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Journal of Digital Landscape Architecture

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<https://doi.org/10.14627/537740001>

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Revealing the Power of Landscape in Mitigating the Climate Crisis

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Abstract: Climate crisis demands decarbonization of our energy supplies. The upscaling of renewable energy is accelerating around the world. Most renewable energy projects fail to realize values other than reducing greenhouse gas emissions and societal support is eroding. Many critics appropriate 'landscape' to oppose, postpone or reallocate climate action. The objective of this paper is to highlight another, often overlooked power of landscape: The power of landscape to enable learning, reflecting, and resolving critical questions regarding climate action. Landscapes, we sustain, deserve ever more attention in the pursuit of timely climate action. We illustrate that the transition to renewables provides the very foundations for new cultural landscapes. This paper draws from a recently published book – The Power of Landscape – which presents our research and design at the Amsterdam Academy of Architecture, complemented by essays from renown architects, geographers, sociologists, and historians.

Keywords: Landscape architecture, transformative challenge, energy transition, renewable

1 Introduction

The objective of this paper is to introduce the reader to the power of landscape – three different kinds of power that we encountered while working as landscape architects on energy transition. While most of that knowledge has been acquired through in our research on the transition from fossil fuels to renewable energy, the findings are also relevant for other transformative landscape challenges of the 21st century. The first power of landscape refers to the fact that landscapes are affecting the quality of life of most if not all humans on Earth. Secondly, landscapes are powerful in mirroring human successes and failures. Thirdly, landscapes have the power to resolve urgent questions many of us face. Have you, for instance, been wondering whether energy transition should be pursued in a centralized manner or more decentralized way, bottom-up? In the book that provides the foundations for this paper we show that *landscape* can provide answers to this and many other critical questions. Beyond the agency of landscape, it has been a shared wish to collect and cultivate novel narratives that can help to engage with the energy transition (STREMKE et al. 2022).

Humans draw energy from landscapes around the world such as the open-cast coal mines in Columbia. A large share of coal from Columbia is exported to Europe and to the Netherlands, our country of residence, until the closure of the Amsterdam RWE power plant in 2019. The landscapes we create are not innocent. Quite the opposite is true: They affect the lives of others – to paraphrase Andrea Cardoso from Columbia who contributed to the research presented in our book. Our consumption patterns, put simply, affect those living in or near energy landscapes. And yet we continue to alter the surface of the Earth. Unprecedented and unreversible transformation of landscapes like in the Appalachian Mountains in West Virginia in the United States. The life of residents in that energy landscape is challenging to say the least. This specific kind of coal mining – mountain top removal – comes with frequent

explosions and heavy traffic. This share of the Appalachian Mountains may be a thing of the past, anytime soon. But also much closer, not far from Dessau/Germany – the location of the 2023 DLA conference – villages are erased from the surface of the Earth for coal mining. The church of Heuersdorf, for example, is the only relict of an entire village. Gone are the dwellings, gardens, and the entire surrounding landscape of Heuersdorf, hundreds of years old.

In different ways but similar magnitude, renewable energy landscapes like the Vajont dam in Northern Italy affect human lives. On the 9th of October 1963, a landslide caused a massive tsunami resulting in the death of more than 2.000 inhabitants. Not all energy landscapes are as violent as the coal mines in Columbia, the US and Germany, or the Vajont dam in Italy, but our energy demand certainly entails costs that are scarcely mentioned in the newspapers. What we do read is that we are currently importing more oil and gas from Northern America. But where exactly does that energy come from and what kind of energy landscapes are materializing? Much of the energy originates from the oil sands in Northern Alberta/Canada. This fossil energy landscape is larger than all of England. Three times larger than The Netherlands; the only energy landscape that can be seen from space. And those energy landscapes are powerful indeed, affecting those living inside or nearby. In the summer 2019, the entire landscape was on fire causing thousands of people to evacuate the region. Despite the recent, geopolitically motivated resurrection of fossil fuels they will be outperformed by renewable energy sources in terms of greenhousegas emissions and because many are less expensive.

2 Fossil Thinking

Sadly enough, some of the renewable energy landscape dress their like fossil predecessors. Who could easily tell that Figure 1 features a geothermal power plant, that the resulting energy landscape is renewable in nature? Of course, they are effective in mitigating the climate



Fig. 1: Geothermal power plant, Imperial Valley, California/United States (Sven Stremke)

crisis, but renewable energy landscapes too can be monofunctional, blunt and reckless. Another example is the wind energy landscape near Palm Springs, the biggest one in the USA, an agglomeration of thousands of wind turbines. Every type of wind turbine that was ever sold in the US can be found in that energy landscape. The mountain range to the South of Palm Springs serves as visual pain killer but the daily reality of the local landscape users is harsh.

More traces of what we call, fossil thinking' can be found in renewable energy landscapes. In the Sierra Nevada/Spain, for example, the sublime mountain panorama helps to mitigate the appearance of solar power plants. But their high fences, the mono-functionality, and the absence of vegetation underneath the installations are a straight-forward expression of ignorance for our planet. Less violent than other energy landscapes, perhaps, but certainly no expression of stewardship for 'Gaia' – to quote BRUNO LATOUR (2017) who reminded us of our new responsibilities now that we have entered the Anthropocene. At some point, during our field work in Andalucía/Spain, we encountered a sign outside a solar power plant stating: Prohibited to take photographs: To us, this symbolizes a call for help. Have we created yet another 'monster' to paraphrase Dutch philosopher MARTIJNTJE SMITS (2006). We know, something is wrong, and some may argue it cannot be dealt with. But is that really so?

To put things very clear: Nothing is wrong with renewable energy technologies *per se*, they are efficient and affordable, and help mitigating climate change. But once they arrive in our living environment something is happening. Let's take a closer look at the concerns people have about energy landscapes, with the help of a specific example: The Cleve Hill Solar Power Plant – one of the largest renewable energy landscapes in the United Kingdom. PHILIPPA RODDIS and her team conducted an online questionnaire to find indicators for community acceptance (2020). More than 800 people participated. Their concerns have been coded and ranked as following: 18% of all concerns relate to 'wildlife and habitats', 10% to the 'project scale', and 8% to 'landscape character'. Nine of the top 10 determinants of community acceptance are linked with landscape. Together they amount to circa 70% of all determinants. Put simply: More than two-thirds of all concerns that people have are related to landscape. This certainly does not align with the way applications for building permits or subsidies for solar power plants are evaluated in the Netherlands and many other countries.

3 Alternative Narratives

In our book, we question the strong focus on energy technologies such as power plants, photovoltaic panels, and wind turbines. We illustrate that energy transition is not about technology, but about a changing environment: the landscapes we live, work and recreate. And there is growing evidence of possible synergies between renewable energy and other challenges in our landscapes. Renewable energy, to begin with, can help recovering soil quality and biodiversity, especially in arid conditions such as in Southern Spain. Underneath the solar trackers in Las Gabias, for example, we found a closed vegetation cover with high biodiversity. This energy landscape is called 'solar orchard' by the locals.

In other places, the accessibility to the landscape has increased, for example through maintenance roads that came with the construction of wind turbines near Viticuso/Italy and Tarifa/Spain. In fact, in Tarifa wind energy is celebrated. The terrace of the local Cafe *Con Horizonte* faces the wind turbines and many photographs in the restaurant feature the local wind

park. In other places it is the very energy infrastructure that creates access and hosts new functions such as the public park on the crest of the hydropower plant in Canales/Spain.

Solar energy landscapes too, can increase accessibility to our living environment. In Bronckhorst/The Netherlands, a piece of landscape that was largely inaccessible until the arrival of the solar power plant is now open to the public during daylight hours. Some of those energy landscapes host community gathering spaces. More importantly, we were told that the co-creation of renewable energy landscapes such as in Bronckhorst or in the *Bioenergiedorf* Jühnde/Germany were important cornerstones of active community building.

Renewables can provide the economic means to maintain cultural heritage such as Torrigiani gardens in Florence – an UNESCO world heritage site. In 2021, the owner told us that the PV panels allow for the greenhouse and the adjacent villa to be used for venues throughout the year. Elsewhere, energy infrastructure like the Art Deco penstock towers at the Hoover dam in the United States have contributed to our architectural and thus cultural heritage. Even if the US no longer needed the electricity from this hydropower plant, the Hoover dam would not be dismantled as it is listed as national heritage site.

Other renewable energy landscapes have become landmarks, such as the Concentrated Solar Power Plant next to the Interstate 15 between Los Angeles to Las Vegas. This type of energy landscape is frequently associated with post-carbon futures and featured in the blockbuster movie *Blade Runner*. The movie caption says ‘California 2049’ which is somewhat puzzling because the Ivanpah power plant is already in operation for many years.

Other renewable energy landscapes have been featured in commercials for electric cars and are associated with contemporary fashion design, such as the Gemasolar Solar Power Plant in Andalucía (Fig. 2). Gemasolar even has a Google Map review. Are these first signs of our



Fig. 2: Fashion show in the Gemasolar solar energy landscape in Andalucía/Spain (Stephanie Louise Taylor, Media @ JMA Global)

society to become more acquainted with those kinds of landscapes? Are we starting to associate them positively with our new responsibilities in the Anthropocene and the response to climate change?

Either way, energy landscapes can become part of very personal experiences as evidenced by the large number of wedding photographs that are taken in wind parks. The Irene Vorrink Wind park near Lelystad/The Netherlands is a particularly interesting energy landscape. For the very first time in the Netherlands, people opposed the removal of the wind park. Should the Cultural Heritage Agency of the Netherlands be called upon?

Concluding this section of the paper, we like to remind the reader that we found evidence of fossil thinking as well as promising synergies between energy development and other landscape challenges, across the portfolio of renewable energy landscapes. We also learned that the very same energy technology can generate very different responses, depending on a multitude of factors (ENSERINK et al. 2022). What if we as society have been focusing on the wrong thing – energy technology – during the initial phase of the transition, and what should we be focusing on in the future?

4 The Power of Landscape

Energy transition is not about technologies exclusively but about the landscapes that change with the introduction of technologies. Predominant questions in the current discourse revolve around the *what* (choice of technology), the *who* (involved actors) and the *when* (urgency of a timely transition). The discourse yet needs to adopt *where* and *how* questions. ‘Landscape’ can interconnect these questions and in that sense provides a solid starting point for a more inclusive debate on energy transition (OUDES 2022, PICCHI et al. 2023). To exemplify the power of landscape for energy transition and beyond, we will now focus on one of the frequently voiced dilemmas: *central* versus *decentral* decisions making and implementation.

In centralized energy projects such as large hydropower plants or concentrated solar power plants, the initiative is typically taken by stakeholders from outside the local landscape. In the attempt to rapidly increase the installed capacity of renewable energy, national policy, laws and subsidy schemes affect both project developers and energy infrastructure. The resulting intervention, however, affects local landscapes. Those in favor of centralized energy transition stress the urgency of climate mitigation, advocate swift action and top-down development. Many decentralized projects, often entailing wind and solar energy, are initiated and (partly) owned by local communities. In the case of Southill Solar in the United Kingdom, the local community owns and decided about the design of the solar landscape (OUDES et al. 2022). Advocates of a decentralized energy transition point to improved energy democracy and self-sufficiency. In the current energy transition discourse, the central and the decentral perspectives are often presented as if it is either one or the other.

For this dilemma, we argue that the power of landscape lies in the fact that both the central and decentral perspective meet in the physical environment experienced by landscape users. Landscape thus provides a mirror of our success or failures. On the local level it is important to realize that any project is part of the challenge to achieve regional and (inter)national energy targets. In turn, national or regional policy – intended or unintended – affects the choice of location, type of technology, spatial configuration as well as scale and number of additional functions. Both perspectives are therefore needed, and their hybridization is

believed to be beneficial in the long term. We will, in the following, illustrate the power of landscape by drawing evidence from historical map analysis, spatial analysis and fieldwork in contemporary energy landscapes, and design research on future energy landscapes.

4.1 Learning from the Past

Throughout history, both central and decentral perspectives resulted in tangible energy landscapes. Among the first large-scale energy landscapes developed in a centralized and top-down manner were the forest removals during the antique and medieval times, for example in the Northern Italian plain. At that time, wood was used as main source of energy and construction material in many regions around the world, before it was replaced by other energy sources such as coal. Almost simultaneously, small-scale, and locally developed vernacular energy landscapes such as in Mazara/Italy appeared around the world (Fig. 3).



Fig. 3: Historical windmills and salt flats, Mazara del Vallo/Italy (Filippo Innocenti 2011)

Moving ahead in time, a new form of energy landscape started taking shape once the first oil well was drilled in Titusville, Pennsylvania in 1859. The resulting landscapes took on a much different appearance than any of its predecessors. Exoskeletal drilling rigs starting marching across the land like an invading army as frenzied speculators scrambled to extract the black liquid from the land. As enthusiasm spread, those energy landscapes started appearing in many countries (PASQUALETTI 2022, 17).

Centralized development of energy landscapes is still a default reality in the Global South. Multinational energy companies operate far away from most of their clients – us – in the landscape of others, such as in the case of the Cerrejon coal mine in Colombia. Coal mining has dried up drinking water and afflicts agriculture, air quality and causes diseases. The life of the local inhabitants is dominated by the presence of the mine. In 2015, the Cerrejón company began diverting 3.6 kilometres of the Arroyo Bruno for a mine expansion. The stream

is one of the main tributaries to the Río Ranchería and a source of water for local Wayuu communities as well as for the town of Albania. The river diversion caused more drought and forces the members of the Wayuu community to collect water far away from their dwellings (CARDOSO & BANKS 2022). What we learn from these cases is that landscape indeed possesses the power to mirror our success and failures. Existing landscapes illustrate benefits and drawbacks of centralized as well as decentral approaches to energy development. They present an almost indefinite source of knowledge for learning, reflecting, and improving.

4.2 Questioning the Present

Solar energy landscapes – a type of energy landscape that has become rather popular over the past decade or two – originate both from central and decentral approaches to energy development. In the early stages of the current energy transition, the *Solarfeld Gänsdorf* emerged in the highly productive agricultural landscape of southern Germany (Fig. 4). This project came into being when national subsidies were generous and local planning regulations scarce. A local entrepreneur seized the opportunity to develop this large solar power plant, making sure taxes remained locally and thus doubling the tax-income of the local municipality.



Fig. 4: Solar power plant Gänsdorf in Germany shaped largely by a centralized approach to energy development (Frank Stremke 2021)

Other solar landscapes such as the earlier mentioned Kwekerij in Bronckhorst/The Netherlands have been co-designed with and are responsive to the wishes of landscape users. This particular solar *park* – unlike many others power plants that carry that name – is actually a *park*. Located at the edge of a small village, local inhabitants use the solar park for community gatherings, children as playground and others for lunchtime strolls. The Kwekerij has become a best-practice and draws visitors from all over the country and abroad (OUDES &

STREMKE 2021). Please note that the *Power of Landscape* book presents many additional case studies that help learning how the global energy transition can be localized.

4.3 Imagining Alternative Futures

Building upon a critical reflection of the present, we can start imagining alternative futures. For the next generation of landscape architects, the need for energy transition is no longer a question but a fact. While teaching at two Universities, we realized that for young landscape architect, the goal is no less than designing the cultural landscapes of the 21st century.

There are sufficient valid reasons and pressing issues that support their ambition to design new cultural landscapes. However, centralized targets with regard to energy transition, climate adaptation, biodiversity crisis, food security and other 21st century grand challenges are often accompanied with quantitative models and criteria aiming to ‘mitigate impacts’. The next generation of landscape architects, through their design research, emphasises the need to move beyond impact mitigation and, instead, explore local value creation.

The *Blue Heart* project by Changsoon Choi can serve as an illustrative example (STREMKE et al. 2022). It explores the multifunctional values of a new island near the coast of North Holland. The island improves coastal protection, enables the generation of renewable energy for the city of Amsterdam, and creates a new habitat for seals. The location of the island is determined so it can function as an ecological steppingstone between the west-coast of the Netherlands and the Wadden Sea. In doing so, the project reveals the power of landscape (architecture) in the exploration of value creation rather than merely mitigating the negative impacts of energy technology.



Fig. 5: Artist impression of value creation in the North Sea: coastal protection, renewable energy generation and habitat creation for seals (CHANGSOON CHOI 2016)

In the *Land of Succession* project, Hester Koelman takes a more decentralized approach employing a farmers-citizens cooperative and addressing local challenges such as nitrification and peat oxidation in the Lopikerwaard landscape near Utrecht/The Netherlands (STREMKE et al. 2022). She proposes for this landscape to host 30.000 oscillating vertical axis wind stacks – a captivating new structure and experience for landscape users. The stacks form a new grid, contrasting with but respecting the historical polder structure. Citizens can adopt their own wind stack – capable of generating power for ten households – and use the polder as a recreational natural landscape (Fig. 6). Centralized targets can help to push the imaginaries of local landscapes, yet the development of these designs is not top-down, but requires a locally supported, coherent vision of landscape quality and other parameters relevant for the acceptance of landscape transformation by the landscape users.



Fig. 6: Artist impression of value creation in the Lopikerwaard near Utrecht: renewable energy generation, improved landscape accessibility and reduced peat oxidation through increased water level in the ditches (Hester Koelman 2018)

Public art, alike landscape design, can help to foster the societal dialogue on energy transition and the quality of our living environment at large. Since the second half of the 20th century, art advocated for social justice and pinpointed towards key environmental challenges. Artists and artwork can support local communities to imagine alternative futures. Art can, for example, interpret local identity and values such as in the *Energy Duck* project in Copenhagen (MONOIAN & FERRY 2022). It can provide opportunities for people to relate to their landscape, engage with other people, and strengthen their connection to nature as in the case of the *Solar Mountain* project in Northern Nevada (MONOIAN & FERRY 2022). Public art can support both central and decentral approaches by illustrating the beauty and promise of a world that has moved beyond carbon and thus becomes an important constituent of the cultural landscape of the twenty-first century.

5 Epilogue

By complementing the *what*, *who* and *when* with the *where* and *how* questions, a more encompassing energy transition narrative emerges. The answers to these questions, together, provide the building blocks for more meaningful decisions and define how the energy transition takes place in different places, in different landscapes. Our preference for renewable energy sources – effective to mitigate the global climate crisis – leaves us with many choices to be made during local implementation. Choices perhaps less related to *quantity* but rather to *quality*. Quality of implementation processes as well as the outcome of those processes: renewable energy landscapes. Decisions taken during the local implementation will have implications for social and spatial justice, energy costs, energy security and, ultimately, the pace of energy transition. The resulting energy landscapes and their experience by landscape users does and will continue to mirror these decisions in most parts of the world.

The introduction to this paper argued that the energy transition is not so much about technologies but about changing landscapes. The landscapes where we live, work and recreate. Our selection of projects from the *Power of Landscape* book presented in this paper, in a complementary manner, provides evidence to sustain this proposition. We are confident that a more encompassing approach to energy transition involving landscape and landscape users will benefit both the quality of the transformation and its timely realization.

Despite the ground-breaking work of fellow landscape architects such as Sylvia Crowe and Geoffrey Jellicoe in the 1950s, we are just starting to realize the true power of landscape. Landscape, of course, is not a standalone superpower, it needs to inform policy instruments such as renewable energy subsidies and planning regulations. Luckily, these instruments are developed by people. People that we recommend to visit and explore energy landscapes, to converse with locals and experts, to keep innovating and reflecting.

Departing from the landscapes that people use and cherish, instead of technological performance and economic growth that has dominated the post-modern era and thus much of the initial phase of today's energy transition, certainly leads to different conversations. Conversations in which memories of the past and images about the future are starting to coalesce into the cultural landscape of the 21st century.

Acknowledgements

This paper is based on the recently published book 'The Power of Landscape: Novel Narratives to Engage with the Energy Transition' (nai010 publishers, Rotterdam). The authors of this paper would like to acknowledge the work of all contributors to the book, and the financial support by the Amsterdam Academy of Architecture, Wageningen University & Research, Creative Industries Fund NL, and Van Eesteren-Fluck & Van Lohuizen Foundation.

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