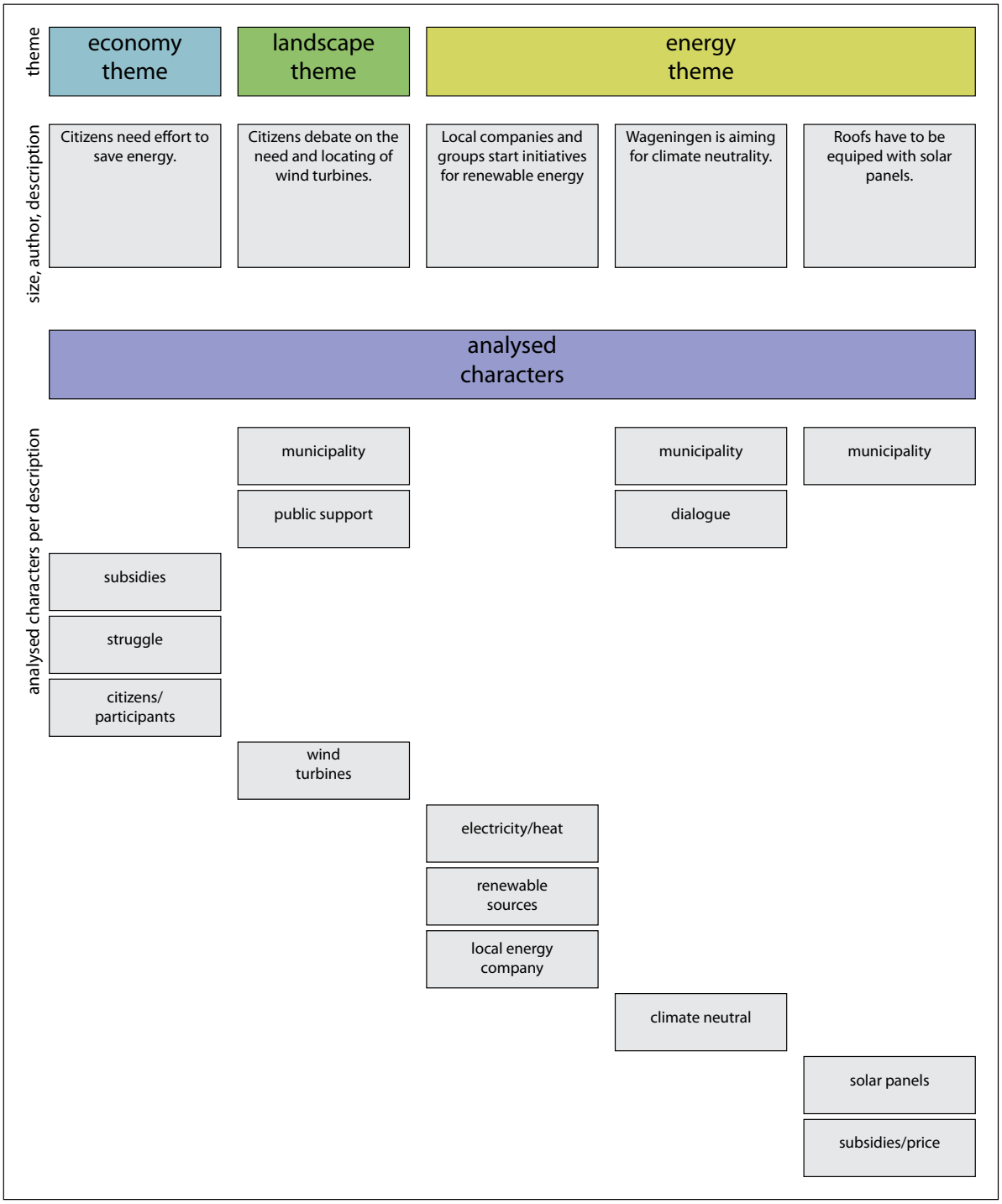


Figure 6.3
Example of characters not appearing in different clusters and themes in Wageningen.

In the reference study on the Eo Wijers Competition it appeared that characters being present and connecting different clusters and themes strengthen the narrative. For Wageningen this structure is not clearly present in the different clusters and themes. The clusters are much more standing alone ***(see figure 6.3)***.



7. Conclusion: narratives in Wageningen

This chapter includes the conclusion of the second part in this study. The research question was formulated as:

- *What narratives can be discovered in Wageningen? (2)*

Five clusters have been discovered that could be classified in the economy, landscape and energy theme. The communication and society theme, which were discovered in the reference study as well, were not present in Wageningen.

Newspapers have a lot of attention for the implementation of specific energy technologies, like solar panels and wind turbines. This attention for solar panels and wind turbines is clearly seen in the size of those clusters, which were much larger than the other clusters.

The larger story around these specific energy technologies appears to be missing. In case of the wind turbines, the public debate does almost not concern anymore the economic benefits and working of the energy system. Debate is completely focussing on the landscape impact. In the Eo Wijers Competition it was concluded that characters appearing in different clusters and themes strengthening the stories. This structure did not appear in the results of the Wageningen case; the clusters seems to be less connected. For example solar panels and wind turbines are not constantly linked to climate neutrality or economic benefits. For the design experiment it would be interesting to transform this into the structure, as seen in the Eo Wijers Competition.

Also interesting is to see that the author of the clusters is important to study. In the case of Wageningen for some clusters (climate neutrality and solar panels) the municipality was the author. The municipality may see a role for citizens in their story, though citizens does not automatically experience this. In the other clusters, the citizens were the authors, but the role for the municipality was marginal in those. The municipality is having ideas about linking for example wind turbines to local economic benefits, but is not able to communicate this to the citizens through newspapers. Municipality and citizens should be co-authors for creating narrative, in which both taking part, supporting the energy transition.

Newspaper headlines are a proper source for identifying important social issues in the community, though interpreting the public opinion on these social issues is harder. Because it is influenced by the opinion of journalists and the ideology of newspapers. However journalist write only about social issues that people really matter to make an attractive newspaper for people. Politicians are aware of the importance of the wind turbines for citizens. In the

new coalition agreement of spring 2014 a binding referendum is promised to the citizens to make the final decision about the wind turbines [Gemeente Wageningen, 2014]. During the study I also informally talked with citizens of Wageningen and almost everyone started discussing the wind turbines, but few citizens know that Wageningen wants to become climate neutral. Most inhabitants of Wageningen are aware of the possible wind turbines, but their opinions on the issue are not similar.

Part 4: Design experiment Wageningen

The aim for the design experiment is to explore the potential for the analytical framework of being a design tool, because the analytical framework could also be instructive for designers. A landscape design is made, to see whether narrative can be of use in a design process, based on the research results and including renewable energy technologies with a major impact on the landscape. First an analysis of the landscape, energy system and narrative is made. Also there will be reflected on the design. The design question for this part is:

- *How can narratives be used in the synthesis of in the design experiment? (3)*

8. Analysis: landscape

Figure 8.1
Wageningen, located on the edge of the Veluwe and along the Rhine river.

For the analysis of the landscape the layer approach has been used, as introduced in the methods section. The results of that is a description of the different landscape types in the area with its characteristics.

8.1 Landscape types

Wageningen has a large variety of landscape types, which a quality of the area. In the municipality, river, sand and peat landscapes can been found. The large variety has a strong relation with the geomorphology of the area. The city is located on the edge of the Veluwe and along the Rhine river ***(see figure 8.1)***. A story on the history of the university, which was focusing on agricultural education, explains that Wageningen was chosen as location, because of the large variety of soil types [Gast, et. al., 2013]. Six landscape types can be distinguished in the municipality ***(see figure 8.2 & 8.3)***:

- *moraine;*
- *moraine flank;*
- *transition zone;*
- *basin;*
- *levees;*
- *floodplains.*

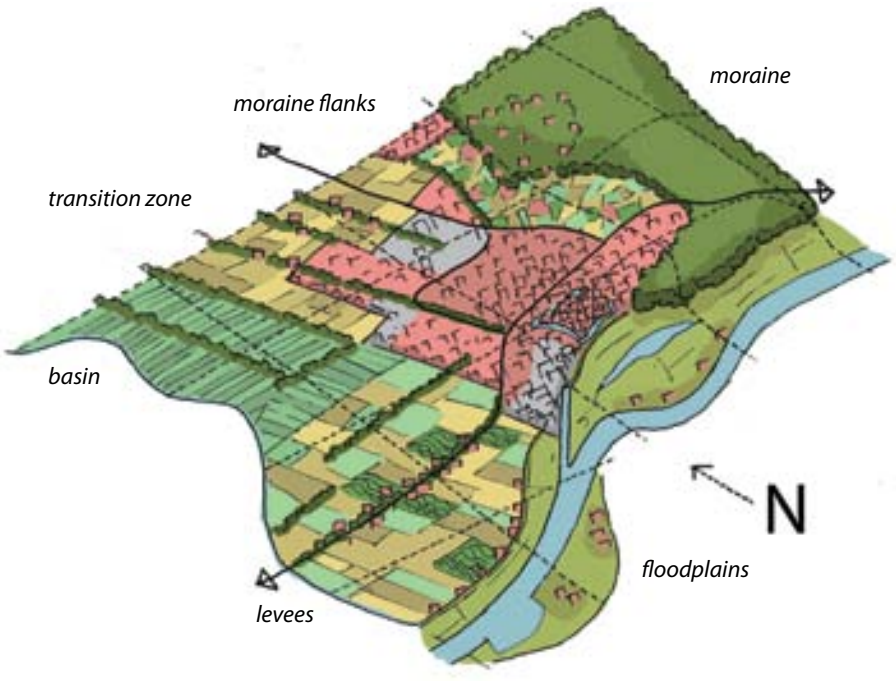


Figure 8.2
Bird's eye view of the Wageningen muncipality with the six landscape types.

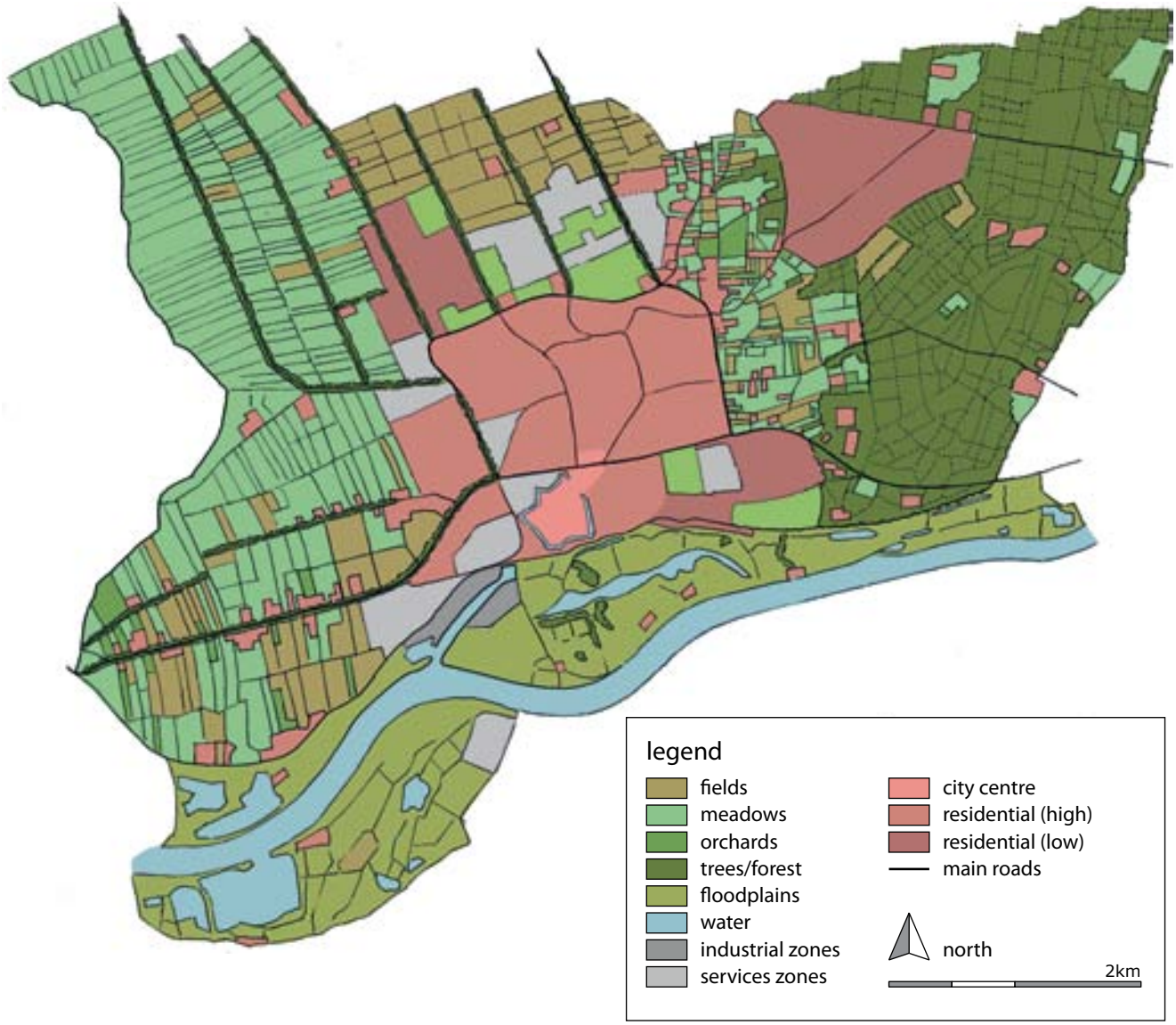


Figure 8.3
Overview municipality Wageningen

Figure 8.4
Location landscape type moraine.

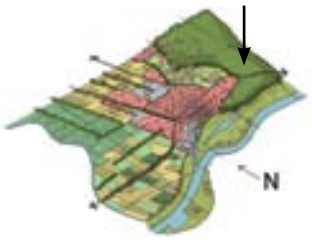
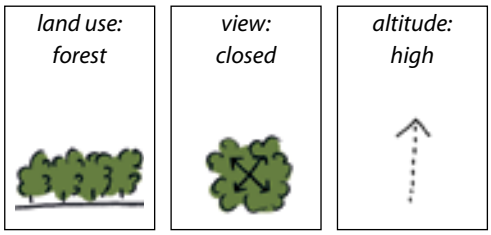


Figure 8.5
Landscape characteristics of the moraine.



Moraine (see figure 8.4 & 8.5)

During the Saalien (an ice age about 150.00 years ago), land ice was covering the Northern part of the Netherlands (and the rest of Europe). With the land ice, soil was pushed towards the South. The remainings of this process are the moraines; the Utrechtse Heuvelrug and the Veluwe are examples of those in the surroundings of Wageningen [Geologie van Nederland].

The name Wageningse Berg *[English: Wageningen's Mountain]* [Gast, et al., 2013] expresses that people experience the moraine as higher point in relation to the surroundings. The highest point of the Wageningse Berg is the about +60 NAP [AHN5].

Because of the geomorphology traditionally the Wageningse Berg is dry and unfertile sandy area, dominated by a dense forest. In late Middle Ages, with settlements and agriculture, the wood was used as building material, energy source and the forest to feed the livestock. The Earl of Gelre was owner of the forest and using it for hunting. From nineteenth century the forest became privately owned, divided in small plots and exploited. Nowadays nature conservation is the main land use and it has become an attractive area for recreation ***(see figure 8.6 & 8.7)***. A dense network of paths in the area is a reminder of the privately owned plots of forest [Gast, et al., 2013].

Figure 8.6 en 8.7
Impression (left) and schematic section (right) of the moraine.

Figure 8.8
Location landscape type moraine flanks.

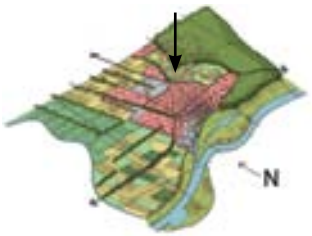
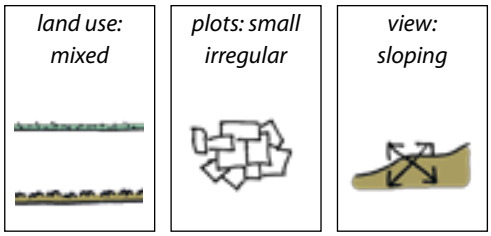


Figure 8.9
Landscape characteristics of the moraine flanks.



Moraine flanks (see figure 8.8 & 8.9)

The moraine flank has been the first place where people settled, because these area was on the edge of dry/wet. The first farmers used the manure to fertilise the soil, because traditionally the sandy moraines were unfertile [Geologie van Nederland]. The Wageningse Eng has is also been fertilised slowly for agriculture in this way. Because the flanks have been used for ages for agriculture, the plots are still small and have an irregular pattern; land consolidation has not appeared. Also houses are spread in the area. The view is a little sloping, which is rare in the flat Dutch landscapes ***(see figure 8.10 & 8.11)***. The landscape is fragmented by the many different land uses, but highly appreciated for recreation and seen as cultural heritage. Roads cross the moraine flank mostly west/east; from the early settlements to the higher grounds.

Figure 8.10 en 8.11
Impression (left) and schematic section (right) of the moraine flanks.

Figure 8.12
Location landscape type transition zone.

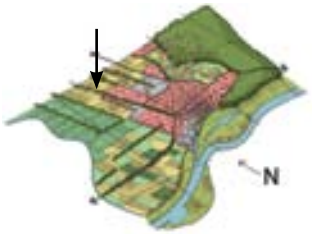
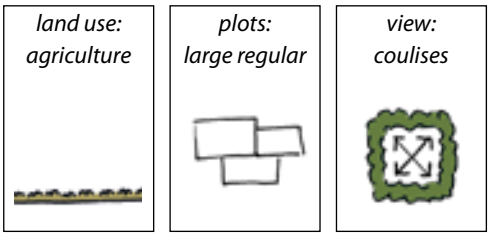


Figure 8.13
Landscape characteristics of the transition zone.



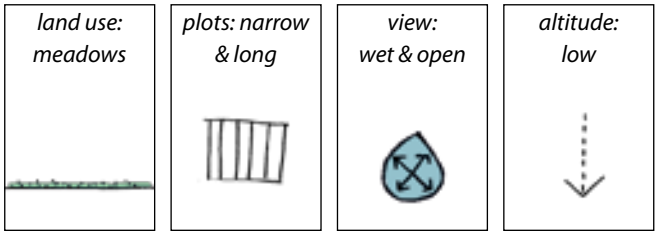
Transition zone (see figure 8.12 & 8.13)

The transition zone has slowly been reclaimed. In early days it had a mixed land use with meadows and agriculture, but with the introduction of fertiliser and improved drainage, the land use is dominated by agriculture. The plots are large and the pattern is regular. Along the reclaimed lines trees have been planted, which makes it a coulisse landscape ***(see figure 8.14 & 8.15)***. Also some farms are present along these lines. In last decade the university build the campus in this area. Also the most agriculture in the area is part of the research facilities. The area is not much used for recreation and the road network is mostly functional for agriculture.

Figure 8.14 en 8.15
Impression (left) and schematic section (right) of the transition zone.

Figure 8.16
Location landscape type basin.

Figure 8.17
Landscape characteristics of the basin



Basin (see figure 8.16 & 8.17)

The basin is the lowest point in the surroundings. With two moraines surrounding it, the Utrechtse Heuvelrug in the west and the Wageningse Berg in the east, and the higher positioned Rhine river, the area is very wet. This results in open landscape with many channels. The plots are long and narrow to allow for sufficient drainage ***(see figure 8.18 & 8.19)***. Though still only meadows and nature conservation are the main land uses. Building and roads are not or barely present in the area and trees are only seen along the reclamation lines. These were the last areas that have been reclaimed, until about hundred years ago. The reclamation of the area was interesting, because of the peat was an important source of energy before fossil fuels were used. The area is attractive for recreation, with a nice path along the Grift (the small river draining the area). A major problem in this area is the shrinkage of the peat ground through the years because of the drainage [Gast, et al., 2013].

Figure 8.18 en 8.19
Impression (left) and schematic section (right) of the basin.

Figure 8.20
Location landscape type levees.

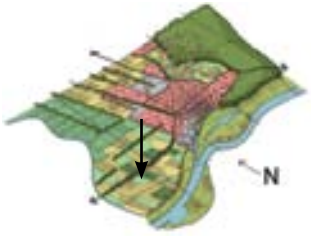
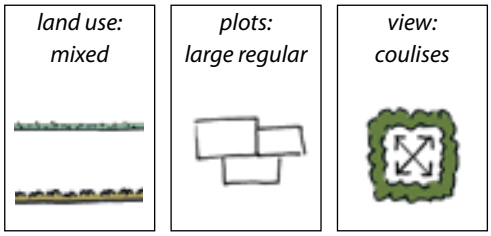


Figure 8.21
Landscape characteristics of the levees.



Levees (see figure 8.20 & 8.21)

The river has deposited silt close to the river and clay on distance of the river before dikes were built. Silt was deposited close to river, because it was heavier than clay and with the force of the water decreasing on a distance of

the river, the silt deposited first; This is the reason the levees are a bit higher than the basin and have fertile soils [Geologie van Nederland]. With the development of the dikes through the ages since 1600 and the increasing population, the areas has been reclaimed, like in the transition zone [Gast, et al., 2013]. Also the landscape characteristics have major similarities with the transition zone; though the land use is more mixed, because the levees are a little wetter and less dominated by the use of the university. There are orchards, meadows and fields. The type of crops have changed over time, e.g. tobacco production was popular in the nineteen century, but has disappeared completely {Gast, et al., 2013]. Along the reclamations lines and the dike there are a lot of (former) farm houses. Trees are clearly marking the reclamation lines, which creates a coulisse view ***(see figure 8.22 & 8.23)***. The road network is functional for the agriculture. The area has a productive image and is not that much used for recreation.

Figure 8.22 en 8.23
Impression (left) and schematic section (right) of the levees.

Figure 8.24
Location landscape type floodplains.

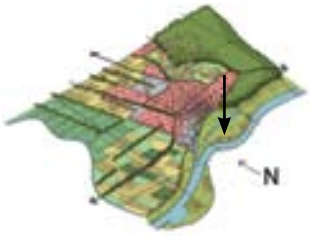
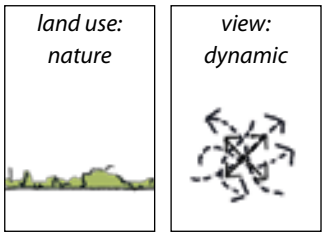


Figure 8.25
Landscape characteristics of the floodplains.



Floodplains (see figure 8.24 & 8.25)

The floodplains are a dynamic environment, facilitating the Rhine river's variable debit. The winter dike is high, bordering this landscape type and protecting the city permanently for flooding. The summer dike is situated along the river and is much lower. It is protecting the floodplains from frequent flooding in summer, so it can be used. In winter and spring the debit of the river is much larger and so the floodplains are flooded frequently. This means sedimentation is continuing in the floodplains and these have become higher through the centuries than the levees. The floodplains are suitable for temporary land use in summer. Currently this main land use is nature conservation and livestock is used to keep the vegetation low ***(see figure 8.26 7 8.27***). This important because this increases the debit of the floodplains in case of high water. Also in 1995 a secondary channel was made to increase the debit and to support nature development. Still fences are used to separate different parts of the floodplains for the livestock [Kurstjens & Peters, 2011].

On some mounds houses are present in floodplains. The area is attractive for recreation, because like the natural and dynamic character.

The first dikes were made around 1600 and the path of the river has been 'normalised' in the end of the nineteenth century. Slowly the natural dynamics of river disappeared and the influence of people increased [Kurstjens & Peters, 2011].

Already since the thirteenth century the soil in the floodplains has been used to make bricks. During the industrialisation and the nineteen century the activities intensified, having major impact on the landscape in the floodplains. The brick factories supplied the local market mostly. Still brick factories are present in the floodplains of the Dutch main river, though not in Wageningen anymore. On one of the mounts is still situated an old brick factory: de Bovenste Polder [Gast, et al., 2013].

The contrast between intensively use in the past and natural identity of today is interesting. Also the temporary land use is an opportunity for development, but the need to keep vegetation low is a limitation.

Figure 8.26 en 8.27
Impression (left) and schematic section (right) of the floodplains.

The city

On the crossing of all those landscape types people have settled in the area. The different landscape types provided the resources during the early Middle Ages for people. In 2013 Wageningen celebrated 750 years city rights. Fortifications were built from 13th to 17th century and the city developed within those fortifications. The water surrounding the old city is still visible today. The city is located strategically for military and trade throughout the history, along the river and on the edge of the moraine. This brought the city an attractive economic climate, but also destruction. For example in the Second World War most of the old city was destroyed and needed to be rebuilt. From the late 19th century the city started to expand outside the fortifications. Wageningen has been a city of industries and labourers, but those all disappeared. The city redirected its orientation, away from the river towards the main rail and road networks in the North, because these have become more important. The city development took place in that direction, because also the landscape was suitable to build in. The university campus is the last development in this direction. Nowadays the university is the most important economic driver of the city.

8.2 Conclusion of the analysis

Wageningen has a diverse landscape with six distinctive landscape types, which is experienced a quality of the area. Throughout history resources in the landscape were used by locals for as energy source, food or building material. People had a strong relation with the landscape. This relation had also a major impact on the landscape. The floodplains were constantly lowered to use the clay for the brick production. The peat was reclaimed and the basin drained. Some parts of the forest were used so intensively that heath replaced the tries. Nowadays that relation is not present anymore. The floodplains, forest and basin are mostly seen as nature. Still the trails of the former land uses are visible, but probably most people will not realise this. The city has become oriented globally; the landscape has become mostly a consumption landscape, being attractive for recreation.

9. Analysis: energy system

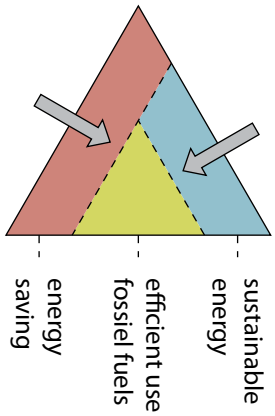


Figure 9.1
Trias energetica [Leenaers, 2012].

In this chapter the analysis of the energy system in Wageningen will be discussed. As discussed in the methods the trias energetic ***(see figure 9.1)*** and energy potential mapping have been the basis for this analysis. The first paragraph will give an overview of the current energy system and the second the desired situation in 2030 according to the municipality. The following paragraphs will discuss the potentials for saving energy, generating energy and being efficient with fossil fuels. Finally in the conclusion will be reflected on the energy analysis and aims formulated for the synthesis.

9.1 Present energy system

The energy consumption of Wageningen is 2.832 TJ [Liander, 2010; MuConsult, 2010; Den Boer, et al., 2011]. The demand for gas is 42,8 million m^2 or 1507 TJ is gas [Liander, 2010]. This is 53,5% of the total energy consumption. For electricity, the energy demand is 166,4 GWh or 582 TJ [Liander, 2010], 20,7 % of total consumption . The energy demand for mobility is about 726 TJ, 25,8% of the total energy consumption [MuConsult, 2010; Den Boer, et al., 2011]. The energy consumption can be specified in different user's categories. Households consume 706 TJ, services 1.334 TJ, industry 66 TJ [Liander, 2010] and transport 726 TJ [Fens, et al., 2010].

In Wageningen some services generate energy from renewable sources, like heat transfer and solar panels. Though the total generation is only 16 TJ, which is only 0,5% of the total energy consumption ***(see figure 9.2)***. This means Wageningen is consuming 2.816 TJ generated in other parts of the Netherlands [Liander, 2010].

All the electricity and gas has to be transported to Wageningen. In the Netherlands the high power network (150kV, 220kV and 380kV) is visible in the landscape: these power lines are above the ground [Leenaers, et al., 2013]. In Wageningen these type power lines (150kV) are passing over the river, through the Binnenveld ***(see figure 9.3 & 9.4)***. In the neighbourhood Nude

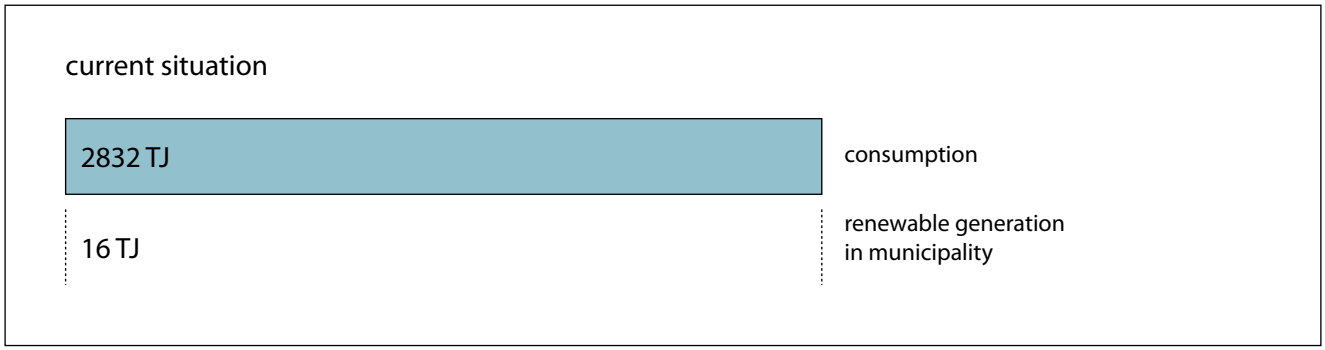


Figure 9.2
Current energy consumption & generation in Wageningen [Liander, 2010; Fens, et al., 2010].

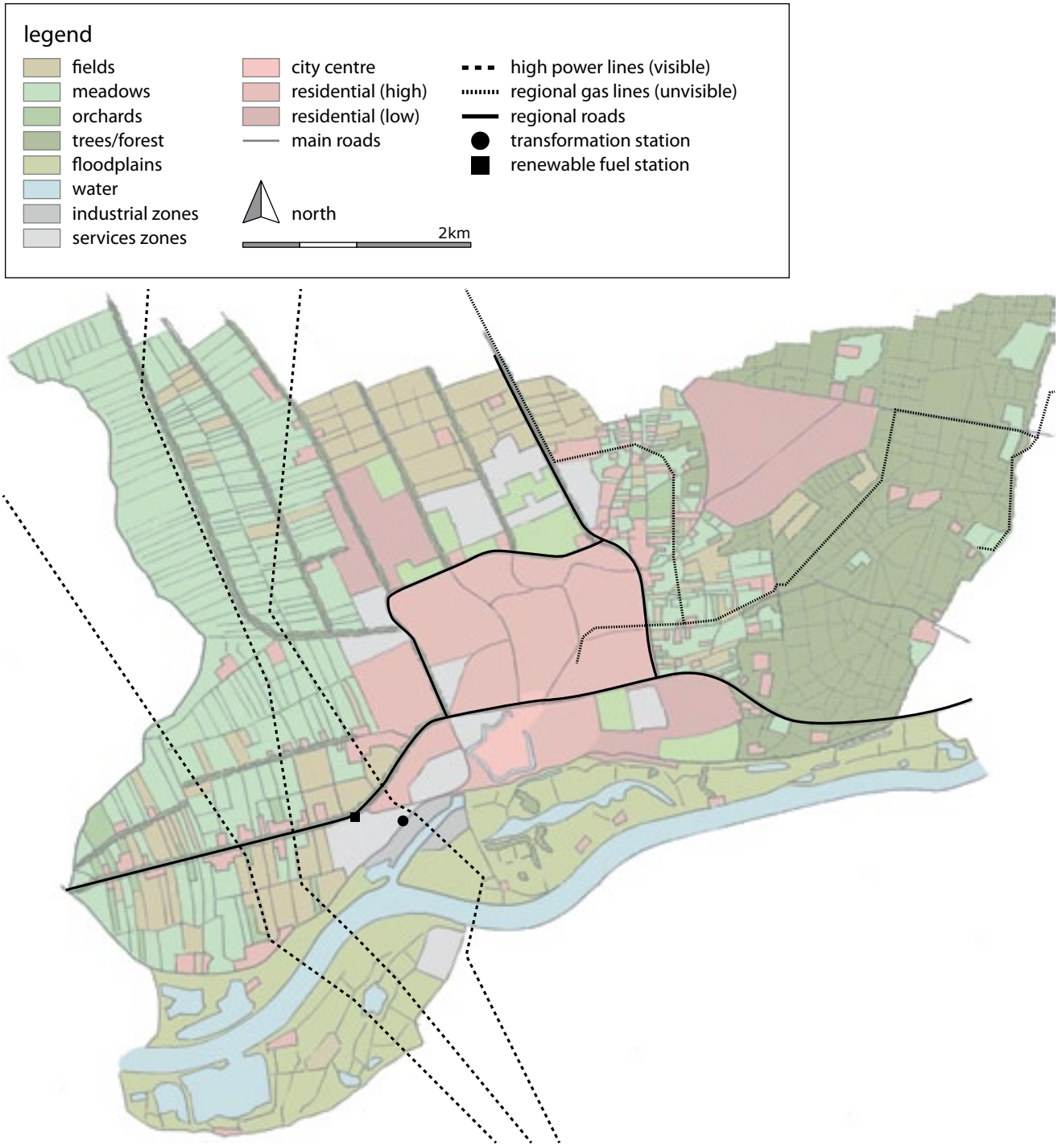


Figure 9.3 (top)
Energy infrastructure [Energieatlas Gelderland].

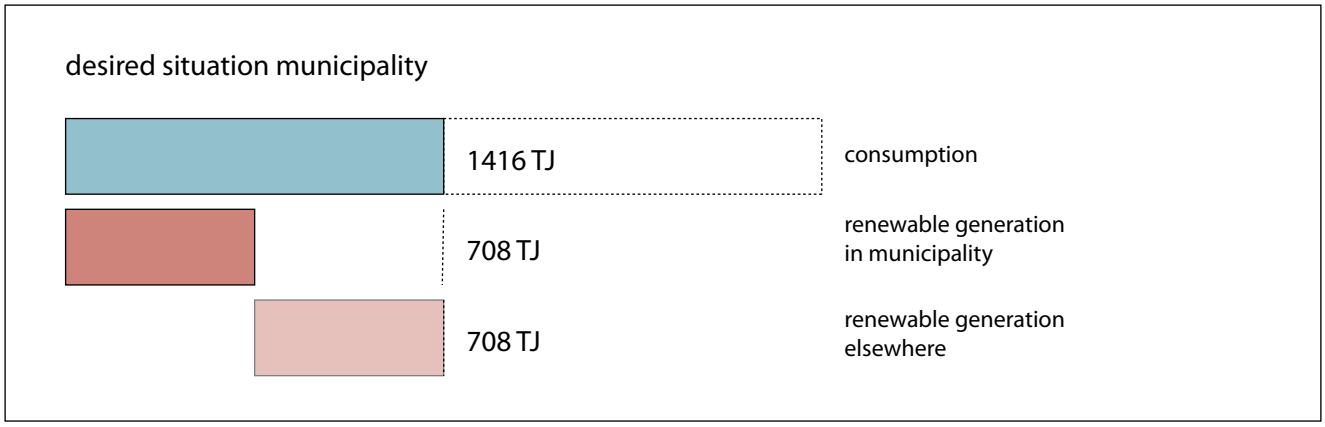
Figure 9.4 (right)
Power lines, west of Wageningen.

is one power transformation station. For gas a regional pipe line is coming from the east into the city; this pipe line is not visible in the landscape. Finally there are several fuel station in the city, but at the moment just one is selling renewable fuel [Energieatlas Gelderland, 2013].

9.2 The municipality's proposal for the future energy system

The municipality made in 2012 a plan to become climate neutral: 'Routekaart Wageningen climate neutral 2030' *[English: Route map Wageningen climate neutral 2030']*. Also different studies have been done on the current energy system and energy potential. The municipality has formulated the aim to save 50% of the energy consumption, to generate 50% of the remaining energy consumption within the municipality from renewable sources and to generate the other 50% of the remaining energy consumption also from renewable sources, but somewhere else ***(see figure 9.5)***. Mobility is excluded from the aim to become 100% climate neutral, because it seems that climate neutrality for mobility is more challanging and so not feasible in 2030. For mobility 2050 is the aim for being 100% climate neutral [Gemeente Wageningen, 2012].

Figure 9.5
Desired energy consumption & generation in Wageningen 2030 according to the municipality [Gemeente Wageningen, 2012].



9.3. Potentials for saving energy

Reducing the energy consumption is important for a sustainable energy system. Saving energy is a combination of improving technology and change in behaviour of consumers. The change in behaviour can be stimulated financially and with publicity [Leenaers, et al., 2012].

For the municipality a study has been done on the potential for households to save energy. With economic feasibility taken into account 4.900 of 12416 houses in the municipality can be improved. With improved isolation and boiler in total 5.5 million m^3 gas or 193 TJ can be saved at these houses. Without taking into account the economic feasibility (payback time maximum twelve years), the reduction would be 9,2 million m^3 or 324 TJ. This would include 95,4% of the total households in Wageningen; almost all houses built before 2000. Houses built after 2000 already have isolated properly [Fens, et al., 2010]. For services and industry there is also a potential for saving energy, but no calculations are available on that.

Also saving electricity can be expected in the upcoming decades with application of improving technology. Already in last years this development has started for most electric equipment at home, like washing machines and fridges, helped with financial support and communication campaigns. People are increasingly made aware of the energy consumption [Leenaers, et al., 2012]. This potential for saving could not be quantified in this study.

For the municipality, study has been done on potential to save energy on mobility. According to the study a scenario with 18% reduction of kilometres in 2030 would be reasonable. This would mean a reduction of 216 TJ. To achieve the scenario an active policy of companies and municipality is necessary. Some spatial measures that have to be taken are the improvement of public transport system and bicycle network. Also communication with citizens and services is an important element [MuConsult, 2010].

9.4 Potentials for generating renewable energy

Four types of renewable energy sources have been studied for the generation of renewable energy, because these appear to give a substantial potential [Fens, et al., 2010; Dooper & Velthuijsen, 2013; Energieatlas Gelderland; Gao, 2012; BuildDesk, et al., 2011]:

- Wind energy
- Solar energy
- Biomass energy
- Heat/cold storage

Wind energy

For wind energy two studies have been conducted on potential locations for wind energy. Especially the limitations, like nature reserves and occupation, have taken into account during these studies. Eight potential locations have been identified with in total a potential of 1786TJ [Fens, et al., 2010; Dooper & Velthuijsen, 2013]. This would be sufficient for the future energy demand of Wageningen, particularly for the electricity demand ***(see figure 9.6)***. Though the total potential would have major impact on the landscape ***(see figure 9.8)***. The city would be surrounded with wind turbines. The wind turbines are also much larger than current high buildings in Wageningen.

Urban wind turbines could also provide electricity ***(see figure 9.7)*** . The average energy generation of an urban wind turbine is 3.400 kWh. Placing 2.000 of those urban wind turbines would result in 6.800.000 kWh or 24 TJ, but probably the feasible number of turbines will be far less [Fens, et all, 2010]. In comparison with 'normal' wind turbines the yield is little.

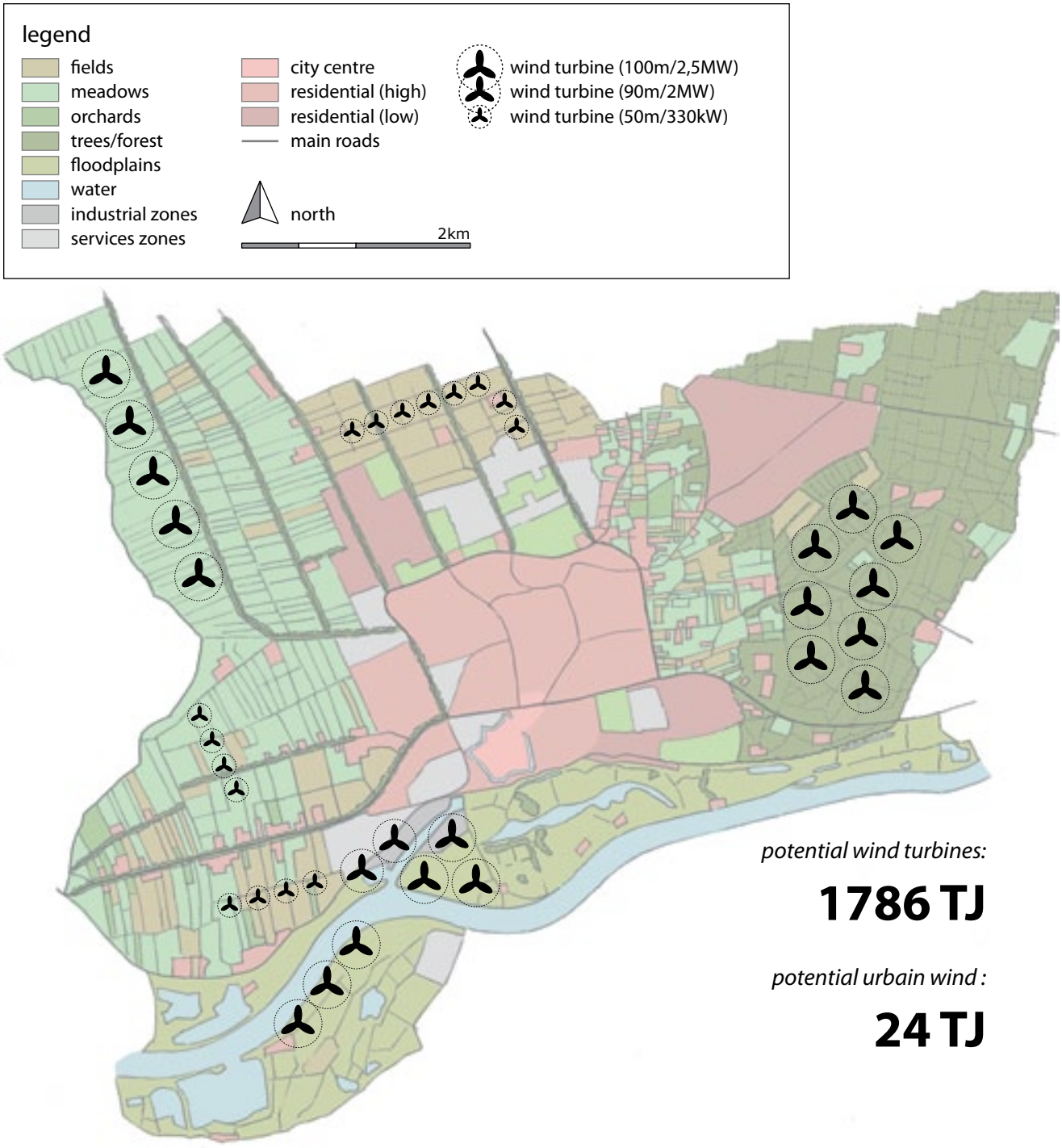
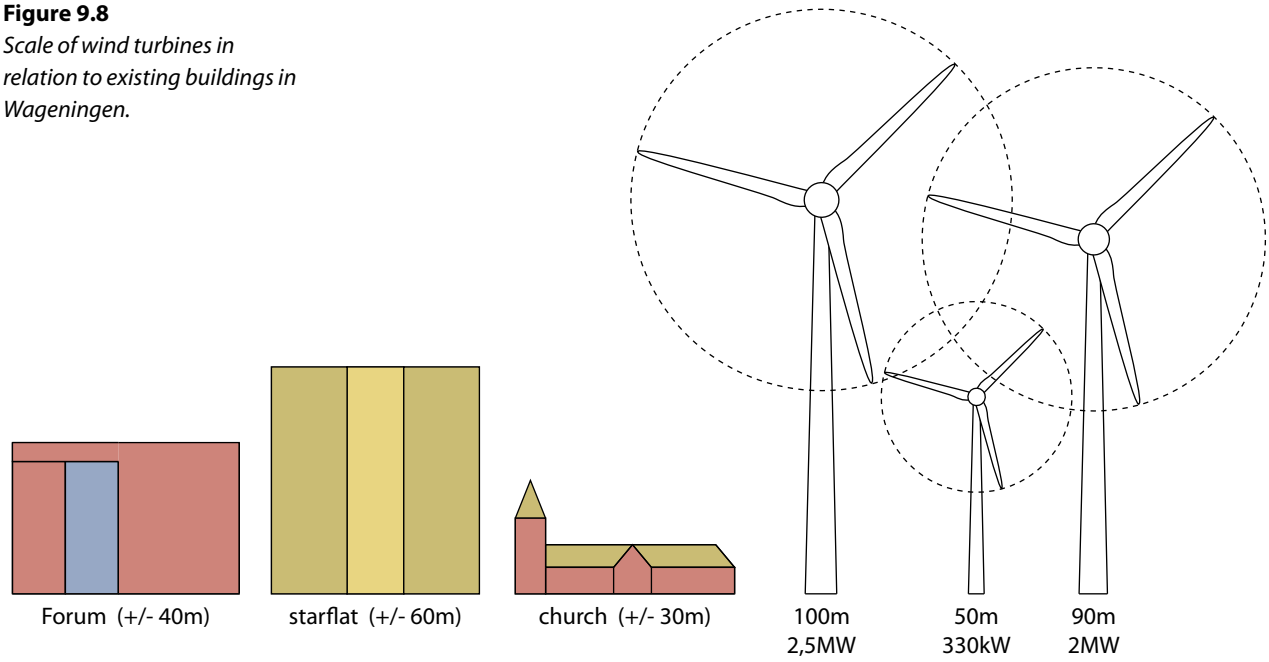


Figure 9.6
Potentials for wind energy [Fens, et al., 2010; Dooper & Velthuijsen, 2013].

Figure 9.7
The only urban wind turbine in Wageningen at student housing Rijnveste.

Figure 9.8
Scale of wind turbines in relation to existing buildings in Wageningen.



Solar energy

With solar panels on roofs electricity can be generated ***(see figure 9.10)***. The Zonneatlas analysed for all roofs in a municipality the suitability for solar panels, based on with GIS [Energieatlas Gelderland]. In the case of Wageningen the potential is 38 GWh or 137 TJ per year for all suitable roofs in Wageningen [Energieatlas Gelderland]. Economic feasibility is taken into account with these calculations. In fact this would be 380.000 m^2 or 3,8 ha solar panels on roofs (south-directed and no other objects). For houses about 25% of all roofs will would be filled with solar panels and for service buildings even about 50% [Energieatlas Gelderland]. Solar panels on roofs could provide a substantial part of the electricity demand.

Solar panels can not only be placed on roofs, but also in fields. Every square kilometre of solar field could provide about 360 TJ [Energieatlas Gelderland]. One or even more square kilometres would potentially be possible ***(see figure 9.9)***. This would mean the solar fields can provide a substantial part of the electricity demand. Though solar fields have a high impact on the perception of the landscape and land cannot be used for other purposes (like food production, biomass production).

The potential for solar boilers is about 50 TJ. This would mean all plot-based houses and 90% of the apartments is equipped with a solar boiler. Every boiler provides 3,4 GJ of energy per year With a solar boiler water is heated for house heating and warm water use [Fens, et al., 2010].

Biomass

Biomass can be used to generate both electricity and biogas [Leenaers, et al., 2012]. Because solar cells and wind turbines can probably provide the electricity demand for Wageningen, the generation of biogas would be interesting. In a realistic scenario the demand for biogas or biofuel in Wageningen would be 454 TJ per year in 2030 [MuConsult, 2010]. The

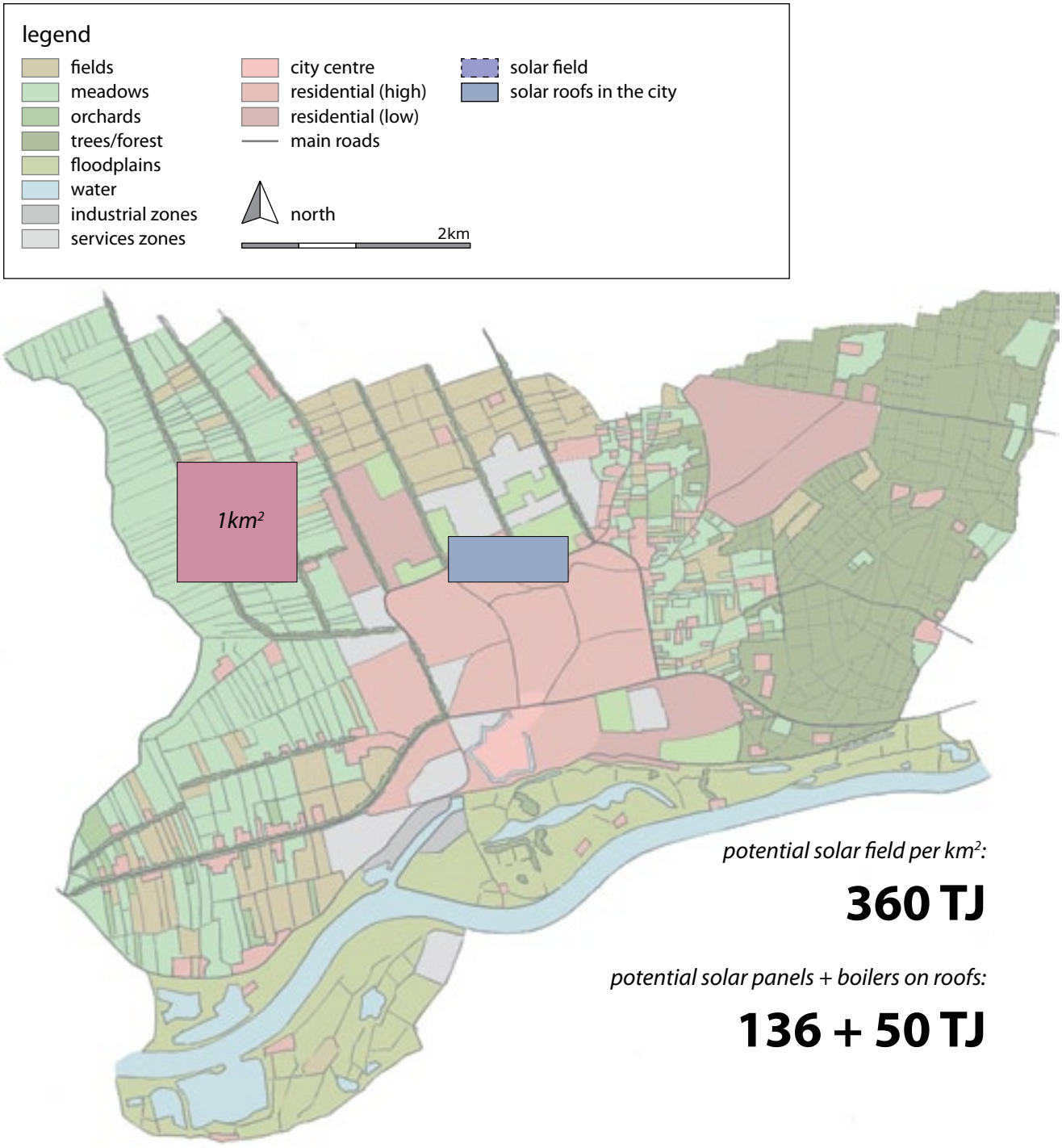


Figure 9.9
Potentials for solar energy [Energieatlas Gelderland].

Figure 9.10
In the city increasingly solar panels appear on roofs.

potential for biomass in Wageningen cannot cover this amount of energy. The potential energy from the all biomass in the municipality has been calculated. At the moment the potential would be only 11 TJ [Energieatlas Gelderland]. That includes mostly the green biomass production with current maintenance and waste of different sources. Gao studied the potential for maximising the potential for biomass production in Wageningen in her thesis 'Designing an attractive biomass productive city of Wageningen'. She concluded that with her design about 350 TJ can be generated, mostly with energy crops ***(see figure 9.12)*** [Gao,2012]. With the moraine, floodplains and basin in Wageningen, ther are a lot of areas were nature is important. These areas have mostly not been seen as potential for biomass production. Though is seems there is a potential for these areas with using active policies and maintenance. Lowering the floodplains and allowing more dynamics are conditions allowing more biomass production in the floodplains [Spijker, et al., 2007]. Important is to realise that the energy demand in 2030 for biogas and biofuel is large, but in 2050 the technology on mobility will have developed. Probably hydrogen and electricity can substitute most biogas and biofuel. Though diversification of sources is still important for coming decades, so using biomass has to be increased. A realistic goal would probably be about 100-150 TJ ***(see figure 9.11)***.

Heat transfer

In heat/cold storage systems groundwater is used as carrier of cold or heat. Groundwater is stored and extracted in certain groundwater layers. Two types of heat transfer system are used [Fens, et al., 2011].

Shallow heat/cold storage systems have a depth up to 100m. These are collective systems for about 20 houses that work best in urban areas (apartments, house blocks). In Wageningen different underground layers can provide on average 50 households per hectare with heating and warm water. For most neighbourhoods this will be sufficient to provide all houses with cold and warm water ***(see figure 9.13)***. The second type, heat/cold storage from 100m to 500m deep, is even more interesting. This is a collective system for about 70 households and therefore attractive for urban areas. In Wageningen there is a large potential for this type of system. It could provide 70 households per hectare with warm water and heating in almost whole Wageningen [Fens, et al., 2010]. Only in the city centre the density is a little higher (77 households per hectare [CBS]). For some neighbourhoods with a density between 50 and 70 this system would be better suitable than shallow heat/cold storage. The deeper systems are more expansive to build and need more people to cooperate, though in Wageningen the potentials are large [Fens, et al., 2010].

Geothermal heat system is a collective system for a few thousand households. A underground layer 1 or 2 kilometre deep is used and can only provide warm water. This type is not suitable for Wageningen, because the identified layers in the underground are not thick enough and the temperature is too low [Fens, et al., 2010].

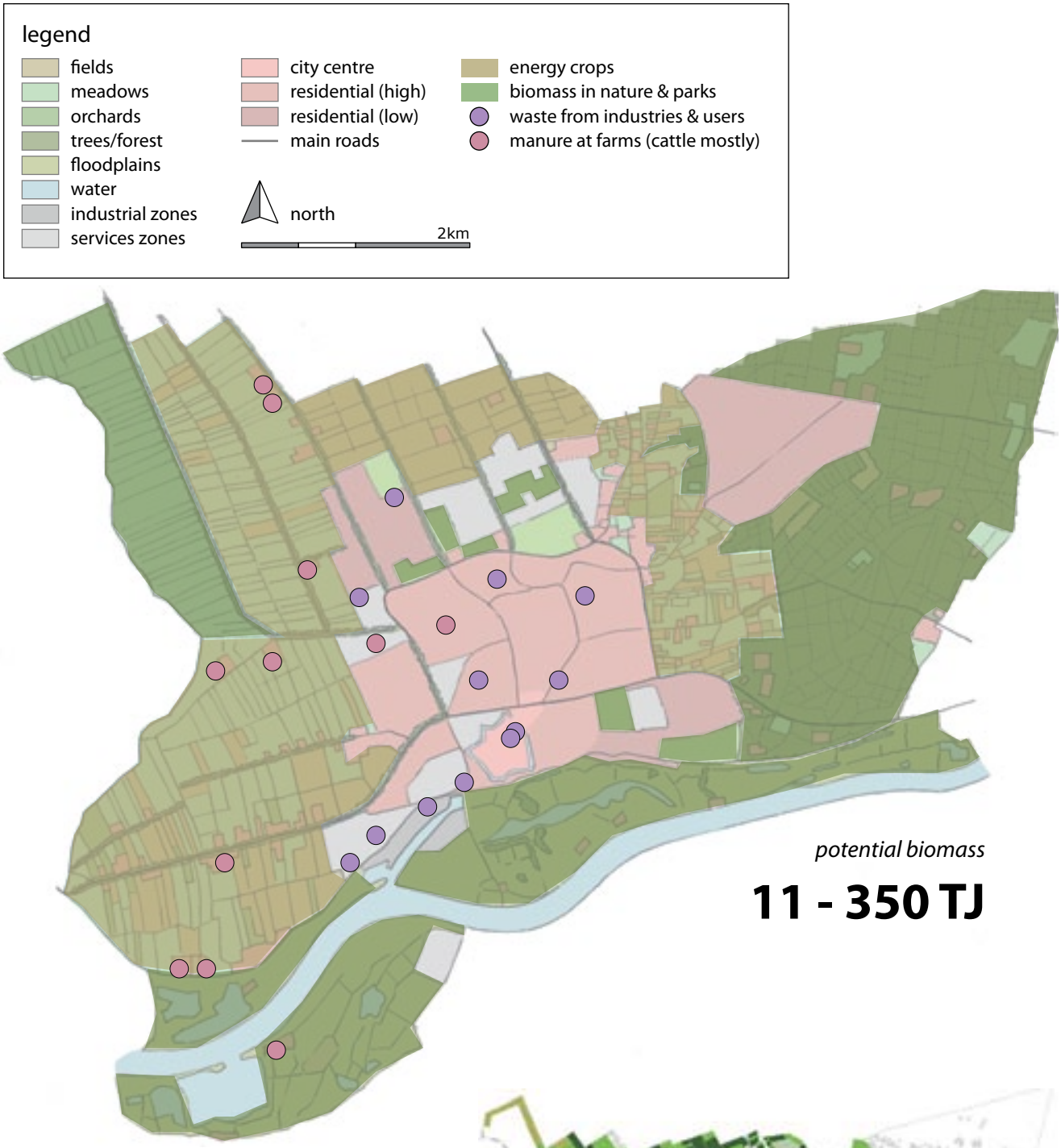
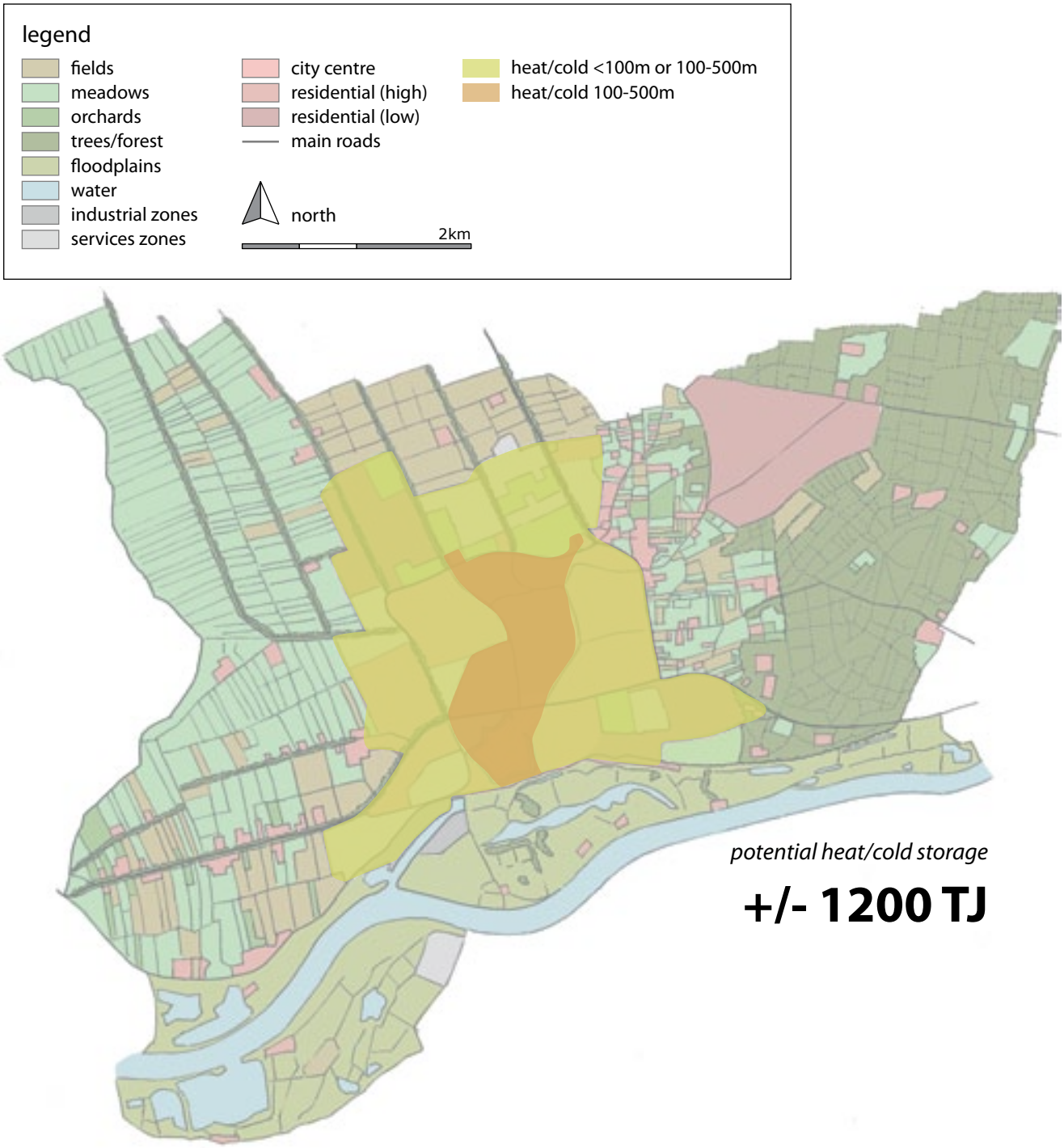


Figure 9.11
Potentials for biomass [Energieatlas Gelderland; Gao, 2012]

Figure 9.12
Design of Gao for maximasing biomass production in Wageningen with energy crops up to 350 TJ [Gao, 2012].

With these high potentials for heat transfer almost all gas consumption could be eliminated, as this is typically used for warm water and heating. Some additional electricity will be needed for pumping. Only the neighbourhoods with a lot of detached houses a collective system will not be suitable. In special for Wageningen-Hoog this will be case. Though also individual shallow system can probably be used. Because collective system are have most potential, an strategy should be developed to create such collectives. Also proper isolation of the houses is essential for the success of these heat/cold storage systems and should be taken care of [Fens, et al., 2010].

Figure 9.13
Potentials for heat/cold storage [CBS; BuildDesk, et al., 2011].



9.5. Potentials for being efficient with fossil fuels

The third step in the trias energetia is being efficient with the remaining fossil fuels [Lysen, 1996]. Because the potential for saving and generating energy on mobility is limited, being efficient with fossil sources is important. People can change their mean of transport, for example by using public transport instead of their private car. In general this results in a reduction of the used joule per kilometre and a reduction of the emission. In total a reduction of fossil fuels used for mobility could be about 108 TJ (9%). For this scenario the government has to communicate and stimulate actively. Also the public transport has to be improved [MuConsult, 2010].

9.6. Conclusion of the analysis

For this analysis all available reports on the energy system and potentials for Wageningen have been used. The reports present a fragmented image with many different numbers. In this study for the first time calculations have been made, which integrate all those numbers in TJ. Based on that those calculations it seems feasible for Wageningen to save 500-1000 TJ in 2030 and to generate about 1500 TJ in the municipality from the four main sources. From that 1500 TJ heat/cold storage can provide 500 TJ, which will have little impact on the landscape. Also the measures to save energy, will have little impact, though are very important to implement. For the design experiment the 1000 TJ that have to be generated from wind, solar and biomass energy are most interesting and the main aim. Realising this would mean that Wageningen is probably not completely independent ***(see figure 9.14)***. With having a high density (1215 citizens per km^2 [Zorgatlas]) and so little space for large scale energy generation this is reasonable. The region FoodValley is cooperating on the climate and energy policy, aiming for a bio-based economy [Faas & Leering, 2011]. Some of the municipality involved have far less density (e.g. Ede, Barneveld and Putten have about 300 citizens per km2 [Zorgatlas]). Maybe the energy technologies will become more efficient and Wageningen will able to be independent itself, but in coming decades the regional cooperation could be useful.

Also important for the design experiment is to match the supply and demand. This means generating sufficient electricity, heat/cold and fuel. Diversification of sources can support this and increase the stability in the energy flow. The energy system comprises also transport and storage of energy. These elements have to a lot impact in the landscape and so the focus will be on generation and consumption of energy in the design experiment.

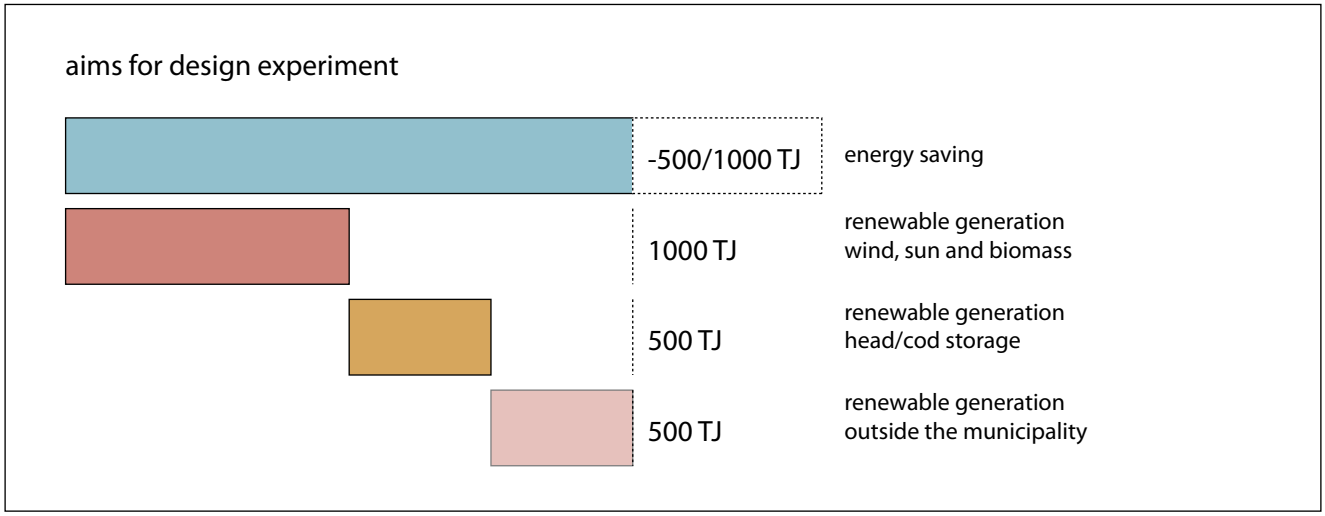


Figure 9.14
Aims for energy consumption & generation in the design experiment.

10. Analysis: narratives

10.1. From research to design

In the third part, the research *for* design, the present narrative in Wageningen have been analysed and discussed. In this chapter the aim for designing a new narrative in future will be formulated. Important conclusions from the first two parts of this study are:

- Transform existing narrative: Transforming the existing clusters in Wageningen is starting point for formulating the aim in this design experiment, because these community is concerned about these issues.
- Using themes: In the reference study five themes were identified. In Wageningen clusters were classified in three of those themes (economy, landscape and energy). Having a narrative integrating at least those themes is important for the design of sustainable energy landscapes.
- Inspiration for aim: The reference study on the Eo Wijers Competition included a lot of ideas on dealing with energy landscapes and the stories of people in another area. These ideas can inspire the aims for narratives in Wageningen.
- Size of clusters: In the design experiment the aim is to create a few large clusters, because the communities are really concerned on these larger stories.
- Author of narrative: Transform the situation, in such a way that citizens and the municipality are co-authors of the narrative in order to involve them both as characters.
- Characters in different clusters and themes: In the reference study it appeared that characters connecting different clusters and themes is a strong structure for building stories. Such a structure is not present in the narrative of Wageningen. Transforming the situation in such a way that structure is present is interesting for the design experiment.

10.2. Conclusion of the analysis

For every theme (economy, landscape and energy) one aim is formulated. With only three aims, it is sufficient for exploring the integration of different themes, but it is also to much to keep focused on a strong narrative.

In the energy theme the current cluster is: 'Effort needed to save energy at home'. This cluster is small and the authors are the citizens. In the future situation effort needed to save energy should not be experienced and

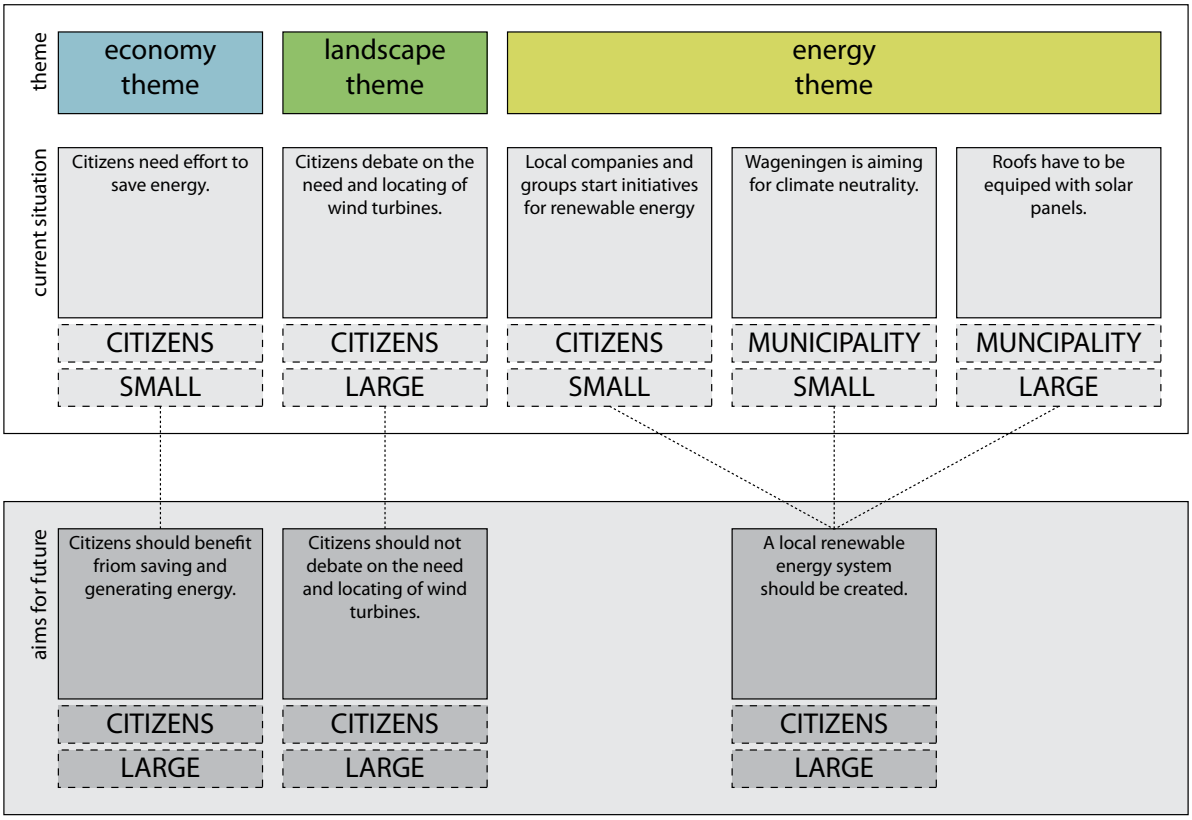


Figure 10.1
Aims for narratives in design experiment.

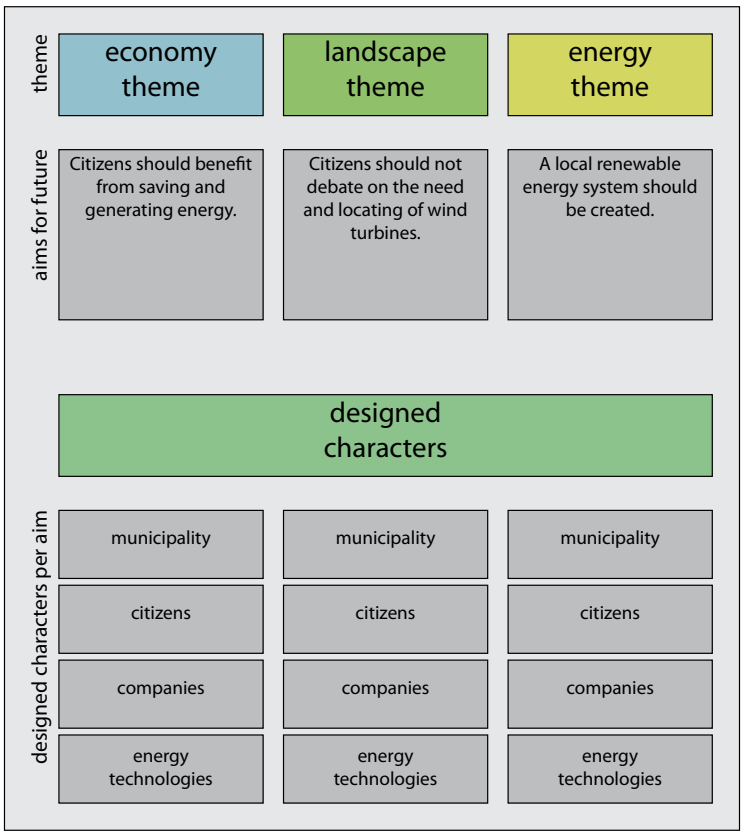
generating energy, but the benefits should be experience by the citizens. There is already the aim of the municipality, but it is not able to communicate this properly. The aim for the energy is formulated as: 'Citizens should benefit from generating and saving energy' ***(see figure 10.1)***.

In the landscape theme the current cluster is: 'Citizens debate on the need and location of wind turbines'. The cluster is large and the authors of the cluster are mostly the citizens. The debate seems to be a never ending story for almost twenty years. Every time a new chapter is added to the story, e.g. the plan for referendum. The aim is that this debate should be stopped in the future situation, because it is not contributing to the energy transition.

In the energy themes three clusters were identified. Interesting was that the first cluster has a lot of potential to build on: 'Local companies & groups start initiatives for sustainable energy'. The authors of the cluster are citizens, but it is a rather small cluster. The municipality is the author of the other two clusters; 'Wageningen is aiming for climate neutrality' and 'Roofs have to be equipped with solar panels'. Having solar panels, has the potential for being a local initiatives. And both could be ultimately supporting climate neutrality, that is strongly depending on a local renewable energy system. For the energy theme the aim for a narrative has been formulated that 'a local renewable energy system should be created'.

With the research showing the importance of co-authorship; citizens municipality and companies are taken into account. These are characters in all of the themes to support this ***(see figure 10.2)***. Other important characters for the design experiment are the energy technologies, because these are the basis for the aims. All these characters will have a role for the different aims, being more or less important.

Figure 10.2
Aims for designed characters in the design experiment.



11. Synthesis

11.1 Design strategies

Three design strategies are used to expressed the aimed narrative ***(see figure 11.1)***:

- *Connect consumer and producer:* The connection between the consumers and the producers has been lost. Consumers are not aware anymore of the efforts needed to generate energy. The energy generation has never been part of the landscape in their living environment. By connecting consumer and producer again, both can benefit.
- *Strengthen existing landscape characteristics:* A quality of Wageningen is the large diversity in landscape characteristics. This is important for people, because the landscape has developed based on the landscape characteristics. Renewable energy technologies can strengthen these landscape characteristics, when a connection is made. This results in a legible landscape that is still attractive for the citizens.
- *Generate renewable energy with a variety of technologies*. From the perspective of a sustainable energy system it is important that different energy technologies are combined, because demand and supply are better matched. Potentials for four types of energy technologies have been identified. All of them will be taken into account in the design. This

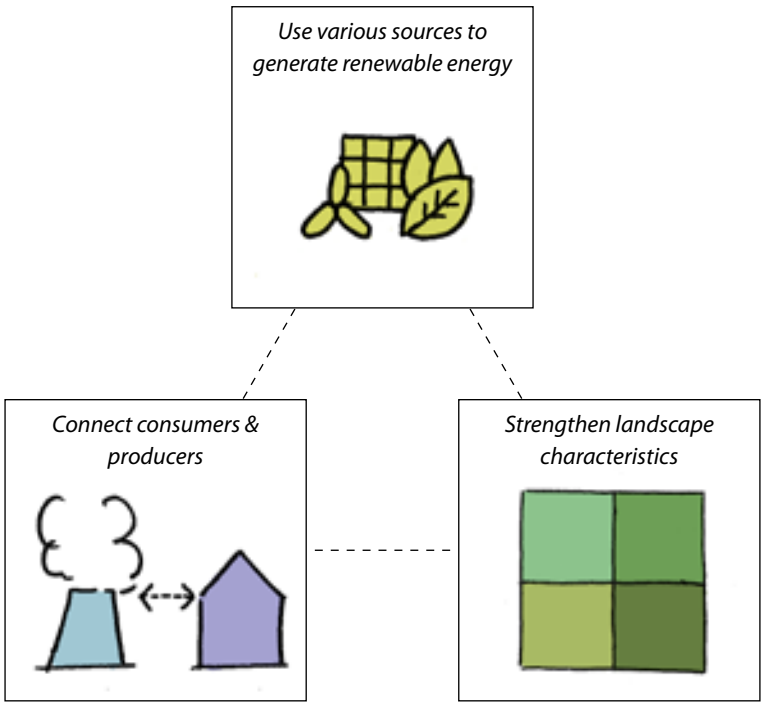


Figure 11.1
Design strategies.

variety of technologies will also support the potential for strengthening the landscape characteristics integrally. This means also the experiment to integrate wind turbines in the design. Wind turbines are the most economically efficient source and are important to create an independent energy system. The combination of design strategies offers the possibility to see wind energy from a different perspective than in the current situation.

11.2 Design principles

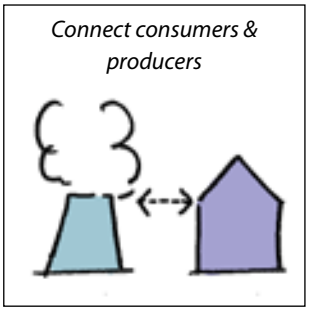
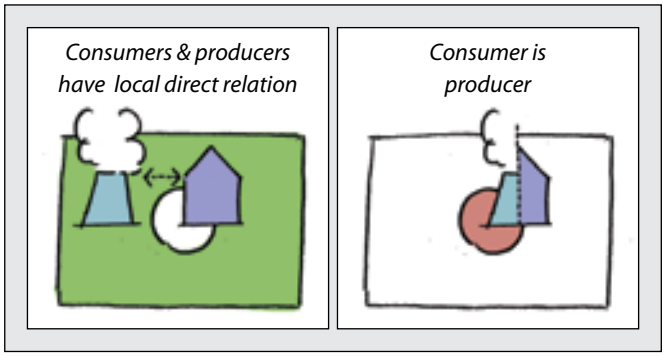


Figure 11.2
Design strategy connecting consumer and producer.

Connecting consumers and producers is done in two ways ***(see figure 11.2 & 11.3)***. The citizens start to generate energy on a small scale in the city. The citizens are not only the consumers, but also the producer themselves. People experience the energy generation daily and have the economic benefits of this. The potentials for energy generation within the city are not sufficient for the future demand. Large scale energy generation outside the city is needed to supply for the local demand. Local companies, farmers and groups can start projects, like a solar field or wind turbine park, helped by the investments of citizens. Both parties can benefit from that and the local energy demand can be supplied. The citizens have also a stronger relation with the energy producers, because these are not the big energy companies with power plants far away, but a local company.

Figure 11.3
Specification of design strategy connecting consumer and producer.



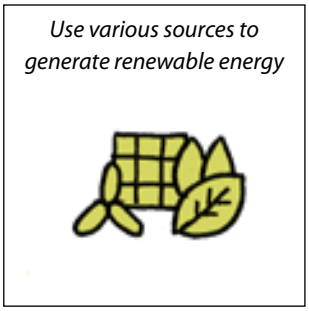
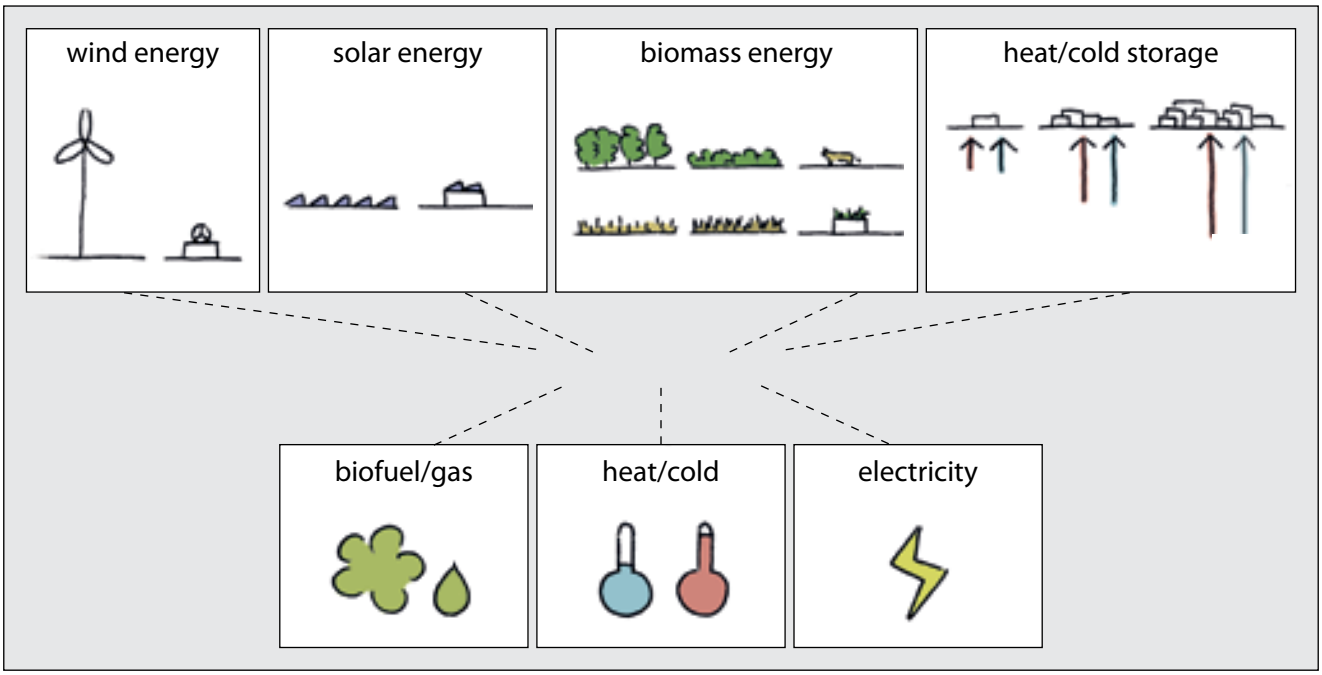


Figure 11.4
Design strategy using various sources to generate renewable energy.

For matching the demand and the supply a variety of sources is important. For example solar panels can provide a lot of electricity, but this can't be used to heat houses. Different types of technologies are available for every source, which are suitable for the urban or rural areas. For example urban wind turbines and large wind turbines. These different types will be taken in account for the design. Together this will create a more stable energy system with matching the demand and the supply ***(see figure 11.4 & 11.5)***.

Figure 11.5
Specification of design strategy using varios sources to generate renewable energy.



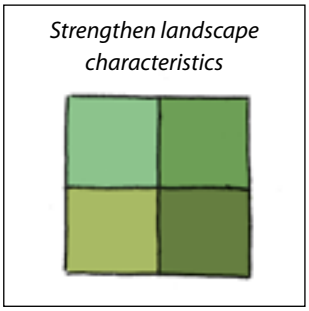


Figure 11.6
Design strategy stregnthen landscape characteristics.

In this design associations are used to strengthen the landscape types by connecting the renewable energy to the landscape characteristics ***(see figure 11.6)***. Associations create feelings and memories, connecting people with places. Associations can explain the stories that designers intent to express [Vroom, 2005; Spirn, 1998]. In the landscape analysis the landscape characteristics have been defined for every landscape type. Plausible associations are made with the characteristics of the different renewable energy technologies.

Solar fields are appearing in regular patterns and completely focused on the efficient production of energy. These characteristics are similar with the agricultural fields and orchards in the transition zone and levees ***(see figure 11.7)***. The solar fields could fit in those landscape types dominated by production ***(see figure 11.8)***. By adding the solar fields, not only the food production will be made visible, but also the energy generation.

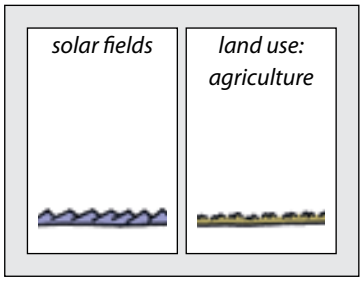


Figure 11.7
Architectonic association solar fields

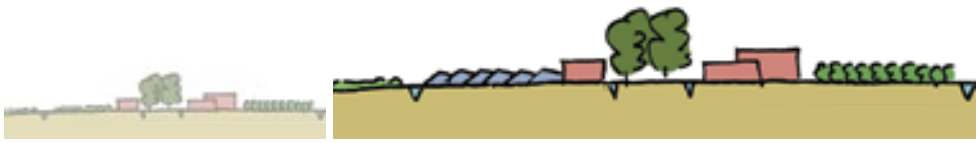


Figure 11.8
Design principle transition zone and levees.

Wind turbines are mostly characterised by the height and that can be associated with the height of the moraine ***(see figure 11.9 & 11.11)***. This association was also made by the citizens of Wageningen who took part in an atelier on wind energy. The forest was after an evaluation the first preferred location. Later the municipality also did survey, in which the harbour and the forest were suggested as preferred location [Windenergie Wageningen]. But in that a survey no story was explained and people preferred the harbour (70%). The association seems plausible, as long as the story of the landscape characteristics is communicated [Uitzinger, 2013].

Also for the landscape types associations are made with the biomass different type of biomass. The concept that energy production can also be beneficial for nature, is also an important principal in the other landscape types dominated by nature. By harvesting the forest extensively, more different species and vegetation get an opportunity. The different vegetation will strengthen the closed view experienced on the moraine ***(see figure 11.10)***. The forest will be much varied and rich, which is also attractive for recreation ***(see figure 11.11)*** [Den Ouden, et al., 2010]. Nature is not something static, in which people have no influence. For centuries Wagengenen inhabitants have used the 'nature' to benefit and it is still possible doing it.

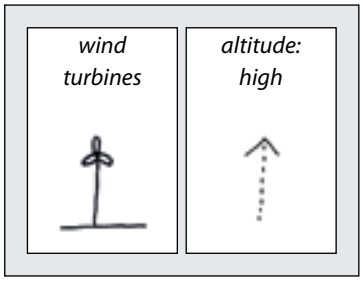


Figure 11.9 (left)
Architectonic association wind turbines.

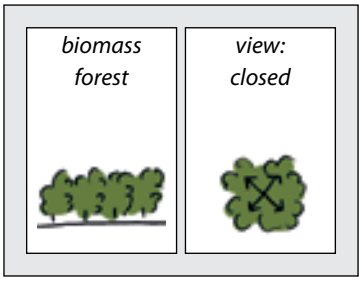


Figure 11.10 (right)
Architectonic association biomass forest.

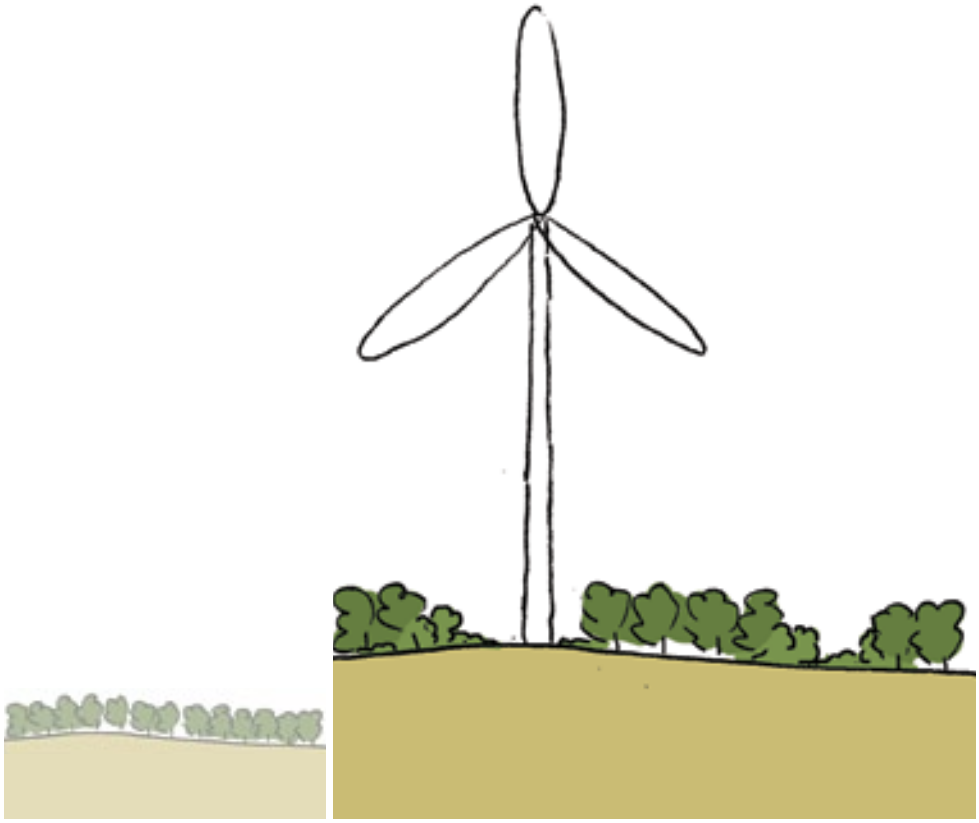


Figure 11.11
Design principle moraine.

The wet and open basins can be maintained and made productive again with reed ***(see figure 11.13)***. The reeds reduces the shrinkage of the peat, filtrates the water and can be valuable nature [Spijker, et al., 2007]. With the reed the wet and open character is strengthened ***(see figure 11.12)***.

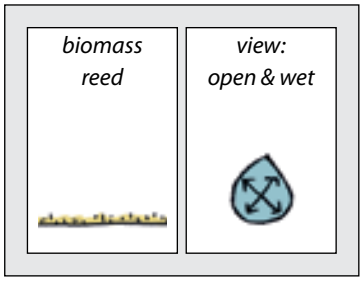


Figure 11.12
Architectonic association biomass reed.

Figure 11.13
Design principle basin.

Also the floodplains can be more dynamic and productive, without harming the nature ***(see figure 11.14)***. Coppices can be planted, but some land has to be lowered to maintain sufficient debit ***(see figure 11.15)***. Lowering parts can create more dynamics and freedom for the river. This so-called cyclic maintenance can produce biomass [Boosten & Winterink Probos, 2007].

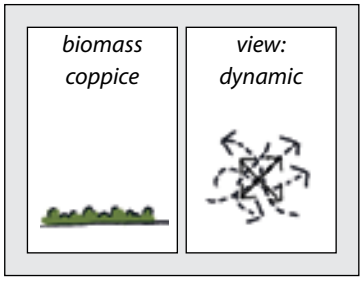


Figure 11.14
Architectonic association biomass coppice.

Figure 11.15
Design principle at floodplains.

Energy crops and agricultural crops are not distinguished by most people. And so the association can be made easily ***(see figure 11.16)***. This results energy crops can be implemented in the levees and the transition zones ***(see figure 11.17)***

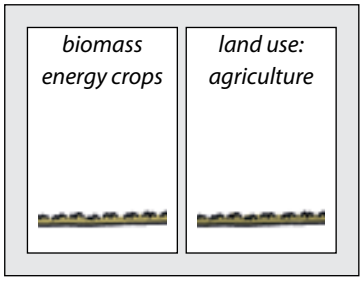


Figure 11.16
Architectonic association biomass energy crops.

Figure 11.17
Design principle levees and transition zone.

Local cooperations and farmers are maintaining these large scale energy generation projects. The itizens can invest in those projects, which will result in lower energy costs and for the farmers it can be a new source of income. The municipality is facilitating and stimulating the community by communicating the broad vision on energy transition, organising network events and supporting planning/realisation of projects. Maybe not all biomass produced in nature areas is currently economic efficient, but it can contribute to social and environmental goals, which is important for the community as well.

The different types of energy can also be generated in the city. Along the main roads there are some high rise buildings. These can be used to place the urban wind turbines. On the high buildings the urban wind turbines can catch a lot of wind. For people to generate energy with solar panels, the roofs are very suitable space, because these are not used for anything else. Many plots in the city are temporary not used, mostly located along the main roads. Because energy crops can also grow in short time, the vacant plots can be used for the producing biomass ***(see figure 11.18)***. On a small scale also in parks and neighbourhoods biomass can be generated, in the wetter parts of the city reed and in dryer parts wood. Neighbourhoods can take care of these, which will improve the living climate for people. For the city centre green roofs are interesting. Green roofs can decrease the demand for heat in winter and cold in summer, because it is isolating [Gemeente Amsterdam]. This is important, because the density in the centre is probably a little too high for sufficient heat/cold storage. Also it can increase the efficiency of solar panels, because it decrease the temperature on the roofs, which fits better with the optimum for the solar panels ***(see figure 11.19)*** [Gemeente Amsterdam]. People in the community will cooperate to generate energy. Most of the heat/cold storage system will be collective. Also the community can contribute to the maintenance of vacant plots and parks. The increased awareness and community feeling will create an attractive living climate. As well important are the measures as improvement of bicycle networks, public transport system and isolation of buildings. These can decrease the energy consumption. It will also clearly show the green image of Wageningen.

11.3 Design

In the design ***(see figure 11.22)*** all these principles can be found. On the moraine a line of wind turbines is placed on the highest ridge. These four wind turbines will generate 315 TJ and will be about hundred meter high, strengthening the association with the high moraine. The solar fields (about 360 TJ) and energy crops are replacing some meadows and agriculture in the transition zone and the levees. The forest on the moraine is made more diverse by extensively logging trees. The dynamics in the floodplains are increased with coppices and lowering the terrain. And the open wet character of the basin is strengthened with reed production.

In the city the solar panels are placed on all suitable roofs, which will generate 137 TJ. On the high buildings the urban wind turbines will be present. In the city centre the roofs are green and sometimes be equipped with solar panels. Vacant land is used for energy crops and the biomass production is parks increased. All together this will enable to generate about 1000 TJ of energy, which was the aim for the energy experiment ***(see figure 11.20)***.

Figure 11.18 (upper left)
The transformation of the city with energy crops on vacant plots, solar panles and good bicycle routes [photo: Oost Ruimte Cultuur].

Figure 11.19 (upper right)
Transformation of the city centre with green roofs and solar panels [photo: Panoramio].

Figure 11.20 (bottom)
Energy system in the design.

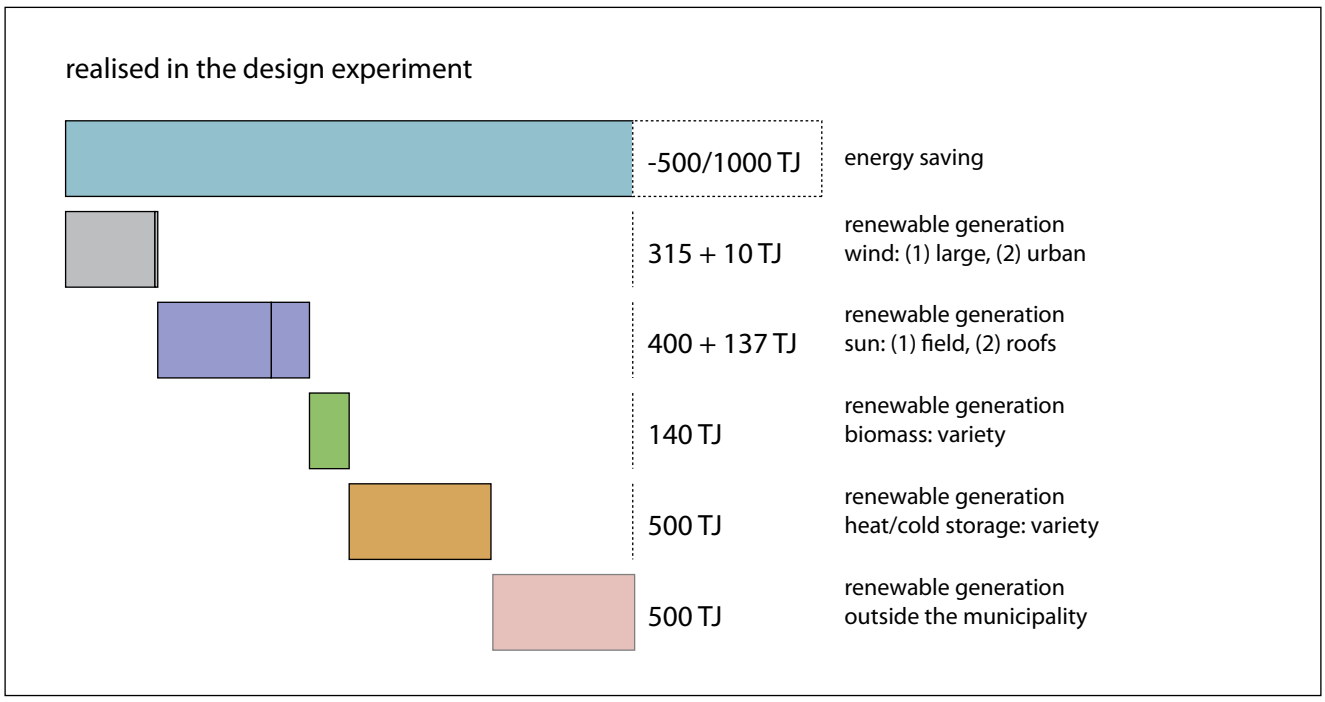


Figure 11.22
Design


legend
fields
meadows
orchards
trees/forest
floodplains
water
industrial zones
services zones
city centre
residential (high)
residential (low)
main roads
energy crops
solar fields
wind turbine
reed fields
solar roofs
urban wind turbines
green roofs
north
1km

Also recreation activities are connected to experiencing the associations between the landscape characteristics and the energy technologies. This can be done in all the landscape types and create more awareness. For example people can go canoeing in the reed lands. The farmer, maintaining the reeds lands, can start to offer this new recreation activities ***(see figure 11.21)***. For the farmer this will offer some new income and for the citizens it is a nice opportunity to experience the basin in a different way. The farmer can use the reed as biomass in a biomass installation. Different sources of biomass are being used in the biomass installation, for example the manure of cattle.

Another example are the wind turbines. These are placed on the highest ridge of the moraine and is about 100 meters high, emphasising the higher grounds ***(see figure11.23)***. The wind turbines are clearly visible from a distance, but in the forest they disappear. People will have different experiences, with and without wind turbines ***(see figure 11.24)***. Also they will have the opportunity to enjoy the beautiful view and height from a tower on the moraine. This viewing point is part of the wind turbine project, which is owned by a cooperation of citizens and companies. They benefit from lower electricity prices.

Figure 11.21
Impression of the biomass production and the recreaton activities connected to it.

Figure 11.23
Section future wind turbines and biomass production 1:2000 (right) and current situation (left). The location of the section can be seen in figure 11.24.

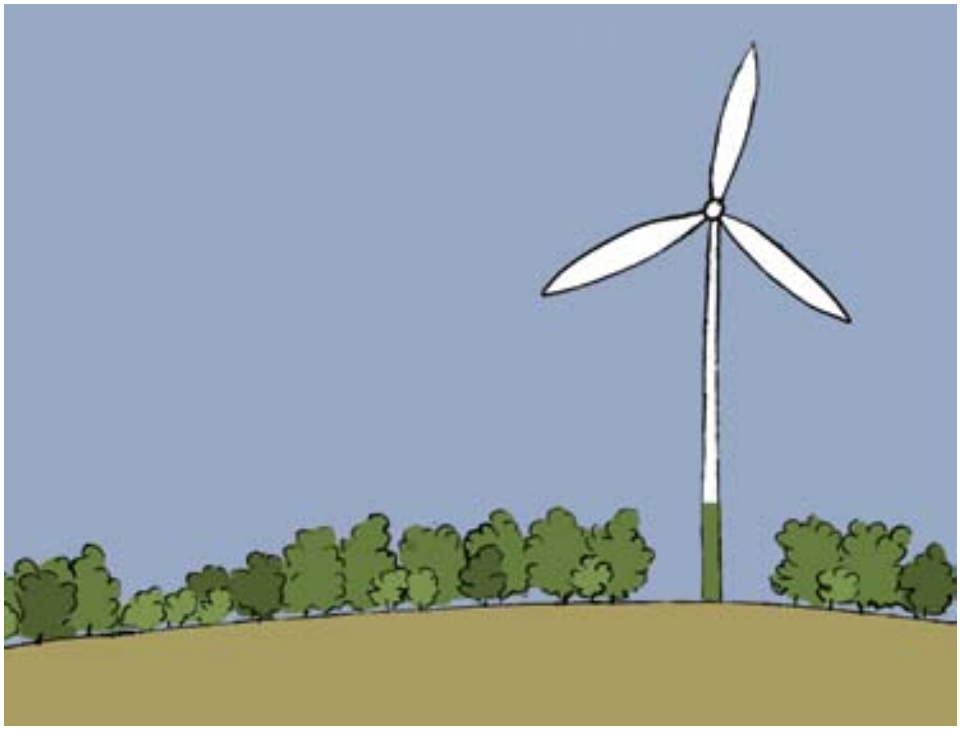
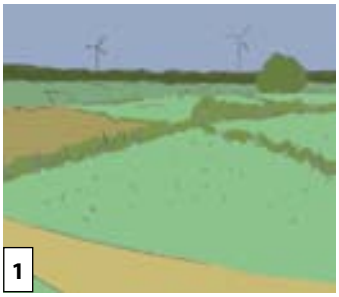


Figure 11.24
Experience of the wind turbines from different points in the landscape.



11.4 Detail solar field

The solar field is replacing some smaller meadows ***(see figure 11.25)***. The common current plot size and lines in the area are respected. The solar panels are low, like most crops in the area also are. The panels are directed to the south for maximum benefits. Protection of the solar field is important and this done with hedges and channels, which are seen much more in the area to separate plots ***(see figure 11.26)***. The solar field is about 2,1ha large, which means it will generate about 7,5 TJ a year.

Also energy on one plot agriculture is replaced by an energy crop. By connecting the energy crops and solar fields to the current structures, the characteristics of the landscape are respected and a flexible system is created, in which farmers and citizens can easily start growing energy crops. This means the principle of this detail are most important, because any plot in the area could probably be suitable.

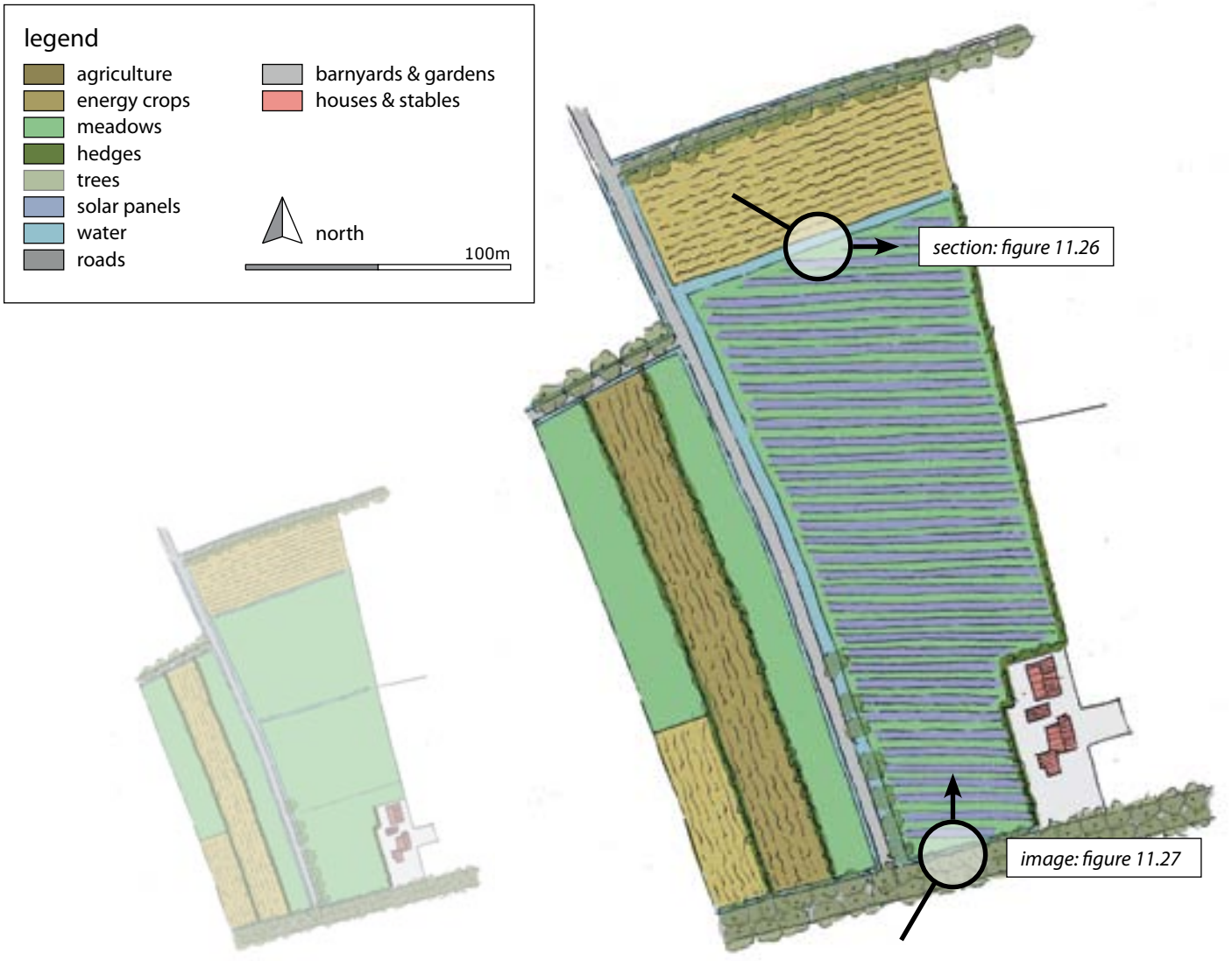


Figure 11.25
Detail of the solar field with left the current situation and right the future situation. For the location of the detail see figure 11.22.

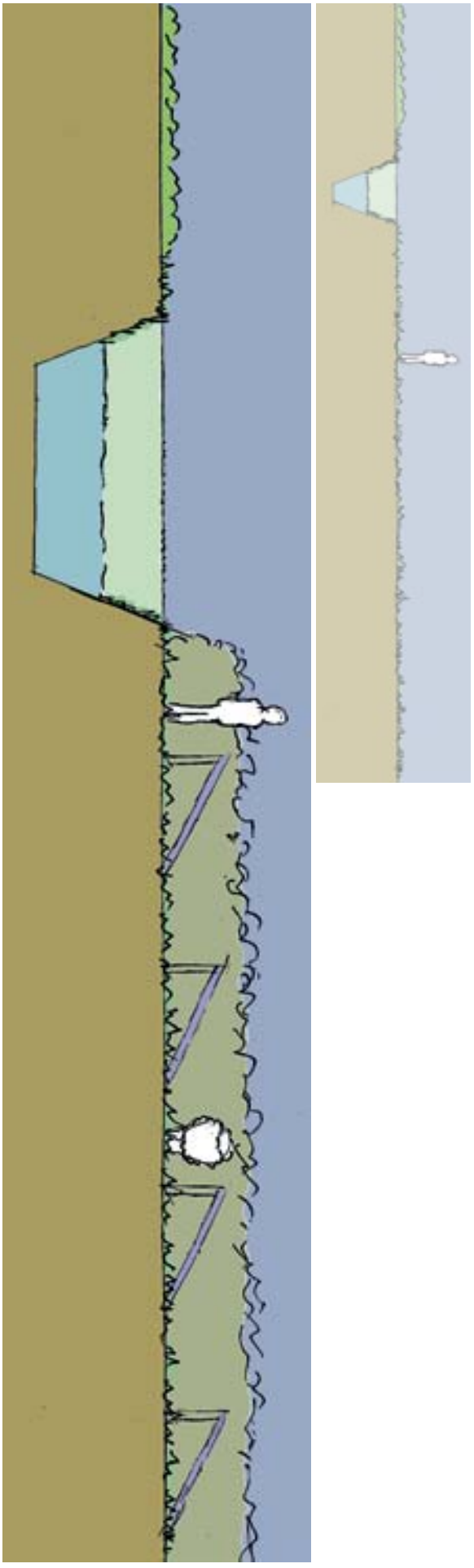
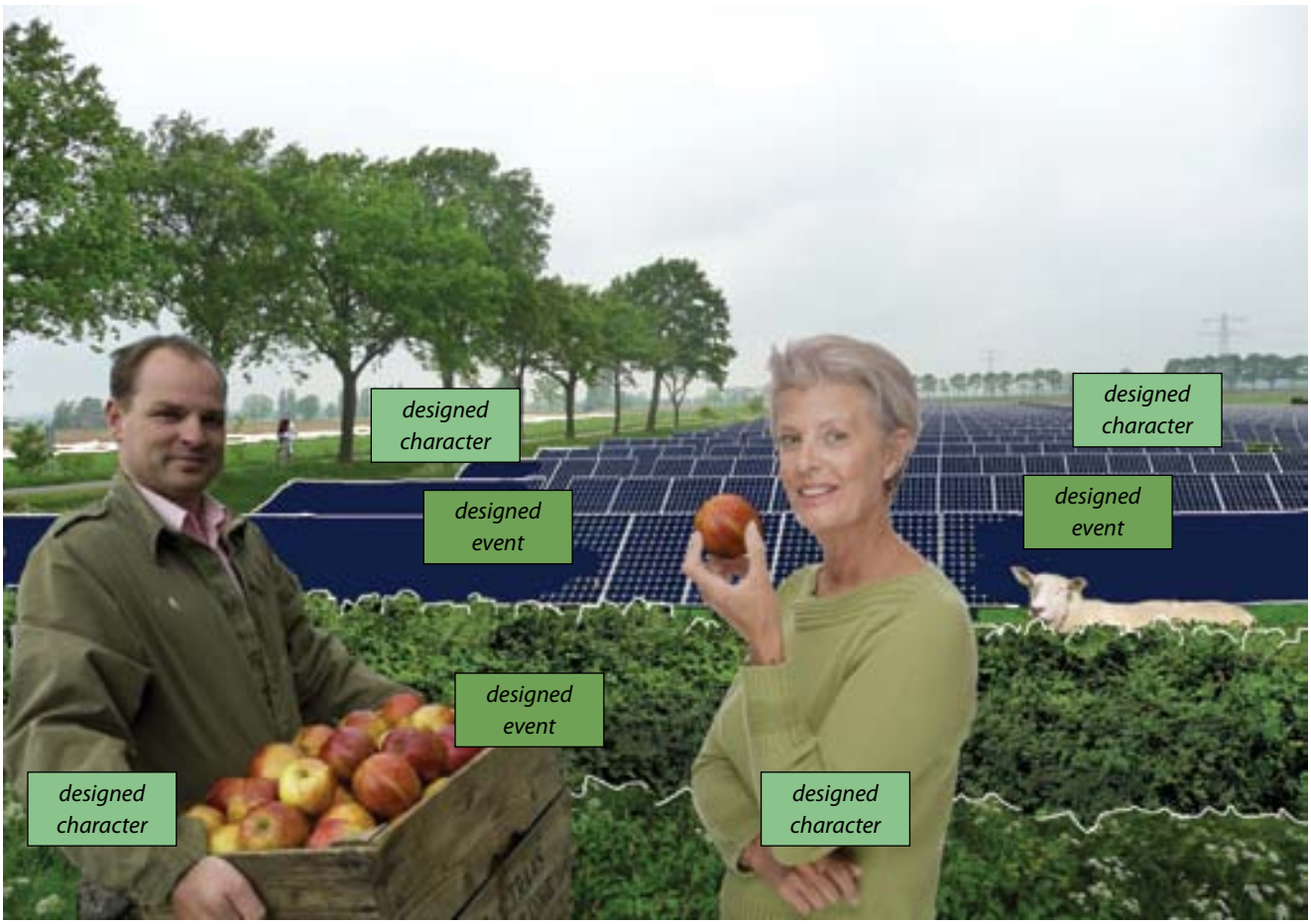


Figure 11.26
Section of the future solar field (left) and the current situation 1:100.

The solar field could be next to the farm of the farmer, who is not only farming in a traditional way, but also generating energy on a large scale ***(see figure 11.27)***. In local cooperations the farmer and citizen cooperate to generate renewable energy, decrease the energy costs for citizens and create new income for the farmers. Also the landscape is attractive, as energy technology being connected to the characteristics. Farmers can also start to sell local products to the citizens and have a social function in recreation.

Figure 11.27
Impression of the solar field with the aims for characters and events coming back.



12. Reflection design experiment

This chapter includes the reflection on the design and the conclusion of the design experiment. The design question for the design experiment is:

- *How can narratives be used in the synthesis of in the design experiment? (3)*

The most debated part of the design will be the wind turbines, because the public debate is already heavy on this issue. In this design experiment it is tried to integrate wind turbines in a larger story. At the moment the story is not present and so the design experiment is at least a proposal to inspire people seeing the wind turbines differently. And wind turbines should not be the first chapter in this story; first the attention should be to other parts of the story. But whether the story is convincing the citizens could not be checked with this study, because that was beyond the aim for the design experiment.

The choice could also been made to not integrate wind turbines in the design because of the public debate. On the other hand, based on the analysis of the energy system and the literature it seems important to create a sustainable energy system. For Wageningen the implementation of renewable energy was the biggest challenge, also if that would include wind energy with its major impact on the landscape. And so the design experiment included that challenge.

Moreover, Wageningen could maybe have a local energy system without wind turbines, but that would also have had major impact on the landscape from other renewable energy technologies. For example the amount of solar fields has to increase. And with current technological development wind turbines are the most efficient source of renewable energy. Maybe this will change in the future and wind turbines are not needed anymore.

In the current plans of the municipality, it is proposed to place wind turbines in the harbour/floodplains, which would not connect well to the landscape characteristics. Also the energy use of the industry in the harbour is limited and so a close connection between energy generation and the main energy users, which would make sense from the perspective of energy efficiency, is not made. A story is lacking and the design experiment tried to create such a story, in which wind turbines are a small element.

In this design experiment characters and events have been used as base for the design. Also aims for narratives in different themes were formulated and the characters were have a role in the different themes to increase the credibility. For example, the solar field is generating renewable energy for the citizens and both the farmer and the citizens can benefit from it. In this case the citizens, farmers and renewable energy are the designed characters and the designed events are benefiting and generating. This method to base

the design on was a result of the research as described in the earlier part of this study. Though this was only the base; to expresses the stories the design strategies were used.

Using the analytical framework forces designer to think about stories and that conscious process supports connecting the landscape to other aspects and to view the landscape more from a stakeholder perspective (citizens and the municipality in this case), making it an integrated proposal in which the current debate on renewable energy within the municipality is taken into account. Reflecting on the design, the characters, events and aims for narratives can still be recognised and so the use and influence of narrative is more clear. By having aims in different themes and characters appearing in all those themes the designer is forced to use a more integrated approach. To conclude the use of narratives to base the design on can result in a more transparent and integrated proposal for a sustainable energy landscape.

Part 5: Conclusion

The last part of this study arrives at the discussion, conclusion and recommendations. The discussion will elaborate on the challenges in this study. And the recommendations will be made for further research. But most important, in the conclusion there will be reflected on the main research question.

- *How can narratives be used in the analysis and design of sustainable energy landscapes? (M)*

13. Discussion

This chapter includes the discussion, which is formulated in three paragraphs. For every part of the study there will be a paragraph.

13.1 Research on design

From the total of 36 competition entries only four competition entries were selected. These four competition entries represented the large variety of all entries and gave me sufficient information for this study. The traditional coding approach with 'paper and maker' was used, because this gave the opportunity to study four entries instead of less. The competition entries BBB and 7S focus more on designing a process than creating a spatial design. BBB has extensive stories about the organisation of digital communication to create new initiatives. This competition entry does not include spatial interventions. WWBS is a completely different competition entry; it focuses much more on the spatial implications of the design. The other two competition entry combine the process and spatial interventions. The methods for the analysis of the essays and posters had small differences. At the first place the data have different appearance (text vs. images) that cannot be interpreted with exactly the same method. The text can be coded directly; for the posters this was more complex. Secondly because the 'paper and marker' approach was used, notes were made first of the image in order to be able to mark it like the essays. The process was experimental and the methods were discussed with the supervisors during the analysis of the posters. As recommendation sticking to the original data as much as possible was suggested in order to increase the transparency. This recommendation has been taken into account in the process for the posters.

The sequence in which the essays and posters were analysed could influence the results. For every essay or set of posters all steps were completed before starting a new essay or a set of posters. This gave me the opportunity to experience and experiment with the process. Though this meant descriptions and themes of the one competition entry were known before analysing the others. A bias for certain themes and descriptions could influence the results. During the process awareness of this potential bias was present and an open attitude was used towards new descriptions and themes. For example in the first competition entry clusters could be classified in four themes. In the following competition entry it appeared that a fifth theme was present. After discovering this the first essay was reviewed again. This study started with analysing the essays, because literature gave more guidelines for analysing essays (text) than for posters (images) and the analysis is less ambiguous. After finishing the essays, the posters were not analysed directly, but some months later. This helped with an open attitude towards the analysis of the posters.

Characters, events and settings cannot be seen and understood without each other. Together the elements are meaningful, but separately this not the case. With coding the elements are identified as separate things, but they can never be seen without their context. In the process the elements for example originating from one sentence were kept together. This complicates clustering, because this creates more space for interpretation with more elements involved. However with analysis of the basic elements could be tested if elements qualify together as being a narrative. It appeared clusters mainly consist of characters and events. The other elements (settings and telling) were sometimes barely present. In this study descriptions have been based also on this type of clusters, because designers did not mention all elements explicitly. In special settings could mostly be assumed, but were not mentioned. As well some events and characters can be setting in a cluster. Coding the entries is sometimes confusing because of this. Though after several times going through the data the important clusters become evident. During the process definitions became sharper, though the coding process remained highly interpretive. In the analytical framework also a difference has been made between analysis and synthesis, because the designers analysed the existing narratives and designed future narratives. Only in VK3.0 the amount of analysis (analysed characters, analysed events, analysed characters and how analysed) was substantial. The other competition entries did not present so much of the analysis. In the other three competition entries it was sometimes even little confusing, because the designers tried to integrate analysis and vision, so coding it as analysis or synthesis was hard. Though the advantage of this system is the sharp distinction between analysed (existing) and designed (future) narratives. The code scheme on these codes should be revised for future application. Finally in the analytical framework analysed telling and designed telling were predefined as codes. With the used data source and definition used very little of these elements have been identified. Only WWBS has elaborated on designed telling. This entry has a focus on spatial design. The spatial interventions express the story in the landscape. The other entries have more focus on the process. The amount of designed telling is in this competition strongly related to the amount of spatial interventions. As the analysis is general mentioned less, also analysed telling was mentioned rarely in all selected competition entries.

13.2 Research for design

The research *for* design was dealing comparable challenges as the research *on* design, because the methods were also comparable. For example the elements in newspapers could not be understood without each other. Also different issues appeard in the research *for* design. In this study newspaper articles and headlines have replaced stakeholders, because these are representative for the social issues in a community and so it seemed to be a proper source for finding narratives. Though a distinction has to be made between identifying social issues and narratives. From literature is known that for identifying social issues newspapers are proper source, but the narratives of people on the social issues is more complex. By mentioning the social issues people are attracted to read newspapers. Journalists and certain

stakeholders try to influence the narratives of people by the newspaper, but if people share this narrative is not clear. Taking into account that the social issues themselves are plausible being part of narratives, the source was still useful for the design experiment. In relation to this only headlines have been used in this study, because these summarise the main message of the article and enabled to study much more different articles. In social sciences this seems to be a well-known method and helped to identify the social themes properly. Though complex and nuanced opinions get less attention by using the headlines only.

During the study it appeared that not only the narratives on the energy transition are important to study, but also on other issues. These other narratives could be opportunity or threat for the narratives on energy transition. Finding other accessible and representative source was not available for this study. In relation to this the amount of data was limited and so the amount of clusters as well. The clusters could only be classified in three of five themes found in the reference study on the entries of the Eo Wijers Competition. Probably this explains clusters could only be classified in three themes. It can also be that in Wageningen the energy transition has nothing to do with society or communication themes. The five themes still seems to be plausible results for narratives in sustainable energy landscapes.

13.3 Design experiment

In the design experiment a landscape design was made, to see whether narrative can be of use in the design, based on the research results and renewable energy technologies with a major impact on the landscape. The focus has not been constrained, by for instance the competition between food production and energy crops, because the design experiment had a different aim. The design shows a possibility to use the findings of the research into the design. Much more ways can be explored, but in this study I focused on the findings of the research and my interpretation of those. Also the aims for future narratives have been created in the design experiment. These have not been examined with stakeholders. In this study the newspapers replaced the stakeholders and so these were used to examine the plausibility of the aims. Unfortunately in this study it was not possible to involve the stakeholders by means of interviews, surveys, etc., because the time available for this thesis was limited.

14. Conclusion

In this chapter the conclusion will be formulated for this study. The study started with a fascination for landscape narratives and importance of the energy transition. The main research question for this explorative study was:

- *How can narratives be used in the analysis and design of sustainable energy landscapes? (M)*

The research *on* design enabled to understand the use of narratives in state-of-the-art design on the level of characters, plots and settings. A large variety of these elements could be discovered and classified into five themes: economy, landscape, energy, communication and society. Curran describes comparable themes in her study about narratives on the energy transition [Curran, 2012] and so the themes appearing in this study seems to be plausible. Another conclusion appearing from the reference study was that characters appearing in different clusters and themes is strengthening the narratives. It seems designers (unconsciously) noticed the importance of the different themes and connected those.

The research *for* design enabled to understand narratives in the project area Wageningen with comparable methods. The amount of data was more limited, but still a large variety of elements has been discovered. Five clusters appeared and these could be classified in three of the five themes that occurred in the reference study (economy, landscape and energy). These themes have been taken into account for the design experiment. The structure of characters appearing in different clusters and themes, did not appear in the project area, like it did in the reference study. Creating such a structure has been addressed in the design experiment, because it seems a strong structure. Besides it has been concluded that the author and the size of the cluster are important to take into account in the design experiment.

The design experiment (research *through* designing) enabled to use the findings of the research in the design. The elements (characters, events and settings) and the other findings (author of narrative, etc.) can be used to base the design on and so it can be concluded that designing can be seen as a form of storytelling. Though the story is not complete with only the basic elements and the interpretation of the designer is needed to really create a full story. In this case that have been the three design strategies.

Potteiger & Purinton describe in their book the most basic structure of narratives: characters, event, setting and the telling [Potteiger & Purinton, 1998]. Based on this, the analytical framework was made, as part of PhD research of de Waal. In this study I explored if the analytical framework is a suitable tool for studying narratives in landscape designs, analysing narratives in landscapes and designing narratives for those landscapes. It

can be concluded that the analytical framework is suitable for analysing the elements of narratives in landscapes and landscape designs, though narrative is a complex concept. This means also the coherence between those basic elements and the plots are not addressed by the use of the analytical framework. The resumes of the competition entries, as presented in chapter four, are a possible way to catch that connection among character, setting and event. However it seems that conscious use of narrative in the design of sustainable energy landscapes can contribute to the socio-cultural aspect of sustainable energy transition, because the use of narrative would result in more transparent and integrated design in which the current debate on renewable energy within the municipality is taken into account. With using the five different themes, an integrated narrative is created, that also reflects common knowledge in landscape architecture about important aspects for a design process in general. This study did also show that the role and author of the narrative is important issue, because this helps really having a role in a narrative. And with the elements and other findings as basis for the design, it has become more transparent. Finally, to conclude, narrative has a potential to be used for the design for sustainable energy landscapes. This explorative study shows that this concept can be applied in research *on, for* and *through* design(ing), but much more research is needed to support the use by landscape architects in practice.

15. Recommendations

From the research presented in this Master thesis, a number of recommendations for further research originated.

15.1 Analytical framework & qualitative method

The analytical framework was appropriate to analyse the elements in the competition entries. Though the indivisible coherence between elements made it hard to come to conclusions. The elements are the basics of a narrative, but the analytical framework does not help to understand the coherence between those elements. For example a story has a beginning, middle and end, which has not been studied. In further research it is important to use an additional method that helps understanding the complexity of the narrative and not only the elements to have a more comprehensive view on narratives and to overcome the problem of indivisible coherence between elements. Making a resume of each unit of analysis, in this case the newspaper articles, or the competition entries, can be a step serving that purpose. Also for the 'telling' in the analytical framework, the data and methods have not been appropriate to discover these. For understanding the complete narratives these are also important. Another source, method or definition should be used to overcome this problem. Interviewing the designers could be an example of this.

Because the 'paper and marker' approach was used, many things in this study could not be quantified. These quantified results could give interesting new insides. Probably a 'computer-aided' approach could be helpful to quantify the results more. Although in social sciences a lot has been written on semiotics, interpreting narratives from images is still largely unexplored in landscape architecture. In this study conversion to text was used as first step to interpret the images, but maybe other methods could improve transparency.

15.2 Narratives in Wageningen

Newspapers were used as representative source for narratives, but it seems newspapers are only able to identify social issues and not the positive or negative attitude people have towards these issues. More research is needed to check if newspaper are a proper source for narratives or if additional methods are needed to validate it. As well only narratives on the energy transition in the project area have been studied, but there are much more narratives in a community. It would be interesting to involve these narratives, because these could provide opportunities and threats to the narratives and the aims related to the energy transition.

15.3 Design for Wageningen

Because this study focused on the implementation of renewable energy technologies and narratives as base of the design, constraints like competition between energy crops and food production got less attention. In future research it would be interesting to take this into account, since constraints like these influence other aspects of the sustainability of energy transition. Also no stakeholders have been questioned in this study, but this could have an added value for further research. In a project area, involving stakeholders, like the municipality, citizens and companies, could validate the discovered narratives and reflect on the aims for narratives and the design. For the municipality of Wageningen in specific, this thesis can be a source of inspiration. It is recommended that the municipality works on an integrated spatial design to become climate neutral. For creating this design different stakeholders should be consulted, their narratives included and the constraints taken into account.

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Attachments

The attachments include:

- the original posters and essays of the selected competition entries from the Eo Wijers Competition (WWBS, 7S, VK3.0 & BBB);
- the different steps in the content analysis of these posters and essays;
- the original newspaper articles and headlines on the energy transition in Wageningen;
- the different steps in the content analysis of these headlines.