Deeply Integrated Design

Source of Knowledge and Innovation

Prof.dr S. (Sanda) Lenzholzer

Inaugural lecture upon taking up the position of Professor of Landscape Architecture at Wageningen University & Research on 16 June 2022

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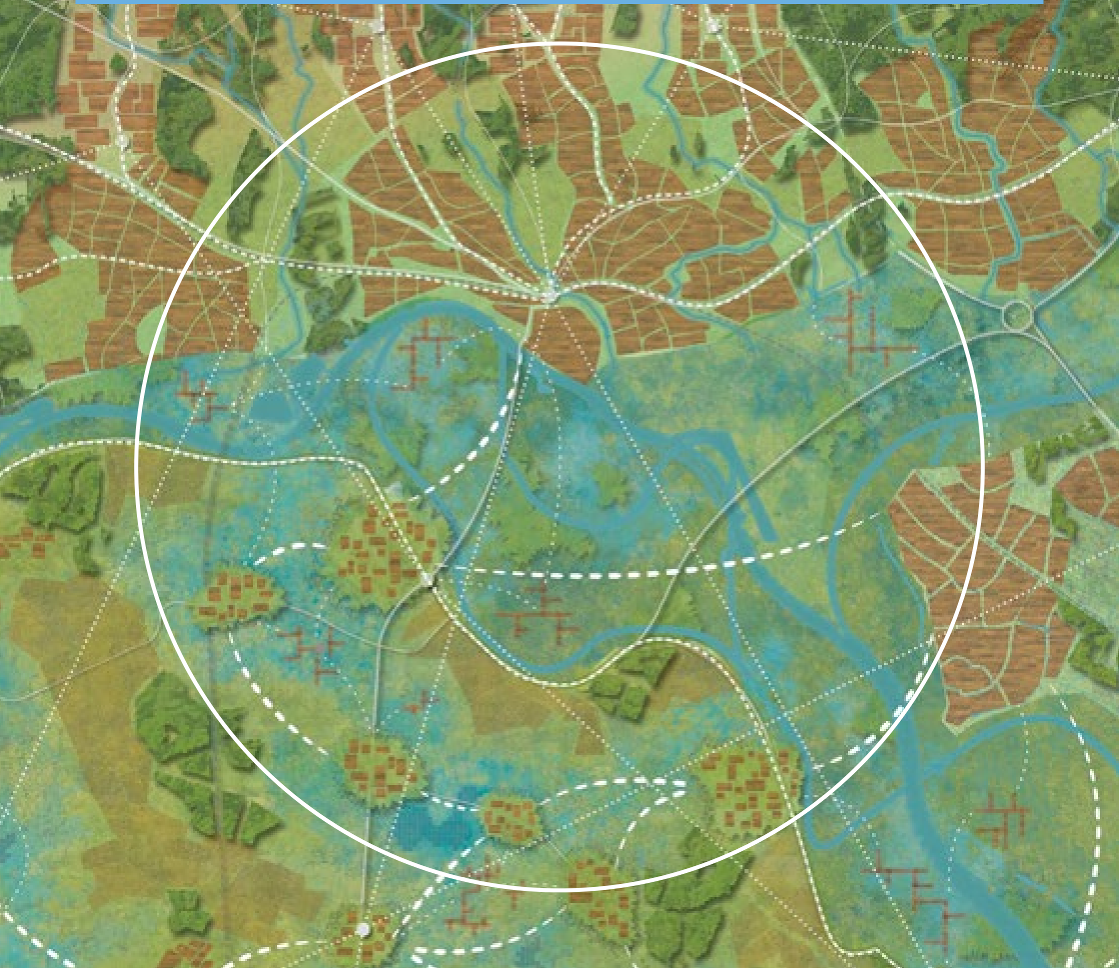

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Dear colleagues, friends and family,

I am really humbled by your presence and that you all found your way to Wageningen to celebrate this milestone in my academic life together with our landscape architecture chair group and me. Now, after a long postponement of my inaugural address, I am even more delighted that we can come together, enjoy a festive moment and exchange thoughts in a 'real-life' mode. I hope that this address can fuel fruitful conversations that connect many different disciplines in Wageningen University and Research and beyond.

Now, let me get to the point of this address and introduce the reasons and developments that ask for generating and implementing 'deeply integrated designs' in landscape architecture to you.

Challenges Now and in the Future

Our socio-spatial environment is changing rapidly, it is becoming ever more complex and is posing new challenges. What comes to mind first is climate change[1] as a driver of rising global temperatures. We increasingly feel the results in our temperate climate zones through more frequent heat waves, especially in urban areas that are already experiencing elevated temperatures[2]. Global warming's many secondary effects, such as increased drought, have also endangered the productivity of many agricultural regions, amongst which in the Netherlands[3,4]. Further, we face sea level rise, elevated ground water levels and increased salinisation of soils in coastal and delta areas[5]. We will also face more frequent downpours that will lead to localised flood events and heavy damage in urbanised areas (see Fig. 1).

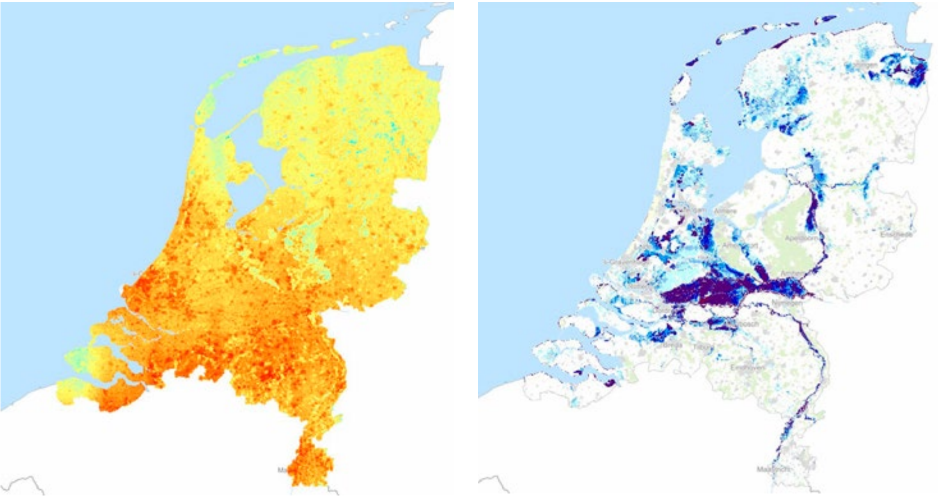

Figure 1 Left: Climate change inducing heat stress increase (scenario 'high 2050'), and right: Climate change inducing flood risk (medium chance, scenario 'now') in the Netherlands

In addition to climate challenges, we also face environmental decay with many forms of air, water, and soil pollution. And in many countries, nitrogen emissions are presenting a large challenge, as they lead to over-fertilisation of soil and eutrophication of waterbodies[6]. All these types of environmental pollutants have led to increased health concerns for humans and other living beings and to species extinction.

Solutions and Potentials

Undoubtedly, these global challenges are pressing and call for solutions, and these can be combined with the potentials offered by many new developments and technologies. With respect to climate mitigation, one major solution at the moment involves renewable energy applications such as solar power installations, wind turbines (see Fig. 2), hydropower plants, or heat-cold storage[7]. When it comes to managing environmental pollutants such as phosphates and nitrogen, we also need to consider that these actually are resources that are needed elsewhere. Often, this is a matter of circular use and calls for the redistribution of these pollutants as resources[8,9].

Apart from these approaches to addressing climate change and pollution, we have witnessed another development that has had a large impact on the way we live, work, and organise our lives: digitisation. Not only has digital work changed our lifestyles, but digitisation also ushers in forms of autonomous transport on roads, on the water, and in the air[10]. Usually, that transport is also electrified, which additionally impacts the organisation of urban space. The digitisation, coupled with robotisation, has also seen increasing growth in agricultural applications[11], as it allows for precision growing. This, in turn, has enabled a range of varied, landscape-responsive and biodiverse crop patterns through methods such as agroforestry and mixed or strip cultivation.

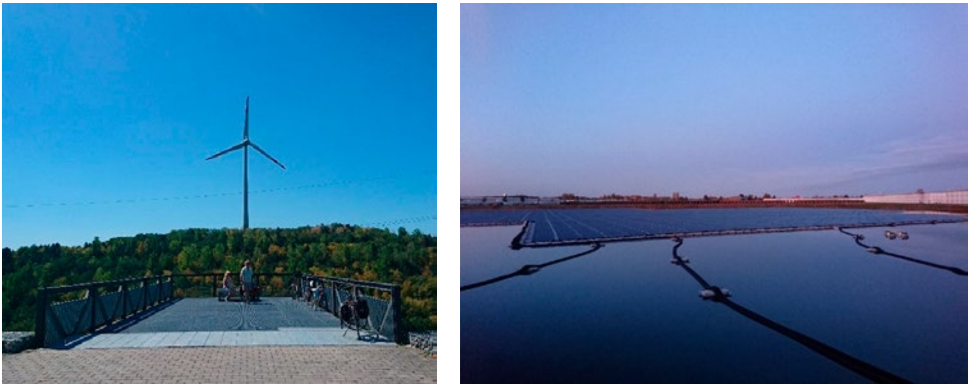

Figure 2 Two types of renewable energy technologies (left: wind turbine, right: floating photovoltaics)

Changing Societies

Partly driven by digitisation, many societies have changed in the past decades and this manifests itself in the emancipation of citizenry and greater access to information. Often, this trend has led to a broader democratisation of planning and design processes and increased participation by citizens. As a result, spatial designers had to become more transparent about design decisions and to legitimize these with reasoning that goes beyond personal ideology or opinion. In addition, there is an increasing call to better support design decisions with data and other evidence[12,13]. On the other hand, this democratisation and the related 'not-in-my-backyard' debates often led to a slowing of design processes[14]. However, given the urgency to make decisions on spatial matters, we cannot afford to take too much time, and we need design methods that accelerate these decision and design processes.

Role of Landscape Architecture in Shaping Environments

I have discussed several pressing challenges that we face as well as technological and societal developments that should be considered in shaping urban and rural environments. Landscape architects, as creators and transformers of such environments, are well-positioned to respond to these challenges and new opportunities. I will now provide an outlook on how design in landscape architecture currently responds to these developments.

However, before I go into that content, allow me to give you a brief introduction about the landscape architecture discipline for those among you who are not familiar with it. As a profession in a Western context, landscape architecture developed from the art of gardening, mainly connected to the design of extensive estates for the nobility, for instance the work of André Le Nôtre in the Baroque period or Lancelot "Capability" Brown's English landscape gardens during the Romantic movement. Following Gilbert Laing Meason's first mention of the term 'landscape architecture' in 1828, Frederick Law Olmsted and Calvert Vaux adopted the term as a professional title in 1863.
After the Enlightenment, garden and park design increasingly served the public and also began to include civil engineering methods, such as Olmsted's '*Emerald Necklace*' park system in Boston. After WWII, the profession and discipline of landscape architecture expanded, driven by the need for comprehensive planning to rebuild European cities and to compensate for a rapid decline in environmental quality[15].

Although the term 'architecture' in our discipline's name suggests that we create stable and fixed forms such as buildings, landscape architecture is more about responses to processes and change. Already in 1909, Frederick Law Olmsted Jr., stated that it "... is not a spasmodic thing to be done in a "once and for all" manner..."[16].

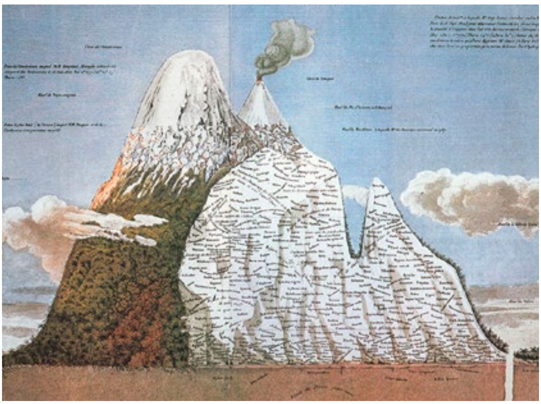

Figure 3 Alexander von Humboldt's understanding of natural systems in their entirety: "Naturgemälde"

This way of thinking harkens back to the ideas of German geographer and philosopher Alexander von Humboldt, who in the early 19th century already understood landscapes as the entirety of Earth's bedrock and soils; its landscapes and waterscapes; and its weather and climate (see Fig. 3), all of which undergo continuous change[17,18].
His work inspired naturalists such as Ralph Waldo Emerson, Henry David Thoreau and the founder of ecology, Ernst Haeckel. Some examples of

more contemporary theories that built on these ideas include human ecology[19], deep ecology[20,21], and systems theories[22].

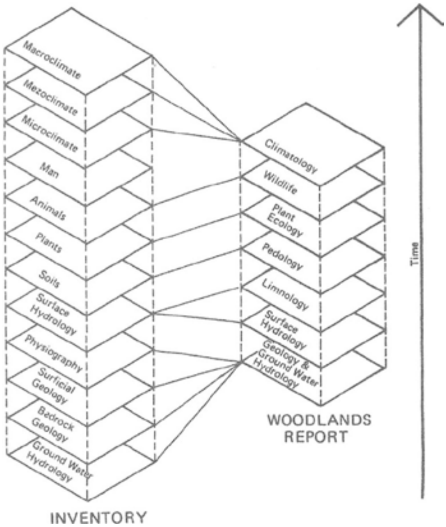

Figure 4 The 'layers of landscape' as analysed by Ian McHarg

In the past 50 years, these theories have become widely adopted into the landscape and urban design professions[23,24,25,26,27]. In particular, landscape architecture professor Ian McHarg translated the systems thinking approach into the now nearly ubiquitous 'layer' approach of landscape analysis, and thus created the foundation for an entirely new basis for design decisions[28]. In this approach, a landscape is 'dissected' into distinct topics that can be analysed separately such as geology, hydrology, flora, fauna, etc. (see Fig. 4). This aids to understand the different components of a complex landscape system. McHarg's famous 'layer' approach has not only influenced many scholars in landscape architecture, but even led to the invention of geo-information systems (GIS)[29].

Ian McHarg was also one of the teachers of Meto Vroom, a former professor of landscape architecture at Wageningen. Vroom became an important figure in the discipline and along with other scholars, Vroom established a more systematic and analytic way of approaching landscape architecture and began a school of thought that Wageningen shares with other universities worldwide (e.g. University of Pennsylvania, University of Guelph, Sveriges lantbruksuniversitet).

As a result, under this systems thinking approach to landscape architecture, we now consider a broad range of sub-systems that exhibit their own logic, processes, and spatial configurations. Landscape architecture has developed methods to analyse our landscape system at several scales to understand how landscapes can be shaped, and to implement a broad range of design interventions. This work usually entails an 'integrated design' approach that intervenes in some parts of the landscape or urban systems. But is this level of integration sufficient? I have my doubts.

Deeply Integrated Design in Landscape Architecture

If we address the challenges, potentials, and societal developments I discussed earlier separately and consecutively, or only in a partially integrated manner, our cities and rural landscapes will be 'continuous construction sites' in the coming decades. In addition, we will face perpetual struggles about scarce space and as designers, we will miss many opportunities to create more innovative solutions. This suggests that we need a more intensely integrated design approach and I therefore call for the introduction of a 'deeply integrated design' in landscape architecture.

To bring integration in landscape architectural design to a deeper level, we must address three parameters that are key to all spatial design disciplines: the 'what', the 'where', and the 'how'. The 'what' entails the topics under study and their relationship to the challenges and opportunities I addressed before. In deeply integrated design, we need to combine far more topics than we did before. The 'where' concerns the geographical context and scale at which these topics are addressed. Here, we need to consider types of areas that are in need of more integrated design. And, most important for a discipline that transforms environments, is the 'how', or the methods to understand and address these challenges and opportunities in a design-based way. In deeply integrated design, we have to understand and integrate the different dynamics of landscapes much more than we did before.

I will now discuss each of these parameters in the context of developments in the field, how the Wageningen Landscape Architecture chair group is positioned herein and what deeply integrated design approaches entail for our school. I will also provide examples to illustrate this otherwise rather abstract plea.

The 'What': topics to be addressed

Topics addressed in landscape architecture education and research often differ across schools, mainly along the lines of design traditions in which we can distinguish two main types of schools. The first type of landscape architecture school appeared in connection to the art of gardening and is often embedded in architecture or art faculties. These schools typically focus on past and present artistic styles, on aesthetics of design, and on representation. The second type of school arose in connection with engineering or agricultural science faculties and has adopted a more technical and scientific approach. These types of schools conduct research and design on the interface between landscape ecology, water management, or civil engineering, also often related to agriculture[30].

In Wageningen, we belong to the latter type of school, given the university's origins and its 20th century focus on landscape ecology, agriculture, and water management. Key

Figure 5 An example of a typical large-scale agricultural design from the Wageningen school: a study for the Achterhoek, 1990

landscape architecture projects that emerged from Wageningen at this time included agriculture reallotment studies, such as plans for the Achterhoek[31,32] (see Fig. 5), or designs for agriculture systems and landscape ecological approaches in Noord-Brabant[33]. Also the groundbreaking 'plan Ooievaar' that addressed flood threats in river areas and that was a driver of the later '*Space for the River*' programme, was influenced by Wageningen alumni[34].

After the year 2000, our chair group has continued its work on water management. Next to this, we have also developed a strong body of research on energy systems[35], and grown our expertise in landscape design heritage and landscape aesthetics, all of which have received international acclaim. Concurrently, I have also introduced a long-neglected issue—urban climate and microclimate—which has laid the basis of a renowned research group[36].

However, we also see some fields that require much more attention by our group in order to address the multiplicity of topics that we need to respond to. For example, one topic that we have neglected over time is design for biodiversity, and this should be revived. Considering our present agricultural challenges, the implementation of circular agriculture approaches is another topic that requires our attention. Finally, physical and mental health are important topics that demand new foci in our group. We are currently developing our expertise on each of these topics that will equip us with the capacities necessary to realise the 'deep integration' needed. To make this more tangible, let me give some examples how the response to many pressing topics can be shaped in deeply integrated design.

One example is a recent MSc thesis project for the Ijmeer (see Fig. 6) which combines a water-based solar energy generation system with water cleansing, creation of diverse habitats and recreation opportunities. Here, optimised configurations of photovoltaics and their infrastructure were integrated with breakwaters and wicker dams to capture suspended sediment. In turn, the build-up of sediment and new microclimate created around breakwaters creates both new habitats and an exciting landscape that affords a range of recreation activities[37].

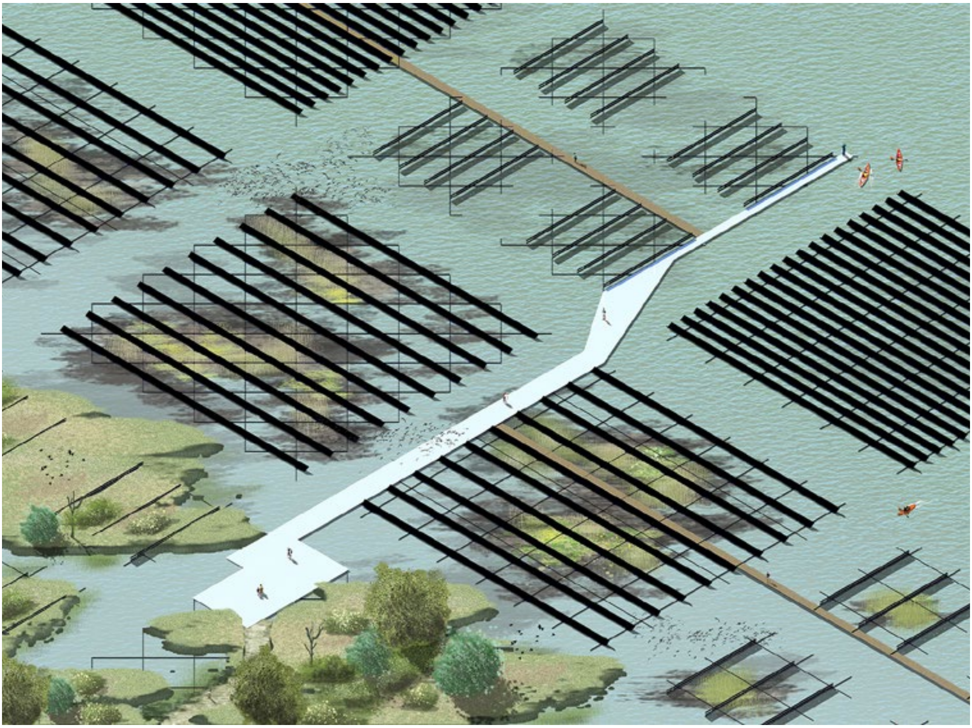

Figure 6 Composition of wicker modules in different stages of succession with new boardwalks for recreation

Another recent example of deeply integrated design for many topics is our new study called '*The city of 2120: all natural!*'[38]. Here, we took Arnhem and its diverse landscape of low-lying river area and the Veluwe hills as an example of two major Dutch landscape types within one city. Arnhem's creeks, which run downhill to *the Nederrijn*, were redesigned with reservoirs to address the current depletion of groundwater layers. These reservoirs were connected to small waterfalls that create cool areas during heatwaves. Also, the valleys and their surroundings were designed to channel nocturnal downhill winds to alleviate heat stress in adjacent neighbourhoods (see Fig. 7). These green-blue open areas also offer space for slow transport systems and for recreation.

These examples of deeply integrated design not only illustrate the necessity of combining more topics than ever before, but also the innovative design solutions that arise from bringing diverse topics together. The topics we address with deeply integrated design also tightly connect to their geographical context, or the 'where' and its scale.

Figure 7 Integrated design for the Veluwe hills that combines water retention, evaporative cooling and greenways that allow downhill cool air fluxes.

The 'Where': Geographic context and scale

In landscape architecture, design interventions are always embedded in physical and spatial contexts. This means that these interventions are not 'stand-alone' objects and that they respond to different parts of the complex systems which they constitute or in which they are embedded. Moreover, as these responses occur at different scales and system levels, we often design in a multiscale manner. This implies that the site of a landscape architecture project, or the 'where' of its geographical context and scale, is crucial, even more so in deeply integrated design.

Landscape architecture has a long tradition of shaping two broad types of spatial contexts: urban and rural landscapes. As I discussed previously, the discipline began with rather small-scale garden designs but the scale of its interventions enlarged into green network systems in cities, particularly after the industrial revolution[39]. As we know, over time the Netherlands has been partly reclaimed from the sea, and so this 'new land' also had to be designed and engineered. As a result, a culture of landscape design on a larger scale evolved here earlier than in other countries. Especially after WWII's food crisis, a need to intensify the Dutch agricultural systems arose and large scale land reallotment schemes were created. The Wageningen school of landscape architecture engaged in research and design for these new types of rural environments[33,40,41].

However, since the 1990s, the growing need in the Netherlands for urbanisation[42,43], nature preservation, and urban water management has called for a 'landscape approach' to designing new urban areas. In response, many Dutch landscape architecture offices have shifted their focus to landscape-driven urban design projects. Concurrently, our group has built expertise in this area to educate the next generation of landscape architects in designing urban areas—not only parks and gardens but also residential and commercial projects. We have introduced urban design approaches into our teaching that embody profound landscape knowledge for urban contexts[44] and translate this knowledge into urban design. Currently, many of our research projects and MSc thesis projects represent the urban realm. One example is an urban design MSc thesis that generated a landscape-based approach for treating stormwater for Tampa, Florida (see Fig. 8). Here, the city's stormwater network was transformed into a more dynamic system that anticipates future flood risk, improves water quality, increases biodiversity and offers rich everyday experiences of water and nature[45].

Figure 8 Mitigating flood problems and increasing the water quality in Tampa, Florida

In recent decades our group has also responded to rural landscape developments with respect to water management and implementation of renewable energy systems. One example of this work concerns another recent MSc thesis (see Fig. 9)that addressed salinisation in deep Dutch polders[46] by testing a range of design strategies for changing groundwater flows and land uses. This study demonstrates that a well-designed strategy can enhance ecological processes, partly reinvigorate agricultural systems and contribute to the recreation potential of deep polder landscapes.

In essence, we have kept the original Wageningen tradition of rural and regional design. But now, we must act on new and urgent issues, such as nitrogen pollution; flooding;

Figure 9 Strategies to influence seepage in deep polder landscapes in the western part of the Netherlands

salinisation and drought in agricultural areas; and implementing circular agriculture systems. This calls for a re-focussing on design for rural areas in our group. These issues we face and their highly dynamic processes, in all kinds of landscapes, call for a new orientation in the methods in landscape architecture.

The 'How': Methods to Respond to Process

Fundamentally, the work of landscape architects is about transformation or creation of new circumstances. As a result, the 'how', or the 'making' of design, is at the core of our discipline. In landscape architecture, this 'how' concerns the design of rural and urban environments with their myriad abiotic, biotic, and social conditions and processes. As I discussed previously, these processes and their variability over time are major drivers in landscape architectural design. However, in order to develop deeply integrated design approaches, we must devote even more attention to the factor of dynamic changes over time.

Since the days when our discipline was still called 'art of gardening', the concept of time has been important, as plant growth and seasonal change largely defined the function and appearance of gardens and parks[47]. However, while these classic factors still receive attention[48], a host of other landscape processes have recently received the attention of landscape architects, such as erosion and sedimentation, tidal flows, riverine and coastal flooding, human use patterns, and how all of these processes can be shaped through design[49,50]. In the Netherlands, we see many important examples of projects based on these newly considered processes, including the '*Markerwadden*' (designed by Witteveen+Bos, Vista and Arcadis, a.o.), which addressed erosion and sedimentation dynamics in the Wadden Sea; '*Ruimte voor de Waal*' (designed by H+N+S, a.o.), which created additional flood space for the Waal River; and the '*Volgermeerpolder*' project (Vista, a.o. see Fig. 10), which revealed processes of peat growth and succession under different hydrologic conditions.

Figure 10 Vision of future development for the Volgermeerpolder by Vista landschapsarchitecten

However, while many of the dynamics in these projects are driven by relatively slow-moving soil and water processes, the atmospheric processes related to microclimate and weather and their rapidly changing patterns have not yet received much attention in landscape architecture. The constantly shifting dynamics of the 'airscape' strongly influence local climates, air pollution levels, and energy fluxes that can be used as renewable energy. These processes also have a reciprocal relationship with design interventions, because the built environment shapes these fluxes in the 'airscape'[51]. To create a better understanding of such highly dynamic fluxes, we must further explore the opportunities of dynamic representation methods such as virtual reality. Visualisation of these complex processes generates an enormous density of complex information (see Fig. 11). As a result, we as designers might run into problems with identifying relevant data and evaluating them with a design purpose in mind. We will have to conduct research on questions such as: what is useful data visualisation for design? Or: which levels of complexity in visualisation stifle design and which inform and inspire design?

Of course, a better understanding of highly dynamic processes is no guarantee for generating deeply integrated design projects. We need to integrate the processes of

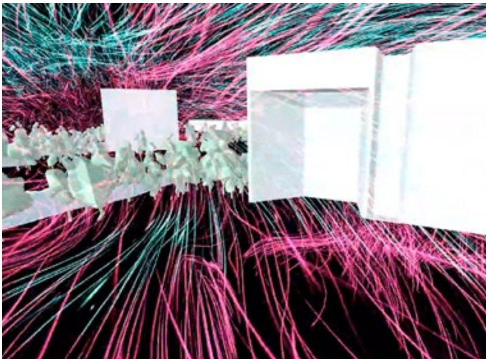

Figure 11 Video still from an animation of an 'airscape': complex wind dynamics on the Wageningen campus

'soilscapes', 'waterscapes' and 'airscapes' in order to design with them. Let me give some examples that demonstrate how we can design by linking these processes.

The first, simple example is a small-scale project that shows how processes of 'water-' and 'airscapes' can be coupled (see Fig. 12). To create a year-round comfortable microclimate for people sitting outside, two conditions are needed: open ventilation during warm months and wind protection during colder months. An analysis showed that groundwater levels are higher during the cooler and low during warm months. The solution based on these dynamics is a hydraulic wind protection: rising ground water levels can raise the wind shields in the cool months for protection and descend in the summer to offer ventilation for cooling.

A large-scale and more complex example again originates from our recent '*The City of 2120: All Natural!*' project[38]. This design combines four dynamic processes: river water level change, groundwater recharge, wind and water energy production (see Fig. 13). The project calls for new reservoirs on the higher, sandy moraines that are connected by pipes

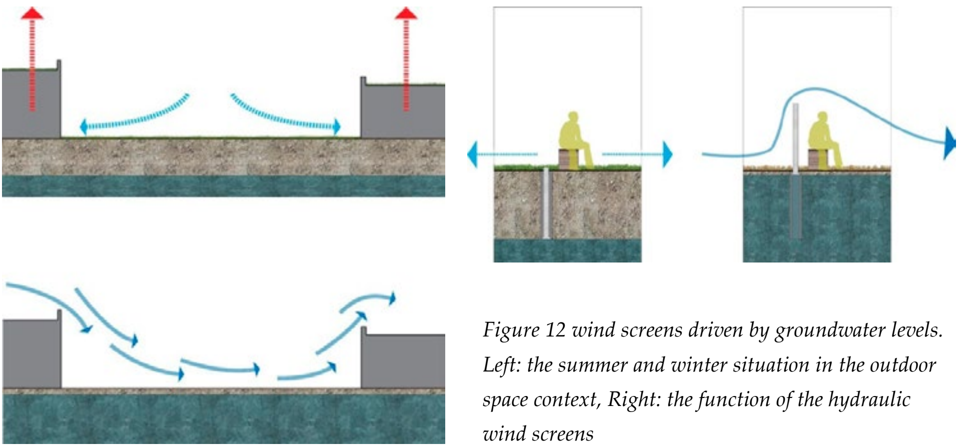

Figure 12 wind screens driven by groundwater levels. Left: the summer and winter situation in the outdoor space context, Right: the function of the hydraulic wind screens

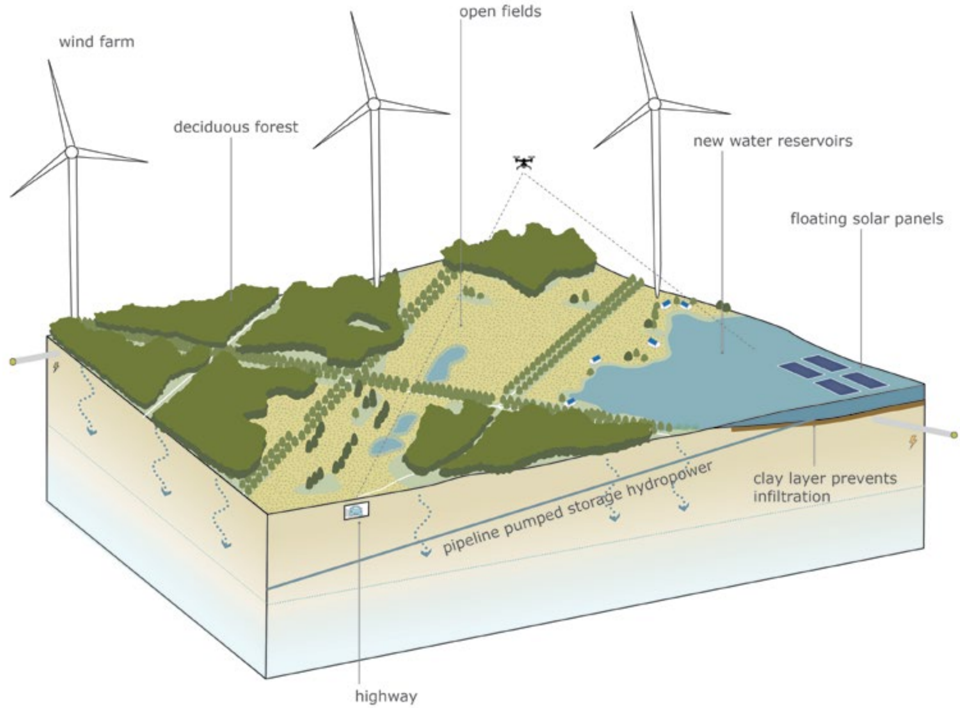

Figure 13 Disentangling the different processes of climate and energy processes on the Veluwe flanks

to the low-lying river basin of the *Nederrijn*. Using wind power, these reservoirs are filled with excess filtered river water in the cooler months, which are also those that exhibit high river levels. However, this design not only utilise wind power to decrease river levels, but its reservoirs function as water powered installations to drive turbines when other renewable energy sources are not available. In addition, the reservoirs provide extra groundwater infiltration capacity, as some of the water pumped into the reservoirs infiltrates through their unsealed edges and replenish ground water reserves.

These are some examples that indicate how we can deeply integrate the highly dynamic processes of the 'airscape' with 'soilscapes' and 'waterscapes'. We will strengthen our efforts to better understand these processes and to design with them. This will involve close cooperation with many colleagues from environmental sciences and data visualisation. In designing with such highly dynamic integrated processes we should also make sure that we design not only for, but also with, society and other stakeholders. The method of Research Through Design is an important catalyst herein.

Research Through Design as a catalyst for deeply integrated design

As I discussed in the introduction, many societies have undergone political shifts through which their citizens have become more involved players in decision-making processes. As a result, design decisions increasingly need to be more transparent and open to public debate. However, to ensure that these design decisions lead to reliable and innovative solutions, more rigorous testing is required. Research through design is a useful approach to meeting this demand[13,52].

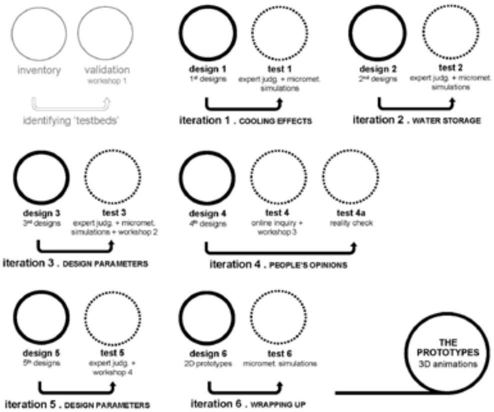

Figure 14 Iterations in RTD and test criteria: an example from the REALCOOL project

At this point, some of you might wonder: what is Research Through Design, or RTD? In a nutshell, RTD is an approach that creates new knowledge and innovation embodied in design products. The RTD process consists of iterative development of integrated design solutions that are tested with established quantitative or qualitative research methods, often with the participation of societal stakeholders. (see fig 14)[53,54]. Both of these rigorous qualitative and quantitative testing methods produce strong evidence and credible results. In complex design situations this legitimation can often help to persuade societal partners and to accelerate the design process. Let me give you two examples of RTD projects from our group that show how different types of design knowledge was developed.

The first example is the '*REALCOOL*' project[55] which generated virtual prototype solutions around small urban water bodies. The project team consisted of experts in urban design, urban meteorology and hydrology and an advisory team with members from engineering, the National Institute for Public Health, municipalities, water boards and design offices. Here, the RTD process began by defining the virtual environments onto which a range of design experiments could be projected: different types of water bodies and their immediate environments (see Fig. 15). Next, the process involved iterations to design and test combinations of shading, vaporisation, and ventilation strategies around the selected water body types. The testing was conducted on performance outcomes, such as biometeorological and hydrological functionality, in combination with other urban functions, construction costs, maintenance requirements,

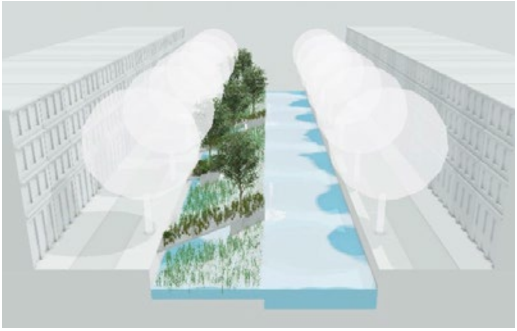

Figure 15 Example of a virtual environment of an urban water body with design interventions, REALCOOL project

and public health effects. The testing procedure also included an online survey of how the public perceived hypothetical environments. After this iteration, a set of virtual prototypes were tested in a 'reality check' in which they were applied by practitioners in real-world projects. These new REALCOOL prototypes embodied integrated, innovative knowledge for future designs of water bodies.

A second example of RTD, called '*In my Backyard, Please*'[56], is one that used a more site-specific approach and followed a co-creation process with citizens. The project created a first stage of a photovoltaic park that integrated multiple land uses. The project team included psychologists, landscape architects, industrial designers, visualisation experts, photovoltaic experts and community residents. The preparatory work for this project focused on locating a project site suitable to all stakeholders. The first co-design iteration began by developing spatial design scenarios on the amount of PV panels to be placed, in which the residents assessed the design scenarios, followed by finding an appropriate locale for the solar installations on site. The next round of design and testing involved the creation of 1:1 mock-ups of PV panels featuring different graphic patterns (see Fig. 16). After placement on site, the residents assessed the aesthetic and functional impacts. The results showed that the mock-up exercise had a positive influence on public opinion, so that a large part of the community became more willing to welcome a solar park near their homes, or 'in their backyard'.

Figure 16 Mock-ups of different PV panel arrays on site for the 'In my Backyard, Please' project

Over the past decade, our group has developed RTD methods for landscape architecture and has built a solid body of knowledge and publications. However, we still need to learn more about highly complex, integrated RTD processes, such as: Which topics should be prioritized? And at what point in time in the process? We can explore the potential of this approach more easily due to the rapid rise of new testing methods such as ‘predictive twins’[57], or parametric design, in which some design decisions are automated by shape-generating algorithms[58]. However, in the efforts of our chair group to further RTD methods, we have largely emphasised scientific methods and neglected the methods used in the arts to generate new knowledge. Many artistic research methods exist ([59]) and we need to better understand how we can integrate these methods with RTD processes in landscape architecture.

In the future, we will also use the power and promise of RTD as a link to invite additional disciplines into the process, and I look forward to cooperating more than ever with our colleagues in Wageningen and beyond. To bring the ‘design forces’ in all five WUR departments together, I will strengthen the ‘Design@WUR’ group I founded a few years ago to ensure that design becomes more visible on campus. Perhaps, our campus will even have a new building that illuminates the integrative and innovative power of design. Being able to develop the power of design and RTD further in the past decades has been an accomplishment of my group and my predecessors and I would like to express my deep gratitude to all of them.

Acknowledgements

First of all, I would like to thank the members of the landscape architecture chair group. We have all gone through very challenging times in the past 2,5 years that have dramatically disrupted our teaching, research, and personal relationships. The pandemic struck right after I started my professorship, which was an adventurous initiation, to put it mildly. However, despite these adverse circumstances, members of our chair group have shown their amazing capacity for endurance, coherence, and creativity. Since that time, our staff numbers have almost tripled in size and our teaching and research productivity are on the rise. Moreover, the unconditional and constant support of Annelies Bruinsma, our administrator and Audrey Raijmann-Schut, our secretary, have been invaluable. I feel very grateful and blessed with our team and I look forward to continuing our route together in the years to come. I also want to thank the support from our ESG directors and the WIMEK graduate school for recognising our potential as designers to explore new urban and rural futures in a transdisciplinary way.

I would also like to thank my colleague prof. dr. Martha Bakker, who leads the Spatial Planning chair group, and the colleagues from her group with whom we fruitfully

collaborate. Over the past 2,5 years Martha and I have led the Landscape Architecture and Spatial Planning (LSP) cluster together with support from the daily board. Martha, I enjoy our constructive cooperation, our mutual support and how our very different characters nicely complement each other.

Without the students, academic life would be quite dull. I want to thank all my current and former students, many of whom are now professionals. Your enthusiasm, creativity, and critical viewpoints have furthered our ideas for research as well as our teaching.

I also would like to acknowledge the valuable contribution of our former special professor Adriaan Geuze, as well as the inspiration from all our colleagues from practice whose co-teaching in our BSc and MSc programmes we very much appreciate.

Although he is unfortunately not among us anymore since last autumn, I would also like to acknowledge the work of my predecessor, prof. dr. ir. Adri van den Brink. He did his very best to further the research agenda and impact of our group, and his work advanced our research capacity. We miss him and pay tribute to his valuable efforts.

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"Ik heb gezegd – thank you for your attention"

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Credits for Illustrations and Photographs

Fig. 1 Klimaateffectatlas 2022, https://www.klimaateffectatlas.nl/nl/

Fig. 2 Left and Right: Sanda Lenzholzer

Fig. 3 Alexander von Humboldt, "Ein Naturgemälde der Anden", https://commons.wikimedia.org/wiki/File:Humboldt1805-chimborazo.jpg

Fig. 4 Ian McHarg, (1996): A Quest for Life: An Autobiography. Wiley, New York, p. 258

Fig. 5 Kerkstra, K. and P. Vrijlandt, Landscape planning for industrial agriculture: a proposed framework for rural areas. Landscape and urban planning, 1990. 18(3-4): p. 275-287

Fig. 6 de Boer, D., Solarchipelago : designing energy transition in the IJmeer along ecosystem change, in Landscape Architecture. 2020, Wageningen University: Wageningen. p. 83

Fig. 7 Timmermans, W., *et al*., De stad van 2120: natuurlijk! 2022, Wageningen University & Research

Fig. 8 Verbon, L., Waterworks - Testing and designing for the Nature and Urban Stormwater Synergy (NUSS) in Tampa, Florida, in Wageningen University, landscape architecture group. 2013, Wageningen University: Wageningen. p. 118

Fig. 9 Bicker, A., Salinization adaptation in the Dutch deep polder landscape in Wageningen University, landscape architecure. 2020, Wageningen University: Wageningen, p. 72/73

Fig. 10 Courtesy of Vista landschapsarchitecten

Fig. 11 Data: Meteorology and Air Quality Group, Wageningen University, numerical experiments by Bart van Stratum with the MicroHH model (https://microhh.github.io/), visualisation: WANDERlab (https://wander.wur.nl/)

Fig. 12 course work Professional Academy, Wageningen University, landscape architecture group, Darius Reznek, 2015

Fig. 13 Timmermans, W., *et al*., De stad van 2120: natuurlijk! 2022, Wageningen University & Research.

Fig. 14 REALCOOL project (http://climatelier.net/projects/research/realcool-really-cooling-water-bodies-in-cities/)

Fig. 15 REALCOOL project (http://climatelier.net/projects/research/realcool-really-cooling-water-bodies-in-cities/)

Fig. 16 Courtesy of Merel Enserink, 'In my Backyard, Please' project (https://zoninlandschap.nl/projecten/i174/in-my-backyard-please)

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