Chapter 1. Introduction

1.1 Problem description

Both landscape and renewable energy are powerful and controversial concepts in public debate and environmental issues.

Landscape has both physical and conceptual meanings. On one hand, landscape is envisioned as a geographical entity, such as sensitive, ordinary and degraded urban, peri-urban and rural spaces where people live and natural areas; on the other hand, as an integrative framework for spatial planning and policy formulation. Thus the European Landscape Convention (European Landscape Convention, Florence, 2000; Council of Europe Treaty Series no. 176, 2004) suggests that landscape is an agent for decision-making and a medium for synthesis for design and planning processes. The European landscapes also represent historical and local identities and new configurations of landscapes are often hardly imagined nor accepted by institutions, professionals and people.

On the other hand, renewable energy deployment is one of the strategies proposed by the Sustainable Energy Transition framework (see e.g. Solomon & Khrisna, 2011; Smill, 2001; Strong, 1992), which proposes the means to transit our planet to a more sustainable condition reducing CO2 emissions. In addition, renewable energy has become worldwide and thus landscapes have also undergone change (Debeir et al. 1986; Ewert, 2012). Indeed energy is considered the most influential driving force for landscape transformations in the 21st Century (see e.g. Selman, 2010).

Sustainable energy transition is also a landscape transition (Nadai & Van

der Horst, 2010b; Shove & Walker, 2010). Therefore the deployment of renewable energy technologies also calls for the renewal of institutional, political and economic organizations, innovative governance, planning systems and changes in people's everyday habits.

Since landscape architecture (among the other environmental and spatial planning disciplines, such as spatial planning, urban planning, engineering) deals with landscape transformations via landscape management and planning, it has recently started to examine the possible contributions to the sustainable spread of renewable energy technologies (De von Back, 2010, Stremke, 2010; Stremke & Dobbelsteen, 2013).

According to international definitions of landscape architecture, for instance given by the American society of Landscape Architecture (ASLA), the International Federation of Landscape Architects (IFLA) and the European School of Landscape Architecture (ECLAS), planning and design are the most common activities for both discipline and landscape architects. Since planning and design dimensions are considered time- and site-specific concepts, a reflection concerning their role within landscape architecture for sustainable energy transition is acknowledged as needed.

Two paradigms have recently been elaborated on the relationship between planning and design dealing with sustainability. The first is the paradigm *knowledge in action* (e.g. Wu, 2006b; Musacchio, 2009b; 2010a; Nassauer & Opdam, 2008; Van Paassen et al. 2011). This approach has been elaborated within the domain of *Landscape Science* and calls for the collaboration of scientists, professionals, stakeholders and people in decision-making positions in landscape development, which is why the design process is seen as a valuable means.

The second is the paradigm of *design as planning.* It has been elaborated in spatial planning (Van Assche, 2004; De Jong, 2011; Van Assche et al, 2013). This perspective links design and planning, seeking for new paradigm aimed at approaching uncertainty and complexity in sustainable transition.

Transition is a societal process that depicts the interplay between societal structures, individual actions and technological innovations, leads to changes that periodically can lead to fundamental structural change (see e.g Loorbach et al, 2009). Sustainable transitions are long-term, multi-level and multi actor processes (Rotmans et al, 2001) aimed at transitioning society to a more sustainable condition regarding for instance industrial production, urbanization, transport, agriculture or water management (see i.e. Truffer et al, 2010; Kielen, 2009; Morissey et al, 2013; Sholten, 2012).The pressure of sustainability is mainly put on by the internationally recognized importance of meeting future energy and environmental policy targets. An important aspect of sustainability transitions is how new innovations in technology and human behavior spread in society, but many uncertainties exist over the scale, timing, and impacts of large-scale diffusion. For example, we do not know whether consumer demand will support the rapid uptake of advanced energy saving technologies to meet climate policies. These uncertainties call for developing more robust methods to approaching socio-technical systems linked to sustainable transitions.

On the basis of this need, landscape architecture is considered contributing to link complexity and sustainability (Musacchio, 2009b) by disciplinary skills. Indeed, historically, landscape architecture has dealt with open green spaces, greening for the city, designing urban green spaces, designing for users and landscaping infrastructures. However, landscape architecture has recently shifted its scope from open spaces and site-specific levels to architecture, urbanism regional planning and design and Infrastructure and Engineering (Koh, 2013; Van Damme et al, 2012). In dealing with these topics, landscape architecture has tackled several sustainable transitions, such as water systems, transportation and agriculture (Markard et al, 2012).

Thus landscape architects have started to be perceived by their science, design, and construction peers as important participants in the planning, design, and construction processes (Minch, 2012) playng an important role for developing sustainable landscapes (Antrop, 2006; Robert &Tayer, 1989).

In addition, landscape architecture has begun to reflect on disciplinary features, acknowledging working across different spatial-temporal scales with long term perspective and solving complex problems with collaborative attitudes as the most important actions within the disciplinary scope. These features fit the purposes of sustainable transitions via the idea of democratization of landscape planning and design.

Within this context, the main aim of this research is to explore the possible contribution of landscape architecture and landscape design to sustainable energy transitions in Italy and beyond.

1.2 Scope of the research

The scope of this research work is Italian landscape architecture. This is enquired by comparing it with Dutch landscape architecture. Italian and Dutch landscape architects' practices in landscape planning and design of sustainable energy landscapes are compared and Italian and Dutch approaches to sustainable energy landscape planning and design are explored within European landscape architecture (Nadin & Stead 2008; Newton, 1971; Nielsen et al, 2007). Thus these countries are complementary cases concerning landscape architecture traditions and sustainable energy transition.

Indeed Italian landscape architecture has historically dealt with garden and site design, neglecting urban and regional planning (Maniglio Calcagno, 1978; Caravaggi, 2002; Cinà, 2010; Tassinari et al, 2013). Thus Italian landscape architecture has a very structured corpus of operational knowledge, such as executive criteria for design. Conversely, Dutch landscape architecture is internationally recognized as an example of the increasing importance of landscape architecture in strategic thinking such as several environmental fields. For instance, several Dutch landscape architecture firms are currently involved in study and projects for the flooded city of New Orleans (USA) and the Dutch landscape architecture company OKRA won the international competition *Re-*

Think Athens, working on the urban micro-climate and saving energy.[1] Indeed, the design approach and designing process have historically participated in regional and spatial planning in the Netherlands (De Jonge 2011; Duchhart, 2007; Meeus & Vroom, 1986; Nielsen et al, 2007; Sijmons, 2002; Vroom, 1994).

As far as sustainable energy transition is concerned, on the other hand, the Dutch National Government has promoted several research programs, involving both academics and professionals, for the study of socio-technical transition phenomena and several experiments were developed in order to test such a theory, including energy issues. The first program, called *Energy Transition Program,* started in 2000 and supported the *Fourth National Environmental Policy Plan* (2001). Thus energy transition is a highly developed topic within Dutch academic and professional contexts (testing for the transition from coal to natural gas occurred on the national level in the 1990s). Therefore this theory is well known and used by members of government and professionals alike. On the contrary, the topic of energy transition and the transition theory in Italy is commonly neglected by institutions and professionals. Despite this, renewable energy in Italy has sharply increased in the last five years according to the targets promoted by the Eupean enegy policies, being very common in the Italian landscape, whilst in the Netherlands renewable energy diffusion did not occur according to the European targets, for instance proposed by the *2020 climate and energy targets.*

Thus Italy and the Netherlands are the cases study of this research work in order to study landscape architects' different approaches to sustainable energy landscape planning and design, according to different national characteristics such as landscape architecture's disciplinary role in society and traditions, renewable energy development and the sustainable energy transition framework.

1.3 Knowledge gaps

Three knowledge gaps were identified in Italy and in the Netherlands as well as in the international context. They pertain to sustainable energy transition and thus planning and design of sustainable energy landscapes.

The first concerns the lack of integration of energy and landscape in spatial planning and urban design. This is due to the feeble consciousness of spatial and territorial dimensions of energy and renewable energy (Sgard, 2010; Bagliani et al, 2010) and to the lack of strategic thinking for landscape transformations. Considering this *territorialization* (Brigge et al, 2013; Dansero & Puttilli, 2010; Raffestin, 2012) of sectoral policies, it is clear that both energy and landscape dimensions are often neglected in such a process.

The second gap refers to the difficulties in linking energy policy formulation and the implementation phases (Nadai & Van der Horst, 2010a; Olwig 2011a; Michalena & Hillis, 2011; 2013). This is because the spatial dimension, as well as the involvement of people in both phases, is commonly lacking. This missing link between energy policy formulation and implementation also refers to the very partial reasoning on landscape governance concerning energy topics. Indeed,

1 see also http://lnkd.in/dddZgvz

the possibility of integrating landscape dimension and energy policies is often neglected.

The third knowledge gap refers to the relationship between strategic thinking and operational thinking in conceiving sustainable energy transitions. Thus planning and designing sustainable energy landscapes by renewable energy deployment require both long term strategic thinking on the regional scale and near future operational thinking on the local scale (Campus, 2013; Stremke & Van den Dobbelsteen, 2012; Zampieri, 2013).

In this respect, landscape architecture, being a discipline which refers both to strategic (producing far future visions, planning) and operational knowledge (designing for near future and for executing projects), can contribute to this debate. In addition, the relationship between strategic and operational domains of landscape architecture is here considered a seminal lens for exploring sustainable energy transition, whilst this problem in the light of sustainable energy, is neglected in Italy.

1.4 Research propositions

This research study is based on two propositions:
1) design is the core of the landscape architecture discipline (see for instance Filor, 1994; Njhuis, 2012; Koh, 2013).

Thus landscape planning and design can inform plans and policies for renewable energy deployment using knowledge and design products emerging from the design process.

This topic is addressed by the Recommendation CM/Rec(2008)3 of the Committee of Ministers to Member States on the guidelines for the implementation of the European Landscape Convention which calls for integration of landscape in sectoral policies. This document states:

'Landscape should be fully taken into account via appropriate procedures allowing systematic inclusion of the landscape dimension in all policies that influence the quality of a territory' (CM/Rec(2008)3, part 1-F).

The research work rephrases this consideration in the following proposition:
2) landscape integration in energy policies can occur through landscape architecture knowledge and landscape design.

In this respect, the aforementioned emerging paradigms of *knowledge in action* and *design as planning* underline the possible relevance of landscape architecture, and landscape planning and design to the complex processes of sustainable energy transition.

1.5 Research goals and questions

The main aim of this research study is to explore the possible role of landscape architecture and landscape architects in sustainable energy transition in order to elaborate on the sustainable deployment of renewable energy

technologies, using planning and design perspectives.

The main questions addressed in this research work can be divided into three enquiries:

1) What landscape architecture disciplinary knowledge and skills do landscape architects use while designing energy landscapes? What are they within the Italian context?

2)What is the landscape architect's role in planning and designing processes aimed at transitioning regions to a more sustainable use of energy? What is it within the Italian context?

3)What is the territorial governance level where landscape architecture can contribute in designing sustainable energy landscapes? Thus what is the role of landscape architecture in sustainable energy transition in Italy and beyond?

1.6 Materials and Methods

This research collected various materials (see figure 1.1):

- Literature survey using the key words *landscape* and *renewable energy* (period 2007-2010);
- Two issues of *Architettura del Paesaggio,* the Italian journal edited by *PAYSAGE* collecting national and international landscape architecture practices. Two issues were chosen to be able to gather projects on the relationship between *landscape* and *renewable energy: Paesaggio, energia e risorse (18/2008),* and *Energia dalla natura e nuovi paesaggi (24/2012);*
- Online questionnaire survey to Italian landscape architects, members of the Italian Association of Landscape Architecture (AIAPP). They were chosen as a sample because they represent the large variety of different backgrounds of Italian landscape architects and because it was quite a restricted sample. The questionnaire enquired into professionals' opinions on landscape architecture and landscape architects' professions, focusing on the implication for sustainable energy transition processes[2];
- 31 energy-related projects developed by Italian and Dutch landscape architects[3]
- eight semi-structured interviews with Italian and Dutch landscape architects dealing with renewable energy in their professional practices[4]
- five embedded cases analyzed through the sustainable energy transition cycle framework (Loorbach & Rotmans, 2010), two in Italy and three in The Netherlands.

2 See p. 209 for the format of the online questionnaire.
3 For the overall list of cases see p.201.
4 The interviews design was structured by the me, Renée de Wall and Sven Stremke, Wageningen University (NL).For the format of the interviews see p. 203.

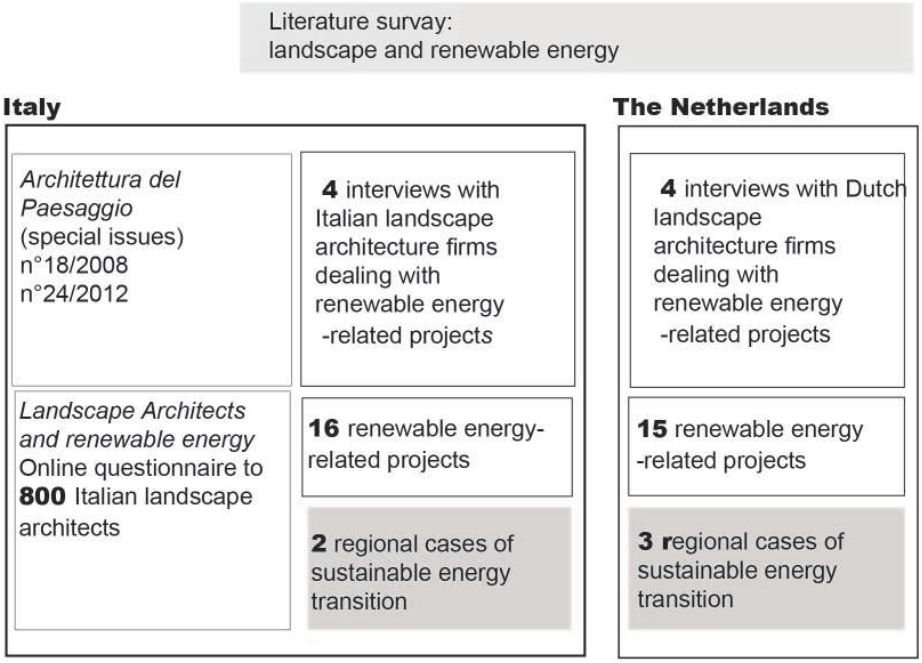


Figure 1.1 Material collected for the research work

The methodological approach pursued by the research design is the interpretive strategy (Deming & Swaffield, 2011; Swaffield 2006). Qualitative methods (Creswell, 2009) are the most used techniques in collecting and analyzing the research data. Questionnaire survey was conducted according to statndard methodologies (Dillman, 1991; Dillman & Bowker, 2001). These kinds of methods fit the purpose of this study because they tackled new practices with undergoing meaning and reflections in order to learn from them. The overall research is strucrured as *research on design* (see e.g. Klaasen, 2007).

In this sense the research study considers Italy and the Netherlands case studies (Yin, 2003, 2012). Energy related works developed by landscape architects are considered embedded cases (Stake, 2006).

Two interpretative frameworks are used for analyzing materials collected in this research study.

1) the analytical framework for creating *precedents* of energy-related projects in landscape architecture (table 1.2).

This framework is re-worked from the study conducted by Van den Toorn & Guney (2011) on analyzing precedent cases in urban planning (see also Pasman, 2003). It is used to compare practices that are different for typologies of assignment and final products.

To this end the framework is unable to make the design process explicit. The framework was used to analyze the 31 energy-related projects developed by landscape architects in Italy and in the Netherlands.

Table 1.2 The analytical framework proposed by Van den Toorn & Guney (2011) was re-worked for the purpose of enquiring about landscape architects' work while designing renewable energy landscapes. The analytical framework is structured following four categories:context, analysis, synthesis and representation. In this way actions conducted by landscape architects in their projects are simplified for comparison.

context	analysis	synthesis	restitution and communication
RES	Elements:	Conceptual approach:	Means
	Natural	Umbrella topic	
Landscape	Technological		Representation
	Cultural	Designing concepts:	
Commissioners		Designing questions	
	Structure:	concerning RES	
Nature of landscape	System	Design principles	
architects'	Pattern		
assignments	Organization	Designing actions:	
		Space/time	
Landscape architects'	Processes:	Intervention/existing	
roles in the design	Natural	Site/program	
process	Socio-technological		
	Cultural	Level of intervention:	
		Element	
		Structure	
		Process	
		Time of intervention:	
		Diachronic oriented to past	
		Diachronic oriented to future	
		Contemporary	

2) The transition management cycle (Loorbach & Rotmans, 2010) is adapted to sustainable energy transition. This framework shows the four cyclic phases conceptually and operationally structuring sustainable energy transition. The first phase consists in the creation of a transition arena by several forerunners who are interested in innovation. The arena is created by a bottom-up process aiming to frame problems. After the arena, a transition agenda is created to discuss objectives and the transition program.

This program is developed by experiments and projects which are considered relevant to test the driving ideas of the transition path. A monitoring phase including all participants in the process is aimed at understanding the results on methods and contents.

This research work considers the cycle of these phases when is structured by the concept of sustainable energy landscape and it is aimed at conceive sustainable energy landscapes (see Stremke and Van den Dobblesteen, 2013).

The 31 energy-related projects developed by Italian and Dutch landscape architects are compared according to this framework. Projects that relate to at least two phases of the framework are further investigated.

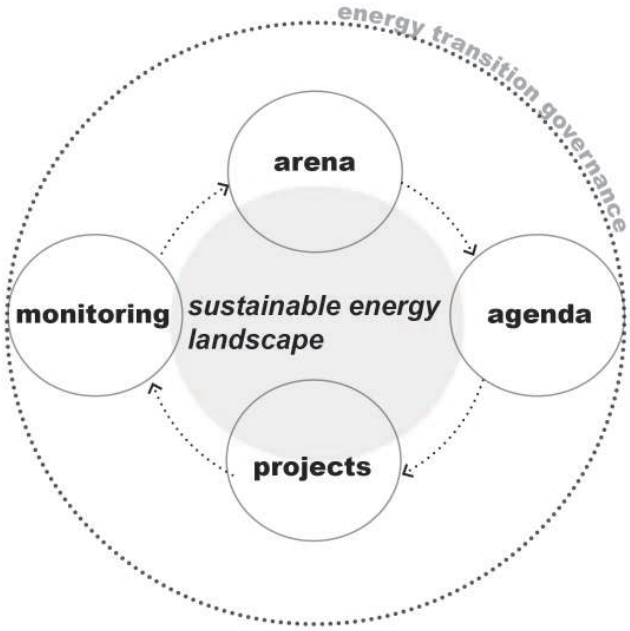


Figure 1.2 The transition management cycle (Loorbach & Rotmas, 2010) re-worked with the purpose to analyse and explain the possible transition to a more sustainable energy landscape.

The concept of *moderatum generalization* (Gobo, 2009; Williams, 2004) supports data analysis and processing. *Moderatum generalization* reasoning offers moderate claims about the social world that are not intended to hold true over long time periods or across cultures. The main concept in this kind of approach is *shared culture* used to build cultural models.

Shared knowledge of a specific cultural domain exists within a group of subjects. Consensus analysis assesses the relationship of each subject's knowledge of the domain in question with the aggregate knowledge of that domain. Consensus analysis determines the culturally correct answers to the survey questions without knowing or assuming the correct answers ahead of time (Fairweather & Swaffield, 2002; Swaffield, 2012; Thompson, 1998; 2000). Data collected and analyzed in this research study are accurately elaborated, searching for shared values in Italian and Dutch landscape architecture contexts. In that sense *moderatum generalizations* are drawn, referring to the two contexts.

This method relies on the application of *abductive* reasoning to generate the synthetic findings. Abduction requires the researcher to come up with explanations that are consistent with the raw data. Essentially, generalization is a way to offer usable knowledge.

Since the topic of this research is quite new for landscape architecture, conclusions are not in the normative domain but in the reflexive one. Indeed this research work looks into what landscape architects need to know and what

landscape architects could do in order to design also for renewable energy policies from the perspective of sustainable energy transition in Italy and beyond.

1.7 Definitions of key concepts

LANDSCAPE: is considered both a conceptual framework to set space and a geographical place (e.g. Nassauer, 2012; Van Damme et al,2013).

LANDSCAPE ARCHITECTURE: is the discipline concerned with humankind's conscious shaping of the external environment. It involves the planning, design and management of landscape to create, maintain, protect and enhance places so as to be both functional, beautiful and sustainable, and appropriate to diverse human and ecological needs (definition from the European Council of Landscape Architecture Schools, ECLAS, http://www.eclas.org).

LANDSCAPE DESIGN: could be interpreted both as a noun and as a verb (Steinitz,1990;1996). As a noun, design is considered the product of a design process. Design as a verb describes the designining process of conceiving spatial transformations (see also Lenzholzer et al, 2013). Both the processes and products have a cognitive dimension (Cross & Clayburn Cross, 1995). They are based on and produce both operational and strategic knowledge.
Operational knowledge is rooted in site-specific practices considering present interventions and strategic knowledge is related to producing different solutions for a problem considering far future visions (De Jong & Fergusson-Hessler1996; Wu, 2006; Van Leewenand & Vermoolen, 2012).

In conclusion, in this research work, landscape design is considered both the design process and the design product based on both operational and strategic knowledge and mainly on the following activities: 1) reasoning across different spatial-temporal scales; 2) layering different meanings; 3) being open to various participants and solutions; 4) using collaborative methods.

RENEWABLE ENERGY: is also called alternative energy. It is usable energy derived from renewable sources such as the sun (solar energy), wind (wind power), rivers (hydroelectric power) and oceans (tides and tidal power), hot springs (geothermal energy), waves (wave power) and biomass (bio-fuels) (Johansson et al, 1993).

RENEWABLE ENERGY POLICIES: are targets and strategies aimed at the deployment of renewable energy, developed by local governments (regional, inter-municipal or municipal) for instance, and regulatory instruments as well as the strategic plans which describe them (see also the definition by IEA/IRENA, 2011). They could be integrated into local operations, comprehensive regional strategies and plans, or through sector-specific targets.

SUSTAINABLE ENERGY TRANSITION: is aimed at achieving environmentally sustainable energy systems through increasing energy efficiency, promoting

renewable energy sources and sustainable transport (Strong, 1992; 1993; Solomon & Khrisna; 2011).

Sustainable energy transition is also envisioned as a socio-technical process, involving technological innovations, complex systems management and multilevel governance (Jeroen et al, 2008; Rotmans & Loorbach, 2010).

Regarding landscape, sustainable energy transition occurs when the physical environment evolves on the basis of locally available renewable energy sources without compromising landscape quality, biodiversity, food production and other life-supporting ecosystem services (Brandt et al,2013; Stremke & Koh, 2011; Stremke & van den Dobblesteen, 2012).

This also involves a gradual change in individuals' and communities' behavior, in public and private choices, and in spatial organization (Nadai et al, 2011).

ENERGY LANDSCAPE: indicates both the physical energy landscapes and the conceptual energy landscapes.

On one hand the geographical dimension describes human energy systems across time such as organic, mineral, electrical and lastly sustainable economy and gives form to landscape (Pasqualetti, 2012). The term energy landscapes also indicates areas or regions mainly characterized by energy infrastructures (Angelucci, 2011) and the energy layer in the landscapes (Stremke, in press). It represents a way to read and design landscape transformations. Thus the term of *renewable energy landscape* is also used to describe places where renewable energy technologies have been developed, but not necessarily aimed at the sustainability of landscape transformation (Stremke, 2010; Pasqualetti, 2011).

The conceptual dimension of *energy landscapes*, on the other hand, refers to the fact that *energy landscape* could be considered a sub-system of landscape or it could be related to the concept of ecosystem services (Howard et al, 2013). Several terms are used to describe the complex phenomenon of renewable energy deployment and the relation to landscape, for instance *landscape of energies* looking at the socio-political dimension of the term (Ghosn, 2010; Nadai & Van Der Horst, 2010a) or *sustainable energy landscape*, referring to actions and processes for spatial transformation aimed at preserving or improving landscape qualities (Stremke &Van den Dobbelsteen, 2012). This research refers to the latter.

EMBEDDED CASES: is a method to complement more general data collection efforts (Yin, 2003). This method combines quantitative and qualitative data in a cross-case analysis (Stake, 2006).

1.8 Structure of the thesis

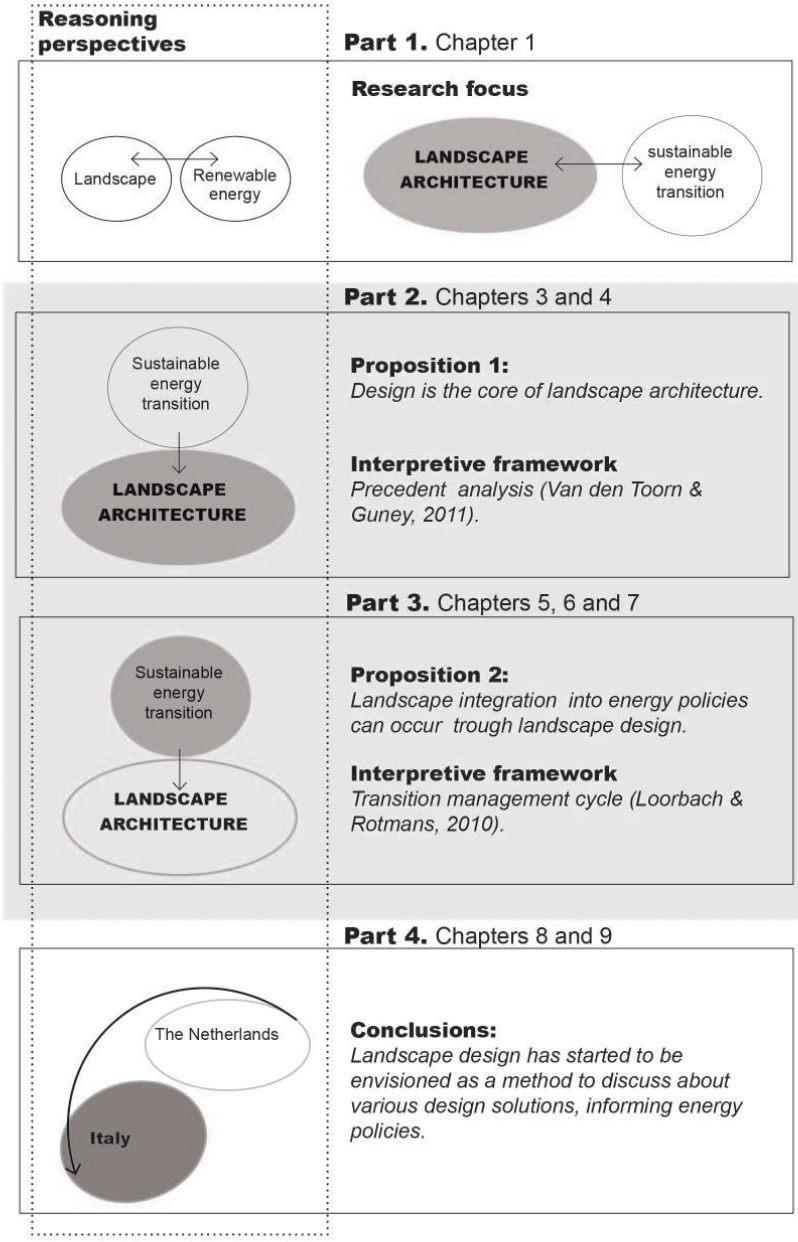
This thesis is structured in four parts following a progressive zooming in process, by analyzing the collected materials.

Part one shows the literature survey on the landscape- renewable energy nexus. The change from dialectic landscape and renewable energy to the emerging role of landscape architecture in sustainable energy transitions is explained.

Part two focuses on Italian landscape architecture from the perspective of sustainable energy transition whilst part three, reversing the approach to the second part, focuses on sustainable energy transition from the perspective of Italian landscape architecture.The different perspectives allowed to explore, on one hand the design skills and techniques used by landscape architects while designing renewable energy landscapes, and on the other hand landscape architects' role in sustainable energy transition.

Part four shows what the role of landscape architecture in sustainable energy transition could be in Italy, considering energy and landscape planning instruments. The most controversial points for the national context as well as some critical points and open questions concerning the research topic are also discussed.

Figure 1.2 Overview of the structure of the thesis.



Micro wind turbines, Pisa, Italy.
(S. Minichino)