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Landscape-based regional design as an approach towards sustainable urban development

Steffen Nijhuis

Urbanization is one of the greatest challenges of this century, alongside biodiversity loss and the effects of climate change (Fig. 1 and 2). It often occurs at the expense of fragile ecosystems that provide essential services (such as food and water) while increasing our vulnerability to flooding and drought. In turn, these challenges can exacerbate existing social inequalities. Achieving sustainable urbanization requires a landscape-based strategy that places the biosphere at the forefront of social and economic development (Fig. 3). A “landscape first” perspective binds people, themes, and scales in a spatially-minded and integrative approach. It considers landscapes complex systems—i.e., relational structures where urban, rural, and natural processes are interconnected—thereby helping to reconcile the rural-urban dichotomy. By considering landscape as the cornerstone for delivering more sustainable forms of urbanization, landscape-based regional design places design with nature, people, and history at the heart of its methodology. It employs knowledge-based spatial design as an integrative, multi-scalar, and transdisciplinary approach. Understanding landscape systems and their associated ecological and cultural logics is the starting point for

spatial design across scales. Using this landscape logic, we can build nature-inclusive and climate-adaptive urban environments to ensure a healthy and safe living environment for all.

Landscape-based regional design

Landscape-based regional design uses the processes and functions of nature as a basis for spatial planning and design. Abiotic factors such as climate, elevation, soil, and water determine urban development opportunities while ecosystem restoration, management, and rehabilitation are employed as formative powers. At the same time, this approach recognizes that landscapes are socio-cultural constructs shaped by centuries of human interaction with the natural environment. Thus, learning from landscape history and vernacular practices while incorporating Indigenous and traditional ecological knowledge underpins this approach. As such, the physical landscape structure, with its associated natural and cultural processes, is leveraged to create favorable conditions for future development and to guide spatial transformations.

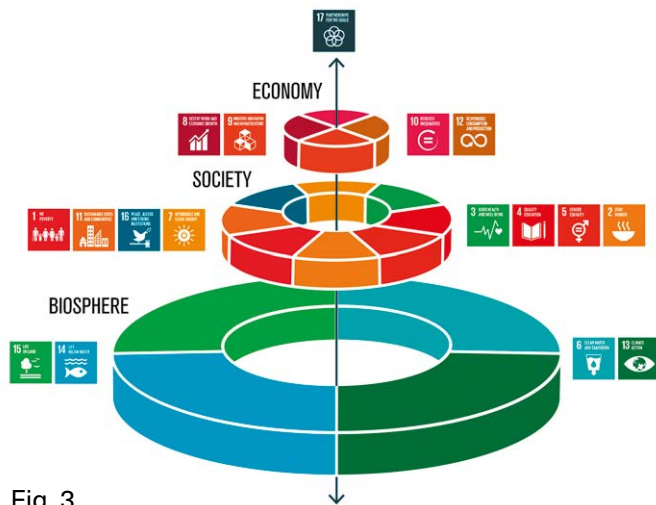


Fig. 3

Through the development of robust landscape structures, landscape-based regional design identifies and directs urban development towards the most advantageous places, functions, scales, and interrelationships. These resilient and adaptive spatial frameworks ensure the coherent development of the region (its long-term strategy) and at the same time create conditions and flexibility for local projects (as short-term interventions). Ultimately, the goal is to create and/or regenerate

living landscape systems where (bio)diversity, cultural history, and multi-functionality lead to socially and ecologically inclusive water-sensitive urban landscapes.

Transdisciplinary design and co-creation

Balancing the relationship between experts, citizens, and authorities is essential for the success of landscape-based regional design (Fig. 4). Here, specialized knowledge and local expertise play vital roles in integrating sectoral activities, encouraging coordination, and achieving sustainable outcomes to benefit all stakeholders. This requires a process that extends beyond the domain of landscape architects, urban planners, and urban designers to actively involve other knowledge domains, such as data scientists, environmental technology, and urban studies. It also affects local residents, the business community, administrators, and other regional stakeholders. Through meaningful participation of all stakeholders in envisioning, designing, and policy-making, it is intended that the resilience and adaptive capacity of urban landscapes will be increased, not only in physical terms but also socio-economically.¹ This strategy implies a shared understanding, often adopting a future-oriented, proactive approach where interactions among citizens,

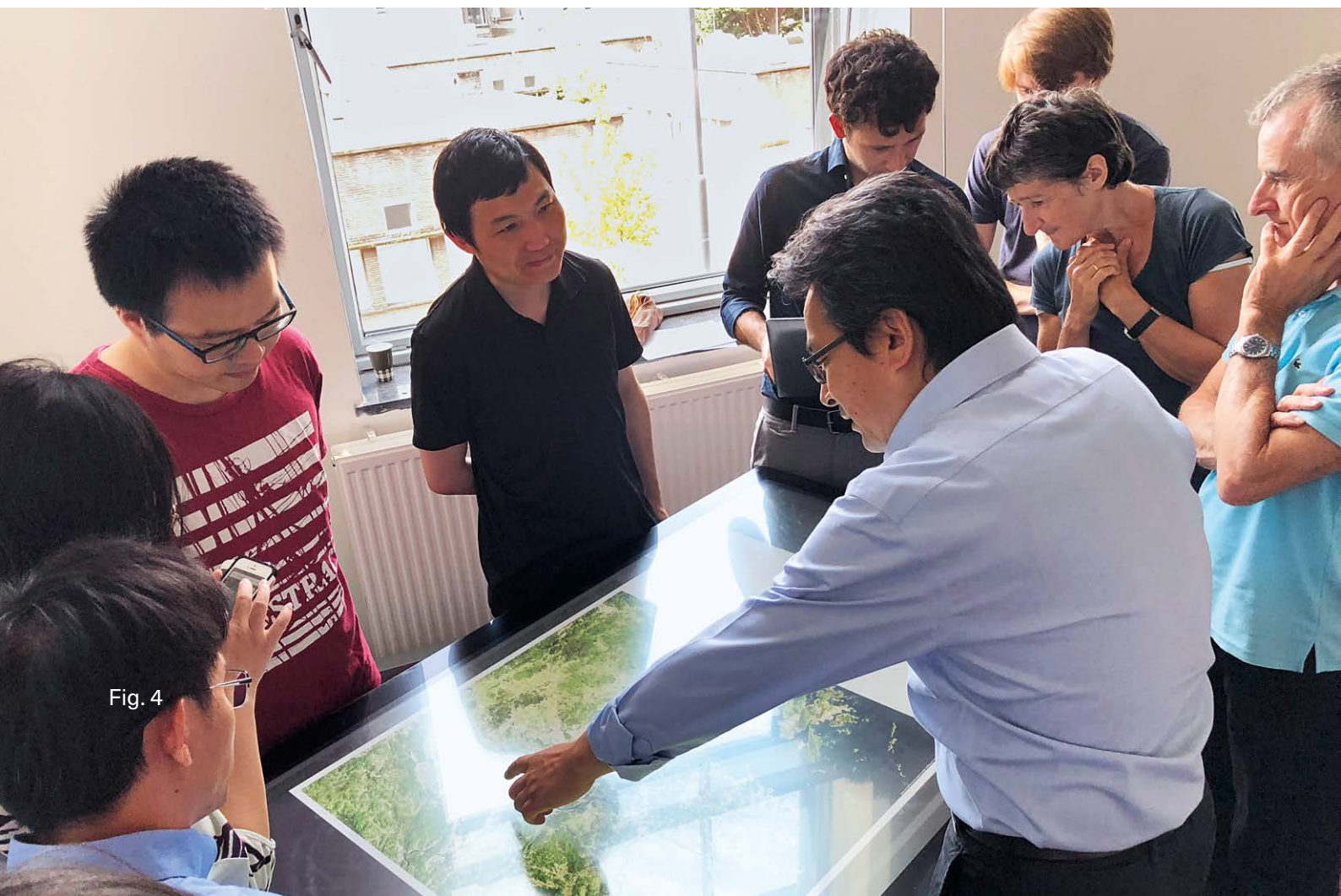


Fig. 4

businesses, experts, and the government play a central role. From this perspective, the design process becomes an essential vehicle for collaboration and the co-creation of knowledge and ideas (Fig. 5).

Landscape in layers

Decomposing the urban landscape into layers according to the dynamic of change is a proven method to increase the understanding of the urban landscape system.² An urban landscape can be viewed as a complex system comprising subsystems, each within its own dynamics and rate of change (Fig. 6). Layers with a low dynamic of change are the substratum (e.g., topography, hydrology, or soil) and climate (e.g., precipitation patterns, temperature, or wind). These environmental factors are considered the most influential conditions for land use, termed “first-tier conditions.” Infrastructural networks for transportation, water management, and energy supply form another layer, termed “second-tier conditions.” Displaying quicker growth and change than the first-tier environmental conditions, these are also significant conditional variables for land use.

Together, these first- and second-tier conditions pave the way for the development of agricultural land use and urban settlements, resulting in the layer with

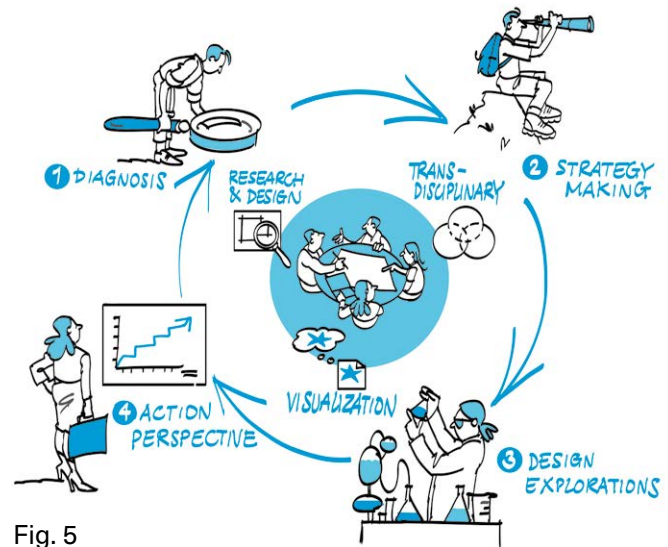


Fig. 5

the highest change and transformation dynamics. Thus, an understanding of urban landscapes is inherent to the concept of the layers and their relationships constituting the landscape system. The landscape is a relational structure connecting and influencing scales and spatial, ecological, functional, and social entities. As such, the landscape is not just a holistic system but also a scale continuum that we can only understand by looking at different spatial scales and their relationships.

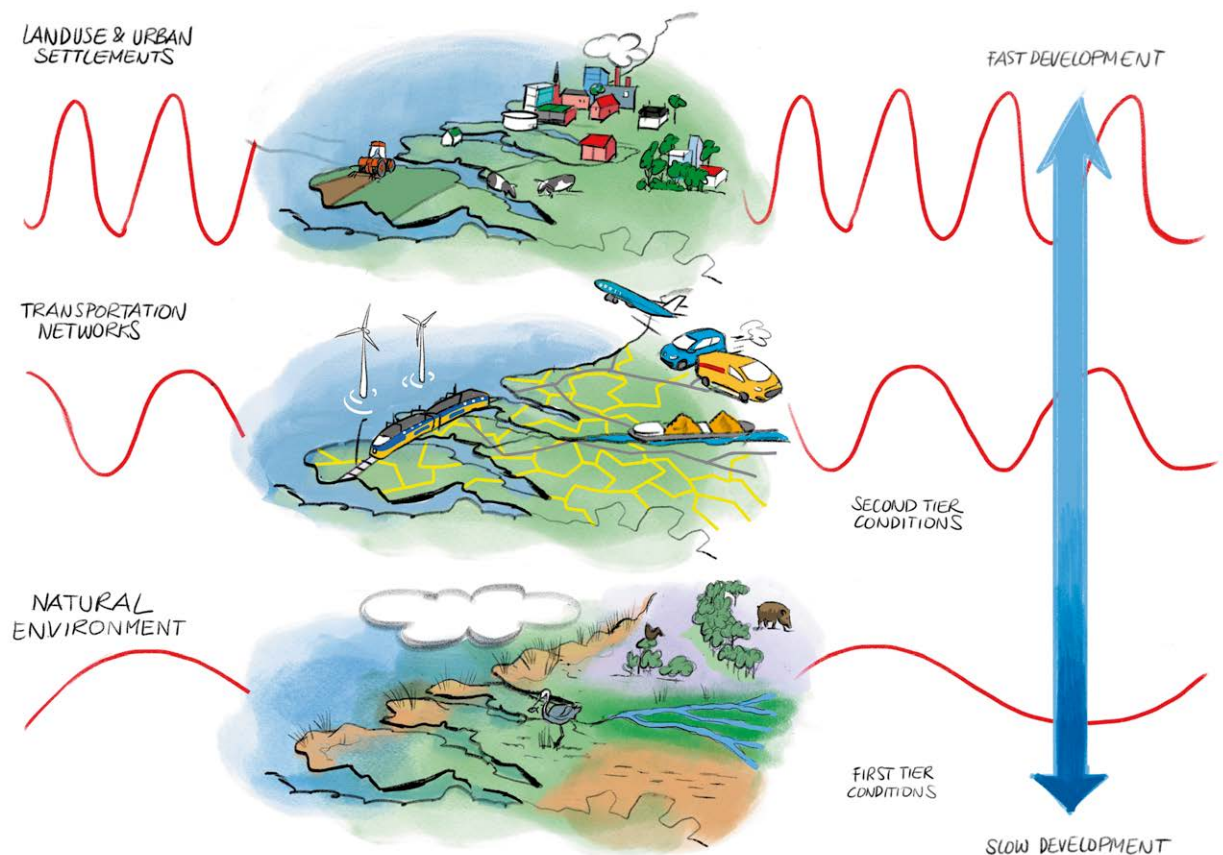


Fig. 6

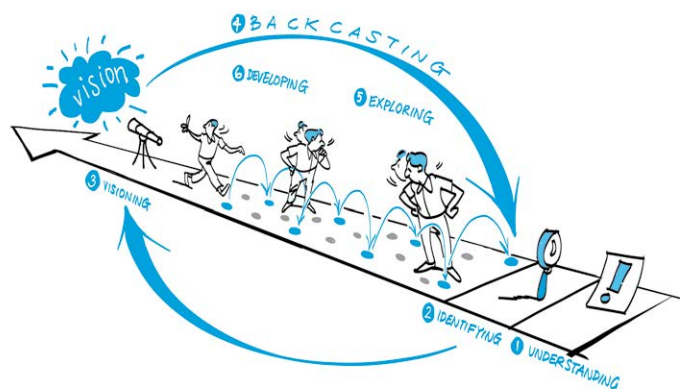


Fig. 7

Strategy formation

Once knowledge of natural and urban systems has evolved into a solid and shared understanding of their functioning alongside the challenges and opportunities they present, the process of strategy formation and design explorations can begin (Fig. 7). Strategy formation involves making plans that guide long-term actions into the future;³ one could say it is about outlining a path to get from “here” to “there.” These outlines are typically broad, allowing details to emerge alongside them while providing flexibility. In this regard, strategy formation is a planning procedure to help guide design explorations and make plans accordingly.

Strategy formation also entails creating a long-term regional vision or perspective that utilizes knowledge of natural and urban systems to address identified challenges and potentials.

In this process, a regional design is developed to envision a desirable future, expressing what the urban landscape could or should look like. However, this is not a blueprint for the future. Instead, it provides strength and direction in spatial terms and gives meaning to what stakeholders want to achieve together, fostering a sense of focus and belonging when a vision is shared.

In the regional design process, scenario studies can be employed to better understand uncertainties related to spatial development. Scenario studies combine realism, prediction, and imagination to identify robust developments and “no regret measures.”⁴ In scenario studies, the emphasis is not so much on differences (expressing uncertainty) but on commonalities (most likely to occur); e.g., the structures, locations, and developments that appear in every scenario. Based on this understanding, the long-term regional vision is typically shaped and spatialized by developing adaptive

regional design models, such as spatial arrangements that express the desired structure of an area.

Backcasting and adaptive design principles

Having established the long-term regional vision in the form of a regional design, the next question concerns what must be carried out today to achieve this vision and how to adapt to changing circumstances along the way. This question can be answered through a process of backwards reasoning, typically known as “backcasting,” a method seeking to discover how a desirable future can be attained. This involves working backwards from the vision to the present, determining practical actions and considering what is realistic while charting the best possible approach in the right direction.⁵ Adaptive design principles are a powerful means of guiding short-term actions and identifying solutions for actual problems. A “design principle” refers to a basic idea or rule that explains or controls how something occurs or works and can be identified by studying relevant cases. “Principles” represent generalized design knowledge detached from a specific context but applies to others.⁶ Thus, design principles embody the essentials of particular proven design solutions in such a way that they can be applied and adapted to new contexts or changing circumstances while maintaining focus on the overall objective. In this way, adaptive design principles guide in substantiating the long-term vision in an open-ended process in which strategic projects and design explorations play a key role in achieving sustainable urban landscapes.

Design as knowledge production

Design aims towards inventions; i.e., finding spatial solutions and “making them possible.” As such, spatial design translates abstract strategic notions into physical structures and layouts addressing several scale levels—a synthesizing activity that concerns putting things together rather than taking them apart. It is about integration instead of reduction; the relations between things and not the things alone.⁷ In this respect, design explorations are used as a vehicle to make spatial problems visual, generate solutions, explore possibilities, and express cultural values through spatial form. Thus, design is regarded as a process or action geared towards exploring and producing.

In this process, knowledge from other disciplines, such as ecology, urban planning, cultural history, and water management is spatially translated and integrated. Designing, therefore, plays a role as a thinking-



Fig. 8

technical tool with which one thinks and acts in a structured way to generate ideas and explore possible solutions. This method is known as “research through design.”⁸ In this approach, goal-oriented searching is central to a process where thinking and producing go hand in hand while mechanisms of research and design are combined with imagination, creativity, and innovation. During this process, a conscious or unconscious synthesis occurs that precipitates into a visual form by drawing, mapping, or modeling with analog or digital media.

Design explorations

Research through design is an essential means to explore the possibilities of adaptive design principles and contextualize them, such as in “nature-based solutions,” “water-sensitive design,” “socially inclusive design,” or “design with heritage.” This requires a landscape-based regional design to operate at different scales—from regional to local—and to accommodate both general and more specific measures in rural and urban areas. In this process, the utilization of knowl-

edge of the physical, biological, and cultural aspects of the landscape is inevitable. Therefore, design explorations become a powerful research method with which complex spatial challenges can be approached integrally and creatively (Fig. 8). A structured design process is employed, revealing important aspects as tasks are further translated and concretized in spatial terms. Moreover, adaptive design principles formulated in the strategy formation phase are adjusted and applied locally. Through these design experiments, knowledge is acquired by studying the effects of actively and systematically varying design solutions in a specific context.

Spatial design helps to identify challenges and potentials of the urban landscape and to suggest possible solutions. This is achieved by making matters explicit with drawings and sketching the context in which they can be fully realized. In this sense, the design explorations can also help to identify how stakeholders think about future developments at different scales. By visualizing ideas and programs of requirements and positioning them within the space, one can identify possibilities and limitations while formulating questions requiring further investigation.



Fig. 9

Design results provide a context for conversations and observations about the importance of landscape structures and elements, facilitating discussion of any potential solutions and their spatial qualities. In landscape-based regional design, design explorations are used as a systematic search for possible solutions to a spatial problem. At the same time, the design exploration clarifies which landscape structures and elements should be preserved; for example, from an ecological or cultural-historical point of view.

Pilot projects as an action perspective

The identification of strategic pilot projects is crucial to fully realize the ambitions as formulated and mapped in long-term regional design. A pilot project is an initial and relatively small-scale implementation to prove the viability of the approach, principle, or idea, taking the form of a construction project, urban or landscape development project, or research project. The regional design usually entails many potential projects varying in scale and focus; however, these must translate ambitions into reality. Pilot projects can be based on local

Fig. 1 & 2
The landscape as an urban-rural continuum.

Fig. 3
Landscape as the basis for social and economic development.

Fig. 4
Co-creation of knowledge and ideas for the development of a region using a digital map table.

Fig. 5
Landscape-based regional design as a co-creative process for generating knowledge and ideas. The practical design process entails four key phases: (1) diagnosis, (2) strategy making, (3) design explorations, and (4) defining an action perspective. This process is supported by a combination of research and design, meaningful stakeholder involvement, and imagination.

Fig. 6
Landscape in layers based on the dynamic of change.

Fig. 7
The process of strategy formation and design explorations while utilizing knowledge of the natural and urban landscape, developing a vision, backcasting, and identifying adaptive design principles.

Fig. 8
Research through design to explore possible and desirable spatial developments for a future-proof urban region.

Fig. 9
Visualization of a pilot project that shows the potential of a landscape-based approach focused on design with nature, people, and history.

“bottom-up” initiatives, typically building on existing initiatives and networks. For example, these could be a neighborhood park, community gardens, housing project, or “top-down” projects that transcend locality and require regional coordination, such as river regeneration projects and “green-blue” infrastructure.

What the pilot projects have in common is that they contribute to realizing a long-term perspective through short-term actions and implementation. The purpose is to think together, contextualize the adaptive design principles through design, and implement the ideas in practice. Through the pilot project, designers, policymakers, citizens, academics, and industry are united in a “living lab” to experiment, co-create, and test concepts in a real-life environment delimited by geographical and institutional boundaries.⁹ Experimenting together responsibly while monitoring and learning from mistakes creates an informal space in which innovation is key while everyone is equal.¹⁰ This fits well with the social and political conditions needed to arrive at solutions on a policy and practical level. Pilot projects assume strategic value when they contribute to the realization of larger ambitions both in tangible and intangible ways, most notably when they build alliances of stakeholders, develop governance models that guide and facilitate implementation, and leverage innovative business models vital for gaining a realistic perspective on action (Fig. 9).

Landscape as the basis for sustainable urban development

In the above article, a regional design approach is presented that takes the landscape as the basis for sustainable urban development. At a time of complex challenges, the development of approaches such as this offers a pathway to realizing socio-ecological inclusive design processes and modes for collaboration among disciplines and stakeholders. As an inclusive design approach, landscape-based regional design establishes relationships between ecological and cultural factors, process and form, long-term and short-term developments, and regional strategies and local interventions. As such, landscape-based regional design is a powerful vehicle for guiding territorial transformations, creating local identity, and safeguarding regional relationships while simultaneously linking ecological and social processes to the development of urban form. Landscape-based regional design brings new operational power to spatial design as an integrative, creative activity and recognizes the regional rural-urban continuum as a significant field of inquiry that is context-driven, solution-focused, and transdisciplinary.

The text is based on material from: Nijhuis, 2022.¹¹ For an application of the approach in the Greater Bay Area in China see: Nijhuis et al., 2023.¹²

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Fig. 1

Imprint

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