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Climate adaptation, urban regeneration and brownfield reclamation: a literature review on landscape quality in large-scale transformation projects

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ABSTRACT

The transition to renewable energy is a powerful driver for large-scale landscape transformation. Environmental design is increasingly engaged in this transition, but little is known about purposefully designed renewable energy landscapes. To improve the design of large-scale energy landscapes we reviewed the literature on three innovative large-scale landscape transformations: Room for the River Nijmegen-Lent (The Netherlands), Queen Elizabeth Olympic Park (UK) and Freshkills Park (USA). We analysed 61 papers on landscape quality and the role of design, governments and participation. Concerning landscape quality, literature reports on functionality and certain aspects of experience rather than firmness (future values) of the transformation. While designers played an important role in large-scale landscape transformations, local governments seem not to be in control of the decision-making and participation was limited. The three cases illustrate how executed projects influence the discourse on landscape transformation and provide valuable insights for the design of renewable energy landscapes.

KEYWORDS

Environmental design; landscape architecture; energy transition; energy landscape

1. Introduction

Changing societal demands and values often result in the transformation of landscapes (Antrop, 2005). Landscape is here defined as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors' (Council of Europe, 2000, p. 2). Landscape transformation involves a change in the dominant land use and the visual appearance of the landscape. Environmental design disciplines are active in an increasing number of landscape transformations. These disciplines, such as landscape architecture, urban design, spatial planning and architecture are concerned with the conscious shaping of the environment. Examples of designed transformations are the remediation of post-industrial landscapes (e.g. Landscape Park Duisburg Nord in Germany), urban regeneration (e.g. Madrid RIO in Spain) and large-scale climate adaptation (e.g. Rebuild by Design programme in the USA). These examples illustrate that landscape transformation can improve the quality of the living environment (Antrop, 2005; Bélanger, 2009).

A key driver of landscape transformation nowadays is the transition to renewable energy (Bridge et al., 2013; Nadaï & Van der Horst, 2010). This transition requires substantial interventions in the landscape. The renewable energy target for The Netherlands in 2030, for example, equals approximately 3000 additional wind turbines.

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Supplemental data for this article can be accessed here.

These targets will necessitate large-scale landscape transformations in denser populated areas (for the Dutch situation see Sijmons et al., 2017). Up until now, energy transition in denser populated areas is somewhat limited to small-scale renewable energy interventions (e.g. groups of wind turbines in business areas), while large-scale interventions are often located in remote areas (e.g. utility scale solar fields or wind parks in the USA and Spain).

Renewable energy interventions in denser populated areas prove to be controversial, because the resulting landscape transformations alter landscape values of local stakeholders (Selman, 2010; Wolsink, 2007). In several countries, because of this controversy, environmental design is increasingly engaged with renewable energy landscapes (Van den Brink & Bruns, 2012), although this is a relatively new topic for environmental design (Stremke & Van den Dobbelsteen, 2013). Environmental designers can use landscape quality as a conceptual tool to address landscape values in the design of landscape transformations. In this paper, we consider landscape quality to consist of the following three criteria: functional, experiential and future values (Hooimeijer et al., 2001). The design of large-scale landscape transformation for renewable energy, similar to other landscape transformations, will benefit from a more encompassing approach to landscape quality.

General environmental design approaches and environmental design processes are widely discussed in literature (e.g. Sijmons, 1990; Steinitz, 1990). Others have built on this existing body of knowledge to advance environmental design processes for energy transition at the regional scale (Oudes & Stremke, 2018; Stremke et al., 2012). Large-scale interventions are featured in these studies from a *strategic* planning and design perspective, which involves long-term processes of change and vision development (Kempenaar & Van den Brink, 2018). Publications on the *operational* design of renewable energy landscapes, where the change in landscape quality becomes tangible (Wolsink, 2017), tend to focus on experience and preserving scenic values—a single aspect of landscape quality (e.g. Apostol et al., 2017). Little is known about the other two aspects of landscape quality and the operational design of large-scale landscape transformations for renewable energy transition. The resulting main research question is: *How is landscape quality addressed in large-scale transformation projects and what is the role of design, governments and participation?*

Because little has been published on designed large-scale renewable energy landscapes, we adopted a wider perspective and systematically reviewed the literature on three designed large scale, constructed landscape transformations: Queen Elizabeth Olympic Park (London, UK), Room for the River Nijmegen-Lent (Nijmegen, the Netherlands) and Freshkills Park (New York City, USA). For ease of reading, we refer to the first project as 'Olympic Park' and the second as 'Nijmegen-Lent'.

The second section of this paper explains the selection of cases, describes the literature retrieval and analysis, and introduces the three cases. The third section introduces the key concepts underlying the research. The fourth section presents the results, organised according to the key aspects in the research question: landscape quality and the role of governments, design and participation. The research is discussed and conclusions presented in sections five and six, respectively.

2. Method and materials

We used a case based approach to identify literature on the design of large-scale landscape transformations. Experts provided a large number of cases, which we subsequently reduced by means of a desk-study. A preliminary database search informed the final selection of cases, followed by a qualitative analysis of the case literature.

2.1. Case selection, literature retrieval and data analysis

Our systematic review of cases of landscape transformation aimed to 'comprehensively identify, appraise and synthesise all the relevant studies on a given topic' (Petticrew & Roberts, 2008,

p. 19). In an email questionnaire, we asked international experts in the field of environmental design to provide us with suitable cases of landscape transformation. The cases had to (1) show transformation of landscape function and character, (2) be large in scale, (3) be completed or under construction, and (4) involve environmental designers. A total of 18 experts (72%) responded to the questionnaire, yielding 75 unique cases (see supplementary material). In a desk study, we reduced the long list to 16 cases. The existence of peer-reviewed literature was a condition for case selection, to maintain scientific rigour. A preliminary literature search revealed peer-reviewed papers for 8 of the 16 shortlisted cases; the few cases related to renewable energy transition had to be excluded.

For each of the eight remaining cases, we performed a database search for peer-reviewed and grey literature in Scopus, Avery Index, CAB Abstracts and Google Scholar. The search query combined the concepts design, planning and architecture with (alternatives of) the case name. The level of detail in the literature ranges from in-depth accounts of the transformation process by researchers, for example, by interviewing designers and stakeholders, to essays that position the cases in a wider societal or academic context, to papers written by authors immersed in the transformation process. We included literature dated from the initiation of the transformation project until autumn 2018.

We first screened the titles and abstracts, followed by full texts, and we identified additional literature by tracking references. We excluded literature that did not examine environmental design in relation to the transformation project. The three cases with most literature were selected: Olympic Park, Nijmegen-Lent and Freshkills Park. We analysed 61 articles: 19 on Olympic Park, 17 on Nijmegen-Lent and 25 on Freshkills Park. A graphic overview of the literature selection process for the three selected cases can be found in Figure 1.

The conclusions drawn in this paper are the authors' interpretation of documented reflections of other researchers about landscape transformation. We performed a qualitative content analysis to systematically describe the meaning of qualitative data (Boréus & Bergström, 2017). We combined both inductive and deductive coding to identify four key aspects relevant to landscape transformations: landscape quality, governments, design and participation. Other aspects, such as project and

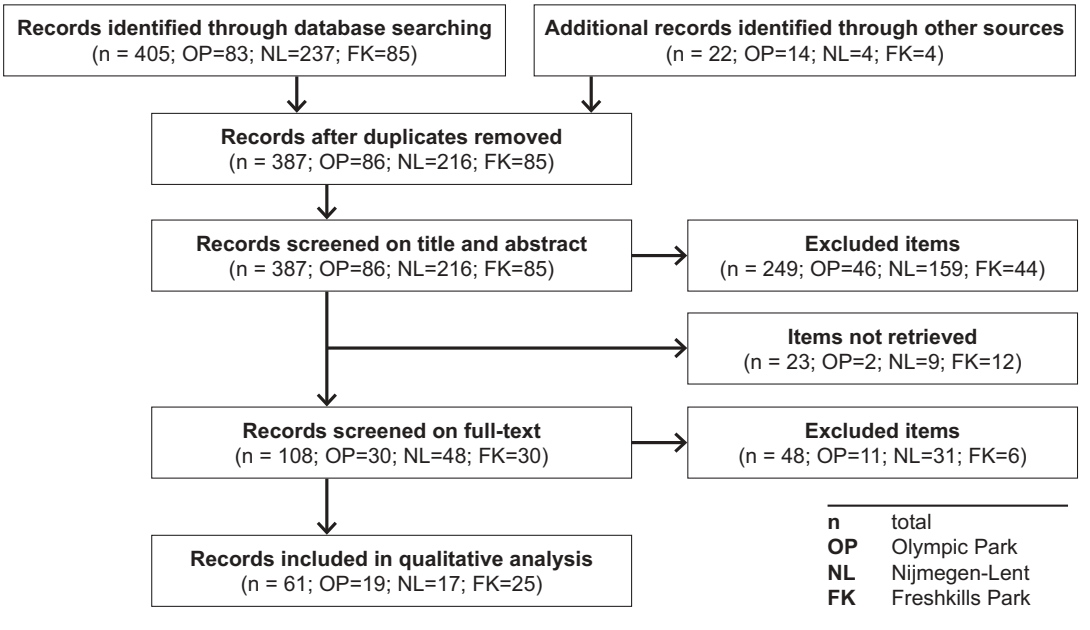


Figure 1. Flow diagram of the literature selection process.

programme management and legal procedures, may also affect landscape quality in transformation processes but are beyond the scope of this review.

2.2. Basic information on the three cases

The 2012 Olympic Games served as a catalyst to regenerate a part of East London giving rise to the Olympic Park. Nijmegen-Lent is a Dutch climate adaptation project involving the creation of a river bypass and the relocation of a dike to increase discharge capacity of the river Waal. Freshkills Park concerns the transformation of the largest landfill of the United States into a public park. The key characteristics of the three cases are summarised in Figure 2.

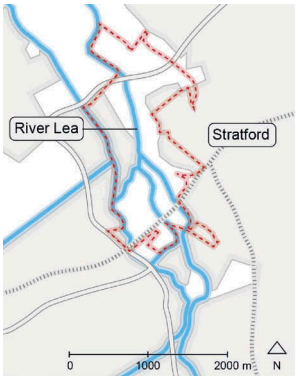
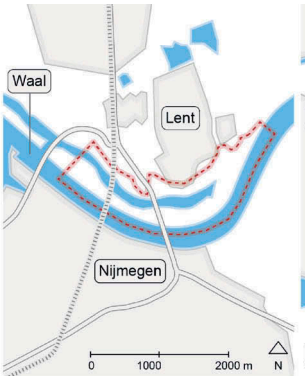
	Olympic Park	Nijmegen-Lent	Freshkills Park
			
Location	Lower Lea Valley in East London, United Kingdom.	Nijmegen, East of the Netherlands.	Staten Island, New York City, United States of America.
Size	230 hectare.	250 hectare.	890 hectare.
Timespan	2005 (Olympic bid) – 2014 (opening park).	2000 (announcement) – 2015 (construction).	2006 (masterplan) - present
Incentive	2012 Olympic Games.	National flood risk management program Room for the River consisting of 30+ indiviudual projects.	Closure of landfill.
Aim	Support Olympic Games and urban regeneration of East London (including jobs and houses).	Integrate flood protection measures with urban development, recreation and road infrastructure.	Reclamation of landfill as public park.
Main spatial interventions	Urban and public park development. Relocation of 250 businesses, 1500 residents and wildlife.	Creation of a river bypass and dike relocation. Demolition of 50 houses.	Capping of landfill and transformation to public park through ecological renewal.
Costs & funding (estimate)	Over 8000m pounds (approx. 9000m euros), funded by national and local government, and the National Lottery Fund.	Approx. 340m euros, primarily funded by national government.	650m dollars (570m euros), partially funded by city of New York.

Figure 2. Key characteristics of the three cases.

3. Conceptual framework

The present review on landscape quality in large-scale landscape transformations aims to inform the design of large-scale renewable energy landscapes. In literature on energy landscapes, amongst others, three aspects are considered to be of critical importance: governments (Leibenath & Lintz, 2018), design (Stremke & Van den Dobbelsteen, 2013) and participation (Devine-Wright, 2011). We found the same aspects in the literature on the three aforementioned large-scale landscape transformation projects. In each case, governmental bodies (in a multi-level governance constellation) proposed a landscape transformation and employed design to give form to the intended change. Local stakeholders were involved to various degrees. All four research components – landscape quality, governments, design and participation are introduced below.

3.1. Landscape quality

The key features of the landscape quality concept are presented as design criteria and are based on the Vitruvius triplet: utilitas, venustas and firmitas (Vitruvius, n.d.). 'Utilitas', or functionality, is translated as *use value*; 'venustas', or beauty/attractiveness, is translated as *experiential value*; and 'firmitas', or firmness, is translated as *future value* (Hooimeijer et al., 2001). Daniel (2001) states that landscape quality 'arises from the relationship between properties of the landscape and the effects of those properties on human viewers' (p. 268). Much of the recent research focuses on the experiential component of landscape quality: *venustas* (see e.g. Dramstad et al., 2006; Vizzari, 2011).

We used the analytical framework for landscape quality by Hooimeijer et al. (2001), who relate each of the three aforementioned design criteria to four societal interests: *economic, social, ecological* and *cultural*. This framework enables each design criterion to be examined from the perspective of specific societal interests (Figure 3). As a result, landscape quality is specified by aspects that relate to both design criterion and societal interest. Hooimeijer et al. (2001) mention several aspects. Aspects of landscape quality from an economic perspective for example, include connectivity and adaptivity to new uses. Aspects of social interest include improving social justice through spatial design and equal access to essential resources. The ecological perspective includes aspects such as contamination and future supply of resources. Aspects of cultural interest include beauty, identity/character and cultural heritage values.

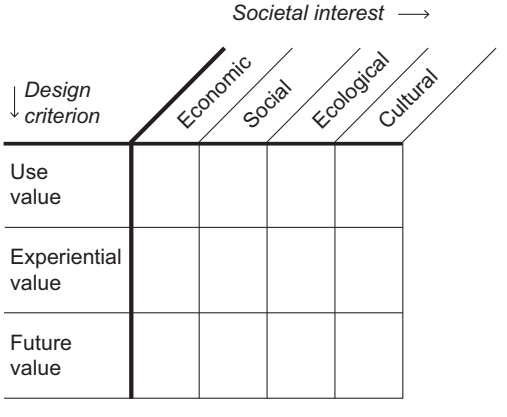


Figure 3. Landscape quality framework: aspects of landscape quality are at the intersection of design criteria and societal interests.

3.2. Governments

Political considerations, economic development and environmental concerns have fuelled a reorganisation of government in much of the Western world (Albrechts et al., 2003). Government decentralisation has led to increased planning responsibilities of local authorities, and involvement of economic parties and civil society in decision-making (Healey et al., 1999). This trend is reflected in the literature on all three cases. We found that interactions between multiple tiers of government featured prominently in the cases. Interactions with non-state actors reported in the literature were mainly concerned with the participation of local stakeholders (see section 3.4). During the literature analysis, we considered the roles of government at the local, mid-level, national and supranational levels as well as the interaction between these levels.

3.3. Design

Design is both an activity, or process, and a product, such as a masterplan. We based our analysis of the design aspect in the cases on the 'framework for theory' by Steinitz (1990), as simplified by Stiles (1994), as it encompasses 'all the design/planning issues which necessarily have to be addressed in the work undertaken by the landscape profession' (Stiles, 1994, p. 141). Stiles (1994) identifies three parts to the design process: (1) resource description, (2) initiation of change and (3) evaluation of the (changed) landscape resources. Resource description encompasses the analysis and representation of the existing landscape, its mechanisms and interrelationships. The initiation of change contains the projected changes and proposed interventions. The final part concerns who evaluates the design, how, and the criteria used. For the analysis of design in the transformation projects, we were particularly interested in the design process (e.g. activities, methods, products) and in the role of design in the transformation process.

3.4. Participation

As landscape transformations, by definition, alter the living environment of local stakeholders, we studied the participation strategies employed in the three transformation projects. We used the 'participation ladder' (Arnstein, 1969), which clusters eight participatory strategies in three categories, to identify and organise the strategies that were used to engage local stakeholders in the transformation project. The strategies citizen control, delegated power and partnership are considered as forms of 'citizen power'; placation, consultation and informing as degrees of 'tokenism'; and therapy and manipulation as 'non-participation'. In addition to the participatory strategies by which other actors involve local stakeholders, we identified strategies employed by local stakeholders *themselves* resisting the transformation process.

4. Results

We first present the reported effects of the transformation projects on landscape quality (4.1). We then report on the role of governments (4.2), followed by design (4.3) and participation (4.4). As this paper progresses, the results build on findings presented earlier in the section. Detailed qualitative descriptions supporting the results can be found in the supplementary material.

4.1. Landscape quality

For all three projects, reported effects of the transformation on the landscape can be related to all design criteria – most attention is given to *use value* and *experiential value* (Figure 4).

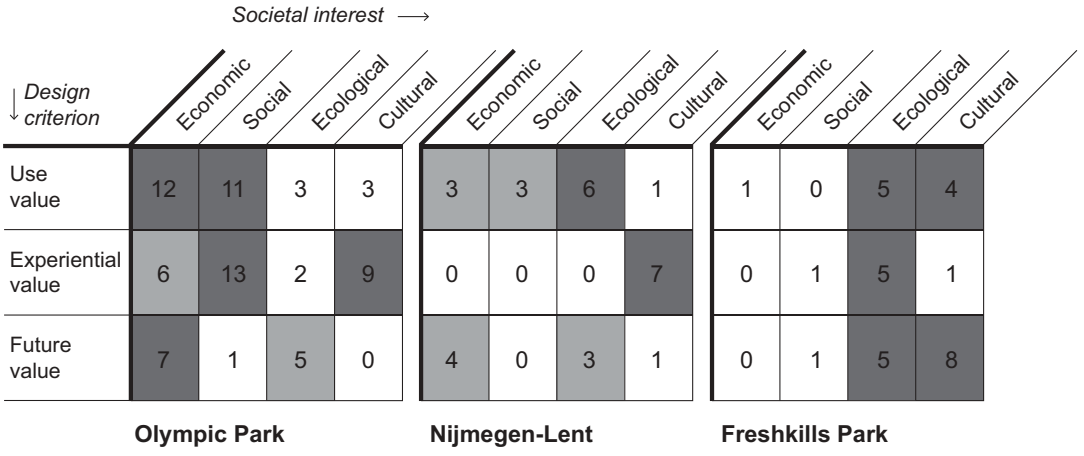


Figure 4. Mentioning of effects of the transformation on landscape quality across the design criteria and societal interests: often (dark grey), occasionally (light grey) and seldom or never (white) relative to the individual case, including absolute numbers of mentioning.

Within *use value*, cultural interests are underrepresented. Within *experiential value*, social and cultural interests are highly represented. Within *future value*, social interests are underrepresented. The reported aspects of landscape quality reflect a distinctive focus of each transformation case, across several, but not all societal interests. For Olympic Park, this concerns social housing and economic profits from urban development in relation to the investments made for the Olympic Games. For Nijmegen-Lent this concerns the combination of flood protection with urban development and the creation of a riverpark. For Freshkills Park this concerns the ecological remediation of the former landfill to a park. The diversity of landscape quality aspects shows that besides the main objective of each project, multiple purposes or co-benefits related to existing local issues or future demands are addressed in the transformation. In the following, we will present the reported effects according to the four societal interests, starting with *economic interest*.

In all projects, an important aspect of landscape quality with respect to *economic interest* is the connection with the wider geographical area. Furthermore, *economic future values* (bottom left cell for each case) reflect the potential of the area to accommodate future (urban) developments. Aspects of social injustice feature prominently in the literature on *social interest*. While amenities such as a public park are mentioned as positive effects, many reported negative effects concern the accessibility of these amenities to various groups, especially in Olympic Park (Davis & Thornley, 2010; Waters, 2016).

Positively formulated aspects of landscape quality, such as water safety, wildlife and habitat creation, relate to the *ecological interest*. A central item is the reintroduction or restoration of natural functions and values, both as patches and as green infrastructure. The future values address themes such as renewable energy provision, circular economy and climate adaptation.

The *cultural interest* of landscape quality is reflected in all three projects through both 'traditional' *experiential values* such the aesthetic experience of landscape features as well as symbolic *future values*, such as Freshkills Park as representation of sustainability (Hutchinson, 2015). Olympic Park and Nijmegen-Lent revolve mainly on experiential value and Freshkills Park on future values.

Few trade-offs between aspects of landscape quality are reported. Most of them are influenced by economic forces, such as in the case of Olympic Park, the decreasing amount of social housing as a consequence of the need to recoup investments (Hoolachan, 2017) and

the cancelling of renewable energy projects (Smith, 2014b) as well as a leisure centre (Shirai, 2014) for cost reasons.

The literature reveals that landscape quality operates on different scale levels, with both beneficial and adverse effects. In Nijmegen-Lent, landscape quality objectives explicitly included urban aspects, which allowed the national flood risk management programme to tie in with local issues, or a 'layering of different demands on the same site' (Redeker, 2018, p. 317). This has even raised water safety levels above those technically required (Heeres et al., 2017) resulting in the cancelling of several other flood risk measures (Havinga & Der Nederlanden, 2018). For Olympic Park, on the other hand, Hoolachan (2017) stresses the tensions between different government views of sustainability. The priority for economic sustainability at the national level has had adverse effects on social sustainability at the local level, such as the displacing of existing communities.

4.2. Governments

During the bid phase for Olympic Park, a patchwork of existing local partnerships collaboratively developed a regeneration strategy (Owens, 2012). The increasing pressure to deliver the site for the Olympic Games gave way to a more top-down process (Davis, 2011; Owens, 2012; Smith, 2014a). The main control over the project lay with a mid-level dedicated planning agency, to which the local boroughs had delegated their planning powers (Davis, 2011; Shirai, 2014). The individual boroughs were participating in the decision-making process through various boards.

The planned location for the flood risk management measures of Nijmegen-Lent was previously earmarked for urban development by the municipality. The national and local governments negotiated to resolve this conflict and empowered the local government to take the lead in the transformation (Heeres et al., 2017), supported by the provincial government (Winnubst, 2011). Next to flood risk management, landscape quality was a second objective of the programme, supported by nationwide descriptions of landscape characteristics (Busscher et al., 2018). The national government coordinated the Room for the River programme, with strict constraints on the required hydrological effects for each individual project (Klijn et al., 2013). Quality control mechanisms were supervised by an independent multidisciplinary Quality team (Klijn et al., 2013). This 'Q-team' made unsolicited recommendations and was unconstrained by formal governmental or institutional opinions on landscape quality (Heeres et al., 2017; Klijn et al., 2013). One effect of the Q-team was the employment of landscape architects to accommodate the standards set by the Q-team and consequently raising landscape quality (Redeker, 2018).

The Freshkhills Park project is being run by the New York City Department of Parks and Recreation, while the local Staten Island administration has little influence on the decision making (Hutchinson, 2015). NYC Parks actively employs the experiential value of the site to engage communities and to raise both interest and funds for the three development phases (Hutchinson, 2015).

4.3. Design

4.3.1. Design process: resource description, initiation of change, evaluation

Within *resource description*, the literature on the Olympic Park project reports a lack of in-depth understanding of the local social topography and how residents experience their landscape (Davis, 2011; Davis & Thornley, 2010; Evans, 2014). This explains many of the reported negative effects on landscape quality from a societal perspective (see 4.1). Environmental design reportedly plays an important role in this process, as representing and visualising the Lower Lea Valley as a deprived site is used to justify the large public expenses (Davis, 2011).

Within the *initiation of change*, the integration of the existing landscape into the design is an aspect of landscape quality to be addressed. The clearing of the Olympic Park site (most houses and

businesses were relocated and the entire area was remediated) is framed by scholars and stakeholders alike as a 'tabula rasa' approach (Davis, 2011; Waters, 2016). This made it difficult for the designers to 'provide a sense of the future "character" or "identity" of legacy for local stakeholders' (Davis, 2011, p. 260). Regarding Freshkills Park, Pollak (2007, p. 89) argues that for transformations of such scale, the perspective of a 'stable whole' is an illusion and that the identity of the site is dynamic and heterogenic.

Another theme is the use of representations, products of the design process. Representations are reported to be subject to political control in Olympic Park (Davis, 2011) and to obscure negative effects in Freshkills Park (May, 2008). However, in Nijmegen-Lent, designs and drawings were reportedly helpful in understanding concepts such as landscape quality (Nikologianni et al., 2017) and stakeholders in being open to new ideas in a collaborative process (Heeres et al., 2017).

The three projects comprise a variety of formal and informal *evaluations of design proposals*, with different degrees of success. On Olympic Park, the objective of the Legacy Masterplan Framework (LMF) was to guide development after the Olympic Games and it formed the basis for other spatial visons. Davis (2011) stresses the absence of alternative scenarios in the LMF, as well as the absence of clear evaluation criteria for the proposed spatial scenario. For Freshkills Park, Hutchinson (2015) reports on the lack of investigated alternative options to a park. The literature on Nijmegen-Lent reports that alternative designs were evaluated but that design criteria were either disputed (Winnubst, 2011) or unknown to the inhabitants (Cuppen & Winnubst, 2008). In addition, literature suggests that the final decision was based on the firmness (i.e. *future value)* of the proposed intervention (Cuppen & Winnubst, 2008; Winnubst, 2011).

4.3.2. Role of design in the transformation process

Designs for Olympic Park reportedly had an important function in the initial visioning process for the Olympics (Evans, 2014) as a quality control framework for the inevitable changes during the transformation process (Nimmo et al., 2011) and in projecting value and need with regard to the urban legacy (Davis, 2011). Despite the strong design-led approach (Neal, 2011), the actual catalyst effect of the urban regeneration was highly dependent on the political and economic context (Davis, 2011).

The design process for Nijmegen-Lent was controlled by the designers (Heeres et al., 2017), who worked in tandem with the process manager (Hulsker et al., 2011). Experienced designers in the role of lead designer and as part of the Q-team functioned as links between the technical design and the integrative spatial design. An overall collaborative approach to design is reported, which resulted in shared solutions and the support by engaged inhabitants (Heeres et al., 2017).

The design competition for Freshkills Park served as an impetus for the transformation, which suggests that in this project a similar importance is attributed to designers. Environmental designers led a large multidisciplinary team and their work is mentioned as one of the key drivers guiding the shape of the park (Hutchinson, 2015). However, May (2008) states that design is being used to recast the image of Freshkills Park in 'the collective memory of a population', with the result that the 'horrible realities of our Modern American lifestyles' are ignored (May, 2008, p. 103). Hutchinson identifies several 'contingencies' or events that altered the original vision for Freshkills Park, such as the terrorist attack of 9/11, pressure from the Staten Island administration, and Superstorm Sandy. These contingencies 'changed the ideas of what a park should be' (Hutchinson, 2015, p. 169): a new range of values, roles and functions are now associated with parks.

4.4. Participation

4.4.1. Participatory strategies

Participatory strategies have been identified in all three projects and literature primarily discusses the involvement of inhabitants. The higher-level participatory strategies *citizen control, delegated power* and *partnership*, according to the literature, have not been applied in any of the three cases.

In the Olympic Park literature, we identified *consultation* and *informing strategies*. The criticism regarding *consultation* relates to the extent to which local citizens could exert genuine influence. Although the scale and complexity of this project is considered too big for consensus building (Davis, 2011; Evans, 2014), the *consultation strategies* employed are criticised for not aiming to influence the design outcome but to 'instil' ownership (Davis, 2011, p. 206). In Arnstein's categorisation, this could be considered a form of *therapy*. The workshops for the draft version of the LMF were attended by 10 to 40 people, which 'represented a tiny fraction of the population of each of the boroughs' (Davis, 2011, p. 201).

The participation strategies identified for Nijmegen-Lent are *placation, consultation* and *informing*. Inhabitants joined advisory boards (*placation)* and formal (Winnubst, 2011) and informal *consultation* events were organised (Heeres et al., 2017). *Informing strategies* are also reported (Rijke et al., 2012). In the phase of the environmental impact assessment, the participatory process was subordinate to the political process (Cuppen & Winnubst, 2008).

Similarly, the literature on Freshkills Park reports *placation, consultation* and *informing. Consultation* resulted in 'consensus building in the community and ultimately encouraged support for the reclamation' (De Sousa & D'Souza, 2011) and the inclusion of public preferences in the masterplan (Sugarman, 2009).

4.4.2. Participation and design

In Nijmegen-Lent, environmental designers invested in building professional relationships with inhabitants (by means of e.g. excursions), which enabled a mutual exchange of thoughts on important issues. Overall, participation is reported to have had a positive effect on the landscape quality (Hulsker et al., 2011) and possibly contributed to the realisation of the project within the envisioned timeframe (Heeres et al., 2017).

Public meetings on Freshkills Park revealed community preferences, including renewable energy provision, an educational programme (De Sousa & D'Souza, 2011) and the parks infrastructure (Hutchinson, 2015). Some of those functions, it has been argued, may have otherwise been introduced by governmental authorities (Hutchinson, 2015).

The design for Olympic Park was primarily influenced by well-organised specific interest groups (Davis, 2011). The resulting changes did not necessarily reflect a shared vision. In general, it was not made clear how the output of the consultation events could influence the design and there appeared to be no difference attributed to individual or shared views. More specifically, a structured analysis or evaluation of the outcomes of consultation was absent, allowing the environmental designers to 'cherry-pick' (Davis, 2011).

4.4.3. Indication of resistance

In addition to these participation strategies, we found evidence of confrontation between inhabitants and governments. Inhabitants were reportedly pro-active in demanding a role in the planning process for Nijmegen-Lent, in response to the initial plan to demolish 50 houses (Winnubst, 2011). This confrontational approach was fuelled by local attitudes to government based on the previous experience of the annexation of the small town of Lent by the city of Nijmegen (Redeker, 2018; Winnubst, 2011). Opposition to Freshkills Park has to do with the landfill itself and the suitability of the site as a park (Hutchinson, 2015). Resistance to Olympic Park focused on the relocation of existing land uses, such as allotments and cycling facilities. Opposition was also fuelled by an evaluation of the existing landscape that was not shared by local stakeholders (Davis, 2011) and the radical changes to the landscape for inhabitants (Hoolachan, 2017).

5. Discussion

5.1. Design of large-scale landscape transformations

The literature on the three projects points to a central and integrative role of design. However, we expected certain topics related to *design* and *designing* to be discussed more extensively in the

literature on large-scale landscape transformations. Firstly, literature only incidentally referred to the use of evidence-based scenarios or alternative futures to facilitate the *initiation of change* (see 3.3). Contrastingly, an increasing number of scholars are concerned with methods to generate alternative futures, supported by scientific knowledge (e.g. Hoversten & Swaffield, 2019; Van den Brink & Bruns, 2012). This suggests a gap between current scholarly thinking and design practice. Secondly, the reviewed literature stresses that criteria to *evaluate* design(s) are either absent, unknown to, or disputed by local stakeholders. Stremke (2015, p. 7) argues that for the design of energy landscapes 'criteria have to be selected, made explicit, and prioritised by stakeholders and experts'. The literature on the three landscape transformations reveals no attempts to accomplish such systematic and transparent evaluation. Thirdly, the recurring attention for co-benefits in all three projects, suggests *multifunctionality* as a consistent and sustained objective in large-scale landscape transformations. Recent research suggests that multifunctionality is also a characteristic of certain types of energy landscapes: landscapes with wind turbines are an example of so-called 'component energy landscapes' that feature concurrent land uses. 'Entity energy landscapes' such as surface coal mines, on the contrary, are characterised by a mono-functional land use and sharp physical boundaries (Pasqualetti & Stremke, 2018). Our three cases, however, are large, distinct landscape entities that comprise multiple land uses. This opens up the possibility of future large-scale renewable energy landscapes that may embody the spatial expanse and physical boundaries of *entity* energy landscapes and yet permit the multifunctionality of *component* energy landscapes. This would enable a scaling up of the energy transition in some landscapes, while allowing the integration of other functions and, not unimportantly, ease the preservation of landscapes with cultural or natural values elsewhere.

5.2. Governance levels and interaction

The results of this review align with the rise of the mid-level governance level, as it 'seems to offer a functional area within which the interactions of economic relations, environmental systems and daily life time-space patterns can be better understood than at a higher or lower level of government' (Healey, 2007, p. 23). The exception is the Nijmegen-Lent case, which the literature shows, revolved primarily around the interaction between local and national government. The strong influence of the national government in this case can be explained by the need to coordinate more than 30 flood risk management projects across the country.

5.3. Participation versus co-creation

Participatory strategies have been employed with varying degrees of success. The literature suggests that participation was used mainly in a one-way fashion, rather than to encourage active engagement in the design process. Literature also reports the use of rather conventional methods, such as public meetings, workshops and site visits. Advanced approaches to engage stakeholders, such as web-based decision support tools (e.g. Grêt-Regamey et al., 2017) or participatory mapping (e.g. Stremke & Picchi, 2017), are not mentioned. Quite the contrary has been described: during consultation events on Olympic Park, for example, participants were presented with three-dimensional puzzle pieces which only fitted in one place, challenging them to find 'the right place, rather than identify creative alternatives' (Davis, 2011, p. 196).

6. Conclusions

6.1. General conclusions

This study set out to investigate large-scale landscape transformation projects to advance the environmental design of renewable energy landscapes, by examining the following research

question: *How is landscape quality addressed in large-scale transformation projects and what is the role of design, governments and participation?*

Literature showed that landscape quality is addressed in all three cases by the design criteria *functionality* (use value), *experience* (experiential value), and *firmness* (future value), of which the latter receives the least attention. Literature attributes many beneficial aspects of landscape quality to the projects. These aspects can be distinguished as *economic, social, ecological* and *cultural* interests, but not all interests are mentioned equally in the literature. Each project has a distinctive focus within the larger realm of landscape quality. Adverse effects were scarcely reported as trade-offs with other qualitative aspects, but were linked to aspects outside the realm of landscape quality, such as economic costs or political context.

The role of mid-level governments was to control the transformation, resulting in an advisory role of local governments. Which government body is in control and how it asserts power is not necessarily fixed throughout the transformation process. Environmental designers played an important role in analysing the existing site and developing designs for the landscape. Nevertheless, the literature shows that important decisions were made *before* environmental designers have been involved. Also, external events and conditions led to changes in the design, or to alterations of functions and values ascribed to the transformation.

The role of participation in the transformation projects was limited and participation strategies were somewhat limited to consultation and informing. While literature indicates that inclusion of local issues or preferences, potentially informed by participatory strategies, results in synergies and support for the transformation, poor integration of participation in the design process endangers genuine influence of local stakeholders. Regardless of the levels of government involved, the type of design process and participation strategies, all three cases feature some resistance to the large-scale landscape transformation.

6.2. New knowledge contributing to renewable energy transition

This review resulted in insights not only for large-scale landscape transformation projects, but also for renewable energy transition. Where the three studied cases show consideration of all three landscape quality criteria, primarily *functionality* and *experience* are addressed in energy landscape debates. The cases incorporate multiple functions, but this is not yet common practice for energy landscapes (see for solar energy e.g. Scognamiglio, 2016). Aspects of *firmness*, or the future value of energy landscapes, are for example, reversibility and recycling of energy landscapes. Although energy landscape literature stresses the importance of this criterion (Pasqualetti & Stremke, 2018), we are not aware of it being substantially incorporated in renewable energy projects yet.

The review showed that the large-scale character of the landscape transformation complicates the development of a new and yet meaningful landscape character. Distinctive for the transition to renewable energy (as opposed to the three cases) is that standardised technological and currently unfamiliar objects are introduced into the landscape. Introduction of energy technologies, such as wind turbines and photovoltaic (PV) panels, will therefore require additional and concerted efforts to avoid a further 'erosion' of landscape diversity at the larger scale. Inclusion of local issues and stakeholder preferences, as mentioned in the general conclusions, can contribute to maintain and strengthen landscape diversity.

In all three cases, we found that governments influence how large-scale landscape transformations are evaluated. Similarly, governments are in a position to determine qualitative criteria for energy landscapes and evaluate projects on characteristics other than mere quantities of renewable energy provision (e.g. landscape quality in the Dutch Climate Agreement, Klimaatakkoord, 2019). The use of qualitative criteria will necessitate a further specification of what is meant by 'landscape quality' and 'sustainability'. Specification of criteria can prevent different interpretations on, for example, different spatial scales. A first step in this direction could be to formally include landscape quality as an objective in energy projects and to coordinate quality control at both national and local levels, as reported in the literature on

Nijmegen-Lent. One of the prerequisites for such an endeavour is to have solid and comprehensive understanding of the current landscape characteristics.

The three cases illustrate how executed large-scale landscape transformation projects influence the discourse on landscape transformation. Without downplaying the potential adverse effects of large-scale landscape transformations, the discourse on large-scale renewable energy landscapes (and beyond) will benefit from the continued study of and reflection on projects that embrace renewable energy *and* landscape quality.

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References

Albrechts, L., Healey, P., & Kunzmann, K. R. (2003). Strategic spatial planning and regional governance in Europe. *Journal of the American Planning Association*, *69*(2), 113–129. https://doi.org/10.1080/01944360308976301

Antrop, M. (2005). Why landscapes of the past are important for the future. *Landscape and Urban Planning*, *70*(1–2), 21–34. https://doi.org/10.1016/j.landurbplan.2003.10.002

Apostol, D., Palmer, J., Pasqualetti, M., Smardon, R., & Sullivan, R. (2017). *The renewable energy landscape: Preserving scenic values in our sustainable future*. Routledge.

Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Planning Association*, *35*(4), 216–224. https://doi.org/10.1080/01944366908977225

Bélanger, P. (2009). Landscape as Infrastructure. *Landscape Journal*, *28*(1), 79–95. https://doi.org/10.3368/lj.28.1.79

Boréus, K., & Bergström, G. (2017). *Analyzing text and discourse: Eight approaches for the social sciences*. Sage Publications.

Bridge, G., Bouzarovski, S., Bradshaw, M., & Eyre, N. (2013). Geographies of energy transition: Space, place and the low-carbon economy. *Energy Policy*, *53*, 331–340. https://doi.org/10.1016/j.enpol.2012.10.066

Busscher, T., Van den Brink, M., & Verweij, S. (2018). Strategies for integrating water management and spatial planning: Organising for spatial quality in the dutch "room for the river" program. *Journal of Flood Risk Management*, *12*(1), 1–12. https://doi.org/10.1111/jfr3.12448

Council of Europe. (2000). *European landscape convention*. European Treaty Series– No. 176, p. 7. https://rm.coe.int/1680080621

Cuppen, M. E., & Winnubst, M. (2008). How public participation influenced the legitimation of a policy process: The case of a dike relocation. In J. Koppenjan & N. Ryan (Eds.), *IRSPM Annual conference 2008* (pp. 1–25). Queensland University of Technology.

Daniel, T. C. (2001). Whither scenic beauty? Visual landscape quality assessment in the 21st century. *Landscape and Urban Planning*, *54*(1–4), 267–281. https://doi.org/10.1016/S0169-2046(01)00141-4

Davis, J. (2011). *Urbanising the Event : How past processes, present politics and future plans shape London's Olympic Legacy*. The London School of Economics and Political Science. http://etheses.lse.ac.uk/382/

Davis, J., & Thornley, A. (2010). Urban regeneration for the London 2012 Olympics: Issues of land acquisition and legacy. *City, Culture and Society*, *1*(2), 89–98. https://doi.org/10.1016/j.ccs.2010.08.002

De Sousa, C., & D'Souza, L.-A. (2011). *From Brownfields to Parkland–Elmhurst Park and Fresh Kills Park, New York, NY: Sustainable Brownfields revitalization best practices*. University of Illinois.

Devine-Wright, P. (2011). From backyards to places: Public engagement and the emplacement of renewable energy technologies. In P. Devine-Wright (Ed.), *Renewable energy and the public: From NIMBY to participation* (pp. 57–74). Routledge.

Dramstad, W. E., Tveit, M. S., Fjellstad, W. J., & Fry, G. L. A. (2006). Relationships between visual landscape preferences and map-based indicators of landscape structure. *Landscape and Urban Planning*, *78*(4), 465–474. https://doi.org/10.1016/j.landurbplan.2005.12.006

Evans, G. (2014). Designing legacy and the legacy of design: London 2012 and the regeneration games. *Architectural Research Quarterly*, *18*(4), 353–366. https://doi.org/10.1017/S1359135515000081

Grêt-Regamey, A., Altwegg, J., Sirén, E. A., Van Strien, M. J., & Weibel, B. (2017). Integrating ecosystem services into spatial planning—A spatial decision support tool. *Landscape and Urban Planning*, *165*, 206–219. https://doi.org/10.1016/j.landurbplan.2016.05.003

Havinga, R., & Der Nederlanden, H. (2018). *Ruimte voor de Rivier - oogst ruimtelijke kwaliteit*. Rijkswaterstaat, Programmabureau Ruimte voor de Rivier.

Healey, P. (2007). *Urban complexity and spatial strategies: Towards a relational planning for our times*. Routledge.

Healey, P., Khakee, A., Motte, A., & Needham, B. (1999). European developments in strategic spatial planning. *European Planning Studies*, *7*(3), 339–355. https://doi.org/10.1080/09654319908720522

Heeres, N., Van Dijk, T., Arts, J., & Tillema, T. (2017). Coping with interrelatedness and fragmentation at the infrastructure/land-use interface: The potential merits of a design approach. *Journal of Transport and Land Use*, *10*(1), 409–435.

Hooimeijer, P., Kroon, H., & Luttik, J. (2001). *Kwaliteit in meervoud*. Habiforum, Expertisenetwerk Meervoudig Ruimtegebruik.

Hoolachan, A. (2017). *Scalar Politics: Sustainability planning under Localism and the delivery of London's Olympic legacy*. University of Cambridge. https://www.repository.cam.ac.uk/handle/1810/269398

Hoversten, M. E., & Swaffield, S. R. (2019). Discursive moments: Reframing deliberation and decision-making in alternative futures landscape ecological planning. *Landscape and Urban Planning*, *182*, 22–33. https://doi.org/10.1016/j.landurbplan.2018.10.005

Hulsker, W., Wienhoven, M., Van Diest, M., & Buijs, S. (2011). *Evaluatie ontwerpprocessen Ruimte voor de Rivier*. Ecorys.

Hutchinson, P. (2015). *Landscape, Power and Biopolitics A Foucauldian Analysis of Freshkills Park, New York City*. University of Canberra. http://www.canberra.edu.au/researchrepository/

Kempenaar, A., & Van den Brink, A. (2018). Regional designing: A strategic design approach in landscape architecture. *Design Studies*, *54*, 80–95. https://doi.org/10.1016/j.destud.2017.10.006

Klijn, F., De Bruin, D., De Hoog, M. C., Jansen, S., & Sijmons, D. (2013). Design quality of room-for-the-river measures in the Netherlands: Role and assessment of the quality team (Q-team). *International Journal of River Basin Management*, *11*(3), 287–299. https://doi.org/10.1080/15715124.2013.811418

Klimaatakkoord. (2019). *National climate agreement the Netherlands*. https://www.klimaatakkoord.nl/documenten/publicaties/2019/06/28/national-climate-agreement-the-netherlands

Leibenath, M., & Lintz, G. (2018). Understanding 'landscape governance': The case of wind energy landscapes in Germany. *Landscape Research*, *43*(4), 476–488. https://doi.org/10.1080/01426397.2017.1306624

May, J. (2008). On technology, ecology, and urbanism. In M. Ballesteros (Ed.), *Verb crisis* (pp. 103–115). Actar Publishers.

Nadaï, A., & Van der Horst, D. (2010). Introduction: Landscapes of energies. *Landscape Research*, *35*(2), 143–155. https://doi.org/10.1080/01426390903557543

Neal, P. (2011). Learning legacy: Tessons learned from the London 2012 games construction project (Report no. ODA 2011/031). Olympic Delivery Authority. http://learninglegacy.independent.gov.uk/documents/pdfs/design-and-engineering-innovation/164-green-structure-dei.pdf

Nikologianni, A., Moore, K., & Larkham, P. (2017). Effective ways to deliver sustainability in urban and regional landscape strategies. *Acta horticulturae*, (1189), 131–136. https://doi.org/10.17660/ActaHortic.2017.1189.26

Nimmo, A., Frost, J., Shaw, S., & McNevin, N. (2011). Delivering London 2012: Master planning. *Proceedings of the Institution of Civil Engineers - Civil Engineering*, *164*(5), 13–19. https://doi.org/10.1680/cien.2011.164.5.13

Oudes, D., & Stremke, S. (2018). Spatial transition analysis: Spatially explicit and evidence-based targets for sustainable energy transition at the local and regional scale. *Landscape and Urban Planning*, *169*, 1–11. https://doi.org/10.1016/j.landurbplan.2017.07.018

Owens, M. (2012). The impact of the London olympics on the lower lea: Regeneration lost and found? *Australian Planner*, *49*(3), 215–225. https://doi.org/10.1080/07293682.2012.706963

Pasqualetti, M., & Stremke, S. (2018). Energy landscapes in a crowded world: A first typology of origins and expressions. *Energy Research and Social Science*, *36*(February), 94–105. https://doi.org/10.1016/j.erss.2017.09.030

Petticrew, M, & Roberts, H. (2008). *Systematic reviews in the social sciences: a practical guide*. Blackwell Publishing.

Pollak, L. (2007). Matrix landscape: Construction of identity in the large park. In J. Czerniak, G. Hargreaves, & J. Beardsley (Eds.), *Large parks* (pp. 87–119). New York: Princeton Architectural Press New York.

Redeker, C. (2018). Rhine cities - Urban Flood Integration (UFI): German and Dutch adaptation and mitigation strategies. TU Delft Open.

Rijke, J., Van Herk, S., Zevenbergen, C., & Ashley, R. (2012). Room for the river: Delivering integrated river basin management in the Netherlands. *International Journal of River Basin Management*, *10*(4), 369–382. https://doi.org/10.1080/15715124.2012.739173

Scognamiglio, A. (2016). "Photovoltaic landscapes": Design and assessment. A critical review for a new transdisciplinary design vision. *Renewable and Sustainable Energy Reviews*, *55*, 629–661. https://doi.org/10.1016/j.rser.2015.10.072

Selman, P. (2010). Learning to love the landscapes of carbon-neutrality. *Landscape Research*, *35*(2), 157–171. https://doi.org/10.1080/01426390903560414

Shirai, H. (2014). *The evolving vision of the Olympic legacy : the development of the mixed-use Olympic Parks of Sydney and London* . The London School of Economics and Political Science. http://etheses.lse.ac.uk/956/

Sijmons, D. (1990). Regional planning as a strategy. *Landscape and Urban Planning*, *18*(3–4), 265–273. https://doi.org/10.1016/0169-2046(90)90014

Sijmons, D., Frijters, E., Wijnakker, R., Hugtenburg, J., Stremke, S., Hocks, B., & Gerretsen, P. *Energie en Ruimte - Een nationaal perspectief*. Vereniging Deltametropool.

Smith, A. (2014a). "De-risking" East London: Olympic regeneration planning 2000–2012. *European Planning Studies*, *22*(9), 1919–1939. https://doi.org/10.1080/09654313.2013.812065

Smith, A. (2014b). From green park to theme park? Evolving legacy visions for London's Olympic Park. *Architectural Research Quarterly*, *18*(4), 315–323. https://doi.org/10.1017/S1359135515000056

Steinitz, C. (1990). A framework for theory applicable to the education of landscape architects (and other environmental design professionals). *Landscape Journal*, *9*(2), 136–143. https://doi.org/10.3368/lj.9.2.136

Stiles, R. (1994). Landscape theory: A missing link between landscape planning and landscape design? *Landscape and Urban Planning*, *30*(3), 139–149. https://doi.org/10.1016/0169-2046(94)90053-1

Stremke, S. (2015). Sustainable energy landscape: Implementing energy transition in the physical realm. In S. E. Jørgensen (Ed.), *Encyclopedia of Environmental Management* (pp. 1–9). Taylor & Francis.

Stremke, S., & Picchi, P. (2017). Co-designing energy landscapes: Application of participatory mapping and Geographic Information Systems in the exploration of low carbon futures. In B. D. Solomon & K. E. Calvert (Eds.), *Handbook on the Geographies of Energy* (pp. 368–379). Edward Elgar Publishers.

Stremke, S., & Van den Dobbelsteen, A. (Eds.). (2013). *Sustainable energy landscapes : Designing, planning, and development*. CRC.

Stremke, S., Van Kann, F., & Koh, J. (2012). Integrated visions (Part I): Methodological framework for long-term regional design. *European Planning Studies*, *20*(2), 305–319. https://doi.org/10.1080/09654313.2012.650909

Sugarman, J. (2009). Environmental and community health: A reciprocal relationship. In L. Campbell & A. Wiesen (Eds.), *Restorative commons: Creating health and well-being through urban landscapes. Gen. Tech Rep. NRS-P-39* (pp. 138–153). US Department of Agriculture, Forest Service, Northern Research Station.

Van den Brink, A., & Bruns, D. (2012). Strategies for enhancing landscape architecture research. *Landscape Research*, *6397*(July2014), 1–14. https://doi.org/10.1080/01426397.2012.711129

Vitruvius, P. (n.d.). *De Architectura (translated by Morris Hicky Morgan, 1960. The ten books on architecture)*. Courier Dover Publications.

Vizzari, M. (2011). Spatial modelling of potential landscape quality. *Applied Geography*, *31*(1), 108–118. https://doi.org/10.1016/j.apgeog.2010.03.001

Waters, J. (2016). *Producing space and reproducing capital in London's Olympic Park: an ethnography of actually-existing abstract space*. University of Sussex. http://sro.sussex.ac.uk/id/eprint/65087/

Winnubst, M. H. (2011). *Turbulent waters: Cross-scale conflict and collaboration in river landscape planning*. Sl: sn.

Wolsink, M. (2007). Wind power implementation: The nature of public attitudes: Equity and fairness instead of "backyard motives.". *Renewable and Sustainable Energy Reviews*, *11*(6), 1188–1207. https://doi.org/10.1016/j.rser.2005.10.005

Wolsink, M. (2017). Co-production in distributed generation: Renewable energy and creating space for fitting infrastructure within landscapes. *Landscape Research*, *6397*, 1–20. https://doi.org/10.1080/01426397.2017.1358360