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Chapter 11
Landscape-Based Urbanism: Cultivating Urban Landscapes Through Design

Steffen Nijhuis

Abstract Sustainable urbanisation requires planning and design strategies and principles that take the (natural) landscape as the basis for working with natural processes for the benefit of socially and ecologically inclusive and thriving urban landscapes. Such an approach takes the landscape first and considers the biosphere the context for social and economic development. In this chapter, the concept of landscape-based urbanism is introduced, taking the physical landscape structure, and associated natural processes as a foundation to generate favourable conditions for future development and to guide and shape spatial transformation. Therefore, this approach offers a multiscale and integrative model for urban development and transformation, the preservation of biodiversity, water resource management, improved leisure facilities, community building, stronger cultural identity and economic development while taking the landscape as the basis. Landscape-based urbanism identifies and guides urban development towards the most advantageous places, functions, scales and inter-relationships through the development of robust landscape structures. Design explorations utilise knowledge of the natural and social context and are used as a systematic search for possible solutions to a spatial problem. At the same time, the design explorations make clear which landscape structures and elements, for example from an ecological or cultural-historical point of view, should be preserved.

Keywords Landscape approach · Adaptive planning and design · Landscape-based regional design · Nature-based solutions · Sustainable urban planning · Ecological design

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11.1 Introduction

Guiding spatial developments in the urban landscape is just like gardening: if you do nothing, the garden will be overgrown and pests and bugs will take over, ending in chaos and decay. On the other hand, the gardener cannot, or should not, completely control everything because it leaves no space for spontaneous development and makes the garden vulnerable to unforeseen circumstances. Gardening is about cultivating the grounds, setting up conditions in such as a way that it will thrive. In this cultivation process the gardener allows dynamic processes to take place to provide sufficient diversity and resilience for renewal. At the same time, it provides sufficient structure to function in a coherent, fruitful way and bring aesthetic pleasure. This chapter does not deal with gardening literally. Here, gardening is used as a metaphor to cultivate the urban landscape throughout the scales, in such a way that it will flourish (Fig. 11.1). Such 'gardening' is all about creating the spatial conditions for ecological, social, and economic development. It provides ways to deal with uncertainty, finding ways to safeguard resources and cope with vulnerabilities. It is about creating strong, adaptive structures, while allowing flexibility, dynamic and change. This requires envisioning – putting a dot on the horizon as a long-term perspective–guiding short-term projects in the here and now.

Especially in times of immense societal challenges related to climate change, biodiversity loss, water management and urbanisation, spatial strategies and design

Fig. 11.1 Cultivating the garden in such a way that it will thrive. Woodcut of a gardener, c. 1550, Germany. (Image: The Granger Collection / Alamy Stock Photo)

solutions that strengthen resilience assist systems in coping with vulnerabilities and enhance their capacity to face natural and human-made threats. This suggests more innovative and integral forms of planning and design that lead to more sustainable and liveable urban landscapes. In this chapter, landscape-based urbanism is put forward as a multi-scale planning and design approach for developing resiliency and adaptive capacity by creating flexible, strong socially and ecologically inclusive landscape structures, connecting long-term perspectives with short-term interventions using research through design as wayfinding in a transdisciplinary process.

The first section addresses the importance of landscape as the basis for spatial development. Next, the development of landscape-based approaches is briefly outlined to arrive at landscape-based urbanism as an interdisciplinary regional design approach that takes the landscape first. The chapter subsequently elaborates how this approach translates into understanding the landscape as a living system and how this knowledge is employed for strategy formation and design explorations.

11.2 Landscape First

The natural landscape is essential for human existence and a good quality of life (IPBES 2019). The natural landscape contains a wide variety of ecosystems and is the prerequisite of biodiversity – the diversity within species, between species and of ecosystems. It also provides vital contributions to human existence and human well-being providing food, fresh water and ecosystem services and goods (Alcamo et al. 2003; Kumar et al. 2010). One could say the natural landscape provides the main conditions for human existence. Landscape, however, refers to an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors (Zonneveld 1995; Council of Europe 2000). This definition stresses the interaction of humans with their environment and merges the concepts of nature and culture – landscape is in that sense a cultural construct. In that context, it is interesting to note that bio-reserves like the Amazon (South America), the Białowieża Forest (Poland and Belarus), the Prairies of California (United States), or the t'Ename Forest (Belgium), because of their high biodiversity, are often referred to as pristine examples of nature or 'wilderness', but are as much cultural landscapes and the product of a symbiosis between people and their natural environment (e.g. Mann 2006; Anderson 2005; Marris 2013; Tack et al. 2021). The point is that for centuries people have lived in balance with nature, creating cultural landscapes with enhanced habitat heterogeneity and developing circular production systems with a multitude of domestic and wild species (Berkes 2018; IPBES 2019) (Figs. 11.2 and 11.3). They learned that mismanaging nature and exhausting the land will lead to the destruction of vital resources. Environmental history points out that whole societies collapsed by damaging their environments. Deforestation and habitat deconstruction, soil problems (erosion, salinization, and soil fertility loss), water management problems, overhunting, overfishing, effects of introduced species, et cetera were the main reasons that, for instance, the prehistoric Polynesian

Fig. 11.2 The Mulberry-dike and fish-pond system near Huzhou (Zhejiang Province) and in the Pearl River Delta near Foshan (Guangdong Province) in South China is a more than 2500-year-old form of agri-aquaculture and includes cultivation of mulberry-dike trees, silk rearing, fish cultivation and is based on a very complex irrigation and drainage system. It is one of the most sustainable agricultural landscapes of the world: mulberry is planted on the dikes and is fertilized with nutrient rich mud and water from the pond, the leaves of the trees are forage for silkworms (silk production), the bark is used for paper and the silkworm excrement is food for the fish in the ponds (Ruddle and Zhong 1988). (Photo: Guo Wei, Beijing Forestry University)

culture on Easter Island, the formerly flourishing Native American Maya civilization, and the medieval Viking colony on Greenland disappeared (Diamond 2005).

However, other societies around the globe also show that people understood the logic of the natural landscape and persisted. By trial and error, a wide diversity of developed practices actively and positively contributed to wild and domestic diversity and landscapes through accompanying natural processes with anthropocentric assets (e.g. knowledge, practices and technology). Indigenous people applied principles and indicators, such as health of the land, caring for the land and reciprocal responsibility, ultimately leading to rich synergies of natural-cultural qualities (Berkes 2018; IPBES 2019). This traditional ecological knowledge is a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, concerning the relationships of living beings (incl. humans) with one another and with their environment (Berkes 2018). Traditional ecological knowledge is a rich source of land-use (or 'gardening') practices that enhance biodiversity and proves that people can be agents of landscape renewal processes that allow for both cultural and biological diversity to flourish. Historical urban landscapes also showcase a sensitivity towards the natural context, particularly to water (e.g. Cronon 1991; Tvedt and Oestigaard 2014). Most cities of today are surrounded by a (engineered) waterscape that is still mirroring, though to different degrees, the character of how hydrological cycles manifest

Fig. 11.3 Wildflower super bloom on the Carrizo Plains of south-eastern San Luis Obispo County, California (US). Over thousands of years, California native people took care of this land and played a major role in the maintenance and enhancement of biological diversity and landscape heterogeneity by employing resource management techniques such as burning, irrigating, pruning, and coppicing, weeding and sowing seeds of wildflowers and grass (Anderson 2005). (Photo: Duncan Selby / Alamy Stock Photo)

themselves locally in the landscape (Tvedt 2016). Spatial differences in precipitation and evaporation patterns fundamentally define the character of cities and the sense of place.

In present times, often referred to as the Anthropocene (Crutzen 2006), people have a substantial negative impact on the planet. Surrounded by the built environment – and a static, mechanical, disembodied view of the world formulated by Descartes, Newton and other thinkers of Age of Enlightenment which has dominated our thinking – it has become difficult for people to relate to the environment (Berkes 2018). This alienation from nature has contributed to the environmental problems of the contemporary world. Under the pretext of technological and scientific advances, people alter and exhaust the natural landscape to an unparalleled degree across all spatial scales. This results in serious negative impacts on climate change and the decline of biodiversity at a rate faster than at any time in human history (IPPC 2013; IBPES 2019). Moreover, if no attention is paid to the landscape's carrying capacity, the risk of damage and capital destruction will increase dramatically (Planbureau voor de Leefomgeving 2021). Therefore, in 2015, the 2030 Agenda for Sustainable Development was launched which provides a globally shared blueprint for sustainable development articulated in seventeen Sustainable Development Goals (SDGs) (UN 2015). These SDGs acknowledge that ending
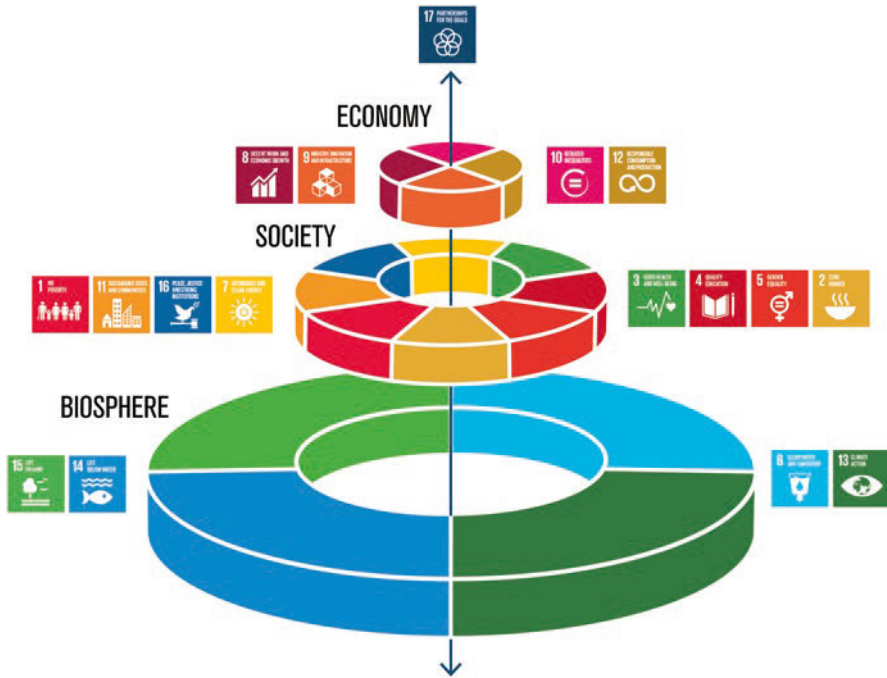
Fig. 11.4 Landscape as context for social and economic development. (Source: Stockholm Resiliency Centre)

poverty and other deprivations must go hand in hand with strategies for the development of sustainable cities and communities, for improving health and education, reducing inequality and spurring economic growth – all while tackling climate change and working to preserve our oceans and forests (UN 2015). To put these SDGs to work in the realm of sustainable urban development, it is necessary to develop and apply planning and design strategies and principles that take the (natural) landscape as the basis to work with natural processes for the benefit of socially and ecologically inclusive and thriving urban landscapes. Such an approach takes the *landscape first* (cf. LAF 2017; Roggema 2020a, 2021) and considers the biosphere the context for social and economic development (Fig. 11.4).

11.3 Towards a Landscape-Based Approach to Urbanism

Urbanism is an interdisciplinary field that combines knowledge from landscape architecture, urban planning, and design for future-oriented action on and thinking about the development of urban landscapes, responding to the needs of society by mobilising its knowledge and skills towards the creation of more sustainable living environments (Nijhuis et al. 2017). Even though sustainability is at the core, the landscape is still often not taken as the basis for future spatial developments. This is

hard to understand because the landscape is the carrier of a multitude of values and services. It is the basis for spatial-aesthetic values like beauty and orientation in space and time. The landscape offers structure, ecological coherence, and variation simultaneously, but it is also flexible and multifunctional. The landscape as natural infrastructure saves billions of dollars a year in response to the climate crisis and is about 50% cheaper than standard infrastructure (IISD and UN-IDO 2021). For example, natural landscape infrastructure helps to reduce the energy demand and can be utilised for energy production; it is a critical factor for water retention and fresh water supply; and it provides a powerful means for flood protection and coastal safety from the perspective of climate resiliency. Next to this more functional benefit, the landscape as natural infrastructure provides many additional values and services. According to the Millennium Ecosystem Assessment (MEA) (Alcamo et al. 2003; MEA 2005), the natural landscape contains and provides for many (ecosystem) services. Supporting services such as soil formation, nutrient cycling, and spatial structure, but also cultural services, such as spiritual, aesthetic, mental and physical health. It also, in terms of provisioning, supplies food, fresh water and wood – it further regulates water cycles, (micro) climate, floods, air quality, temperature, etcetera. Human well-being relies critically on these services provided by nature and landscape (Alcamo et al. 2003), which play a crucial and valuable role in biodiversity, human health, nutrition, habitation and in the health and functioning of our economies (Kumar et al. 2010). In a landscape-based approach, the basic principle is thus to recognise these valuable services in design, planning and decision-making and to take care and use the natural structures and processes that carry out work or offer protection in their natural form.

In the past decades there have been serious attempts to raise awareness of the value of nature and landscape in urbanism. Seminal works include 'Design with Nature' (McHarg 1969), 'The Granite Garden' (Spirn 1984) and 'City Form and Natural Process' (Hough 1984). These publications stress the importance of understanding the natural setting of cities – water, geology, plants and animal life – as a prerequisite to create better, more liveable urban environments. Based on this notion, a wide range of concepts and approaches to shape the relationship between humans and the natural environment have been developed. Examples include: 'Biophilia' (Wilson 1986), 'Eco-cities' (Register 1987), 'Green Urbanism' (Beatley 2000), 'Landscape Urbanism' (Waldheim 2002), and 'Nature Driven Urbanism' (Roggema 2020b). The concepts and approaches as outlined in these publications provide powerful pointers to use nature and landscape as the main driver and shaping force in urbanism.

To make the concepts and approaches for landscape inclusive urbanism operational, an area-specific spatial strategy is needed that takes understanding of the landscape and its social-ecological processes as the basis for spatial development. This requires *thinking big* in terms of scale – from region to locality – and ideas – bold plans that take the landscape as the basis for any development. This can only be done by employing a *design perspective* that *utilises knowledge* of the natural and urban systems to shape a vision and make it tangible through design explorations augmented with *enabling geo-information technologies*, such as Geographic Information Systems (GIS). *Crossing disciplinary boundaries* by collaboration and

co-creation in transdisciplinary ways is also needed to think together to come up with integral solutions and to implement ideas.

Landscape-based regional design is such a future-oriented strategy that aims to enhance spatial development by applying bioregional planning and design principles that view the urban landscape as a social-ecological inclusive, dynamic, and complex system (Nijhuis 2019). Such a landscape approach builds on ideas developed and implemented by Charles Eliot (1893), Warren Manning (1913), Pieter Verhagen et al. (1920), Patrick Abercrombie et al. (1922), Fritz Schumacher (1923), Ian McHarg et al. (1962) (Fig. 11.5), Vrijlandt and Kerkstra (1976) and Philip Lewis (1996). Most of these urban planners and landscape architects advocated a 'vertical approach' in which the variation in the elevation, soil and water system is considered when siting and designing changes and adding new functions. Jan Bijhouwer (1898–1974), the first professor of landscape architecture in the Netherlands was also an important pioneer of this approach, partly due to his expertise in plant
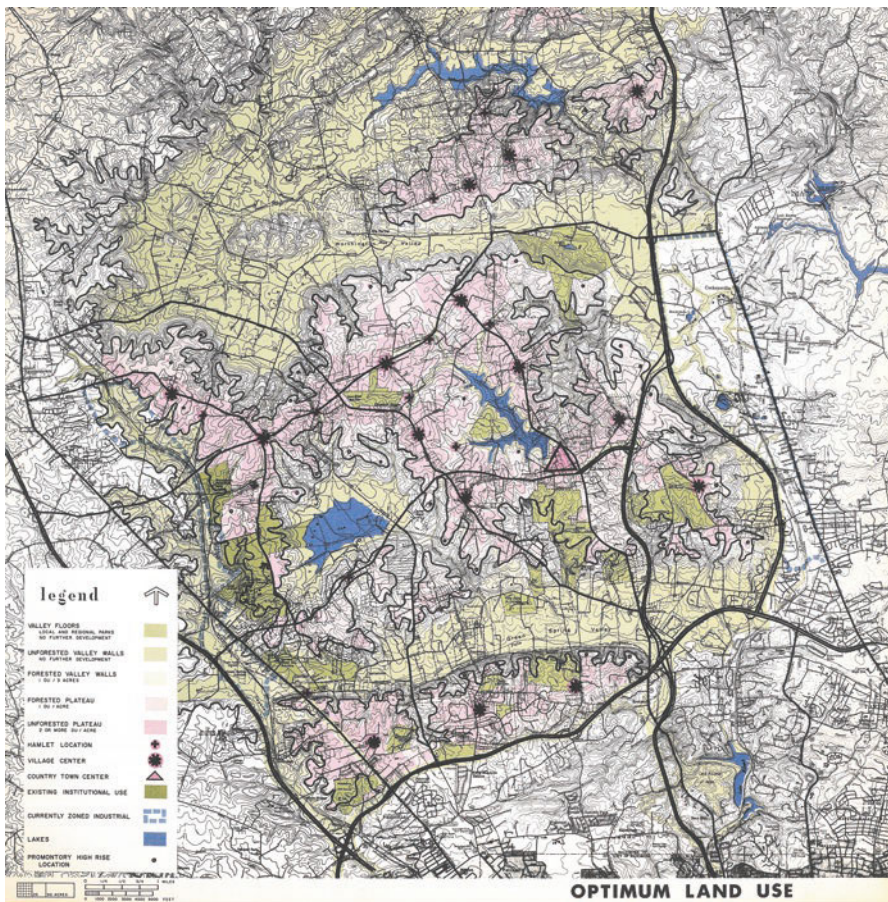

Fig. 11.5 Plan for the Valleys, an early example of landscape-based regional design (McHarg et al. 1962)
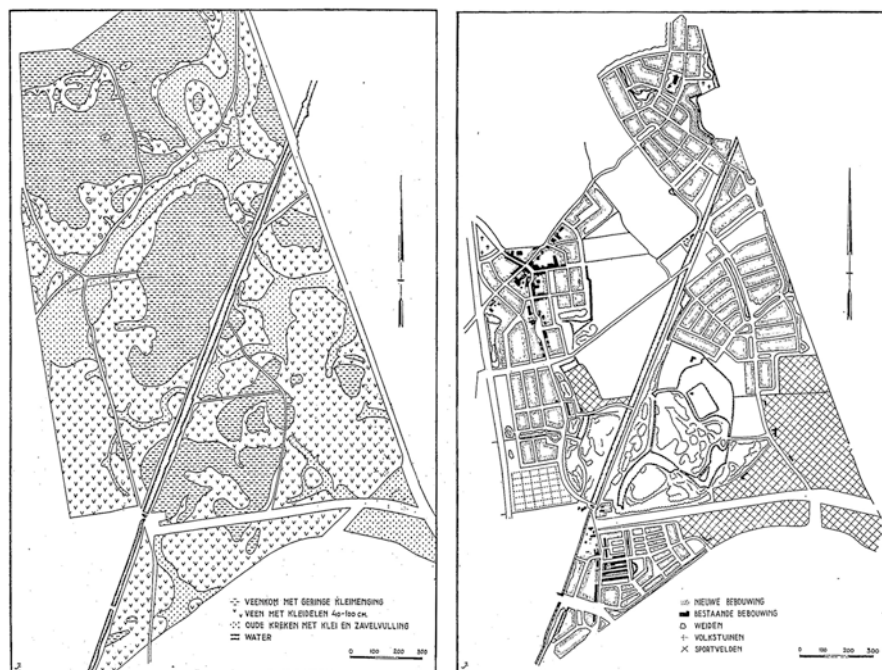
Fig. 11.6 Soil map (left) and urban and landscape design (right) for Kethel and surroundings. (Bijhouwer 1947)

geography focusing on the natural distribution of plants in relation to the soil (Bijhouwer 1926). In 1947, he commissioned a soil survey which he used as the basis for the design of a new town, called Kethel (near Rotterdam, the Netherlands), with surrounding parks and recreation facilities (Bijhouwer 1947) (Fig. 11.6). The possibilities of the soil and hydrology are reflected in the design. He also observed that the variation and recognisability of the landscapes as we perceive them is largely a reflection of the variation in the physical substrate (Bijhouwer 1971). It is urgent to follow this landscape logic again in new spatial developments related to urban development, climate, nature, water management and agriculture. The natural sub-soil sets conditions for the use of space, and this follows the structure of elevation, soil, and water, instead of the other way around. The natural landscape offers opportunities and constraints to human use and consequently should inform human interventions and modifications.

11.4 Landscape-Based Urbanism

Landscape-based urbanism is a form of regional design that applies principles from landscape architecture, urban design and planning, landscape ecology and geography to spatially oriented research, design, and planning. It also utilises knowledge

from systems thinking and complexity theory to promote a more comprehensive regional planning and design form that addresses the complex web of relationships making up the urban landscape (Nijhuis and Jauslin 2015). In landscape-based urbanism, the physical landscape structure and associated natural processes are taken as a foundation to generate favourable conditions for future development and to guide and shape spatial transformations. Therefore, this approach offers a model for urban development and transformation, the preservation of biodiversity, water resource management, improved leisure facilities, community building, stronger cultural identity, and economic development (cf. Neuman 2000) while taking the landscape as the basis.

Landscape-based urbanism identifies and guides urban development towards the most advantageous places, functions, scales, and inter-relationships through the development of robust landscape structures. These resilient and adaptive spatial frameworks ensure the coherent development of the region (long-term strategy) and, at the same time, create conditions and flexibility for local projects (short-term intervention). Research through design is an essential means to explore the possibilities of and contextualise adaptive design principles, such as nature-based solutions, water sensitive design, social-ecological inclusive design, or design with heritage. This implies landscape-based urbanism operates at different scales, from regional to local, and accommodating both general or more specific measures. In this process, the utilisation of knowledge of physical, biological, and cultural aspects of the landscape is inevitable. Enabling digital technologies, such as Geographic Information Systems (GIS), is a powerful tool in landscape-based urbanism for pre-processing, modelling, analysing, and representing data to gain new insights and augment the design process with tremendous calculating and visualisation capacities.

Balancing the relationship between experts, citizens and authorities is also necessary to make landscape-based urbanism work. This calls for a process that is not limited to the domain of landscape architects but that also actively involves other knowledge domains, such as urban planners and designers, data scientists, environmental technology, and urban studies. It also affects people, administrators, the business community, and other stakeholders. The idea is that through meaningful participation of all stakeholders in envisioning, design and policy decisions, the resilience and adaptive capacity of urban landscapes will be increased, not only in physical terms but certainly also in socio-economic terms (Ahern 2011). Resilience is defined as the ability of a system to respond to change or disruption without altering its primary state (Walker and Salt 2006). Adaptive capacity is the degree to which certain uses, processes or structures can be adapted to changing conditions brought about by, for example, social, economic, or ecological processes. Adaptations as such may be spontaneous or planned and may be carried out in response or anticipation of such changes (Folke 2016). This implies a shared understanding of how the landscape system functions. But it also indicates a future-oriented, proactive approach in which the interaction between citizens, businesses, experts and the government is central.
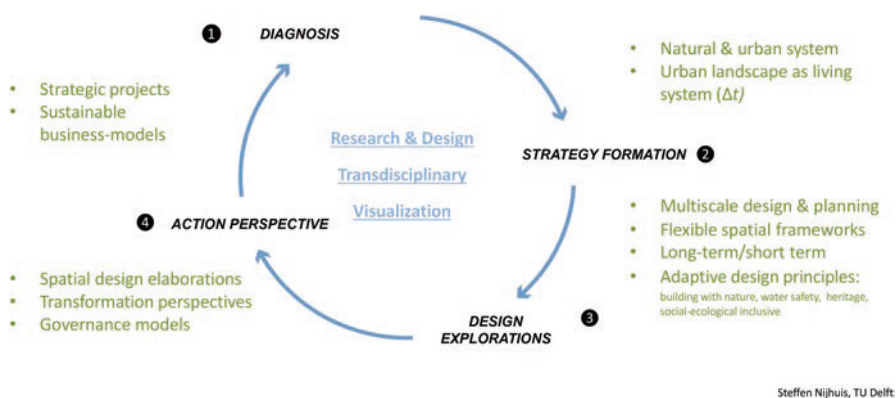
Fig. 11.7 Landscape-based urbanism as a process. Practically the design process entails four key phases: (1) diagnosis, (2) strategy making, (3) design explorations and (4) action perspective. This process is supported by a combination of research and design, meaningful stakeholder involvement and imagination (Steffen Nijhuis, TU Delft)

In landscape-based urbanism, content is thus linked to a process of promoting social-ecological inclusiveness, diversity, and flexibility (Fig. 11.7). Through landscape-based urbanism, we can create conditions, as it were, for change and guide transformations through the development of robust landscape structures that connect spatial scales while at the same time offering space for individual interpretation at the local level. Spatial quality is the leading factor in finding a new balance between experience, use and future values. In addition, multi-functionality, accessibility, heritage and biodiversity are some of the ecological, economic, social and cultural interests that need to be addressed. In this way, specialised knowledge and local expertise can contribute to an integrated approach of sectoral activities and lead to coordinated, sustainable results that benefit everyone.

To summarise, landscape-based urbanism:

– Takes the regional landscape structure and associated processes as the foundation to guide and shape spatial developments and transformation;
– Learns from landscape history and vernacular practice and makes use of the accumulation of indigenous and local knowledge (or traditional ecological knowledge);
– Employs knowledge-based spatial design as an integrative, multi-scale and transdisciplinary approach and exploits the power of enabling digital technologies;
– Develops resilient and adaptive spatial frameworks: robust landscape structures for the coherent development of the region (long-term strategy) and at the same time setting the scene for local projects (short-term intervention);
– Creates and regenerates living systems in which (bio)diversity, cultural history, and multi-functionality lead to sociologically and ecologically inclusive and water sensitive urban landscapes.

11.5   Understanding the Landscape as a Living System

Understanding the landscape is the foundation for landscape-based urbanism. But how to understand the landscape? As mentioned earlier, the landscape is the result of the action and interaction of natural and/or human factors. The landscape is therefore a physical and social construct that changes constantly by natural and human forces. Sometimes the changes are far-reaching, sometimes less so. Some changes, such as the consequences of geological processes or climate change, take a long time to become visible. But change can also occur swiftly, as when a new housing development is built in a former agricultural area, or ecological succession transforms an open field into a forest. Therefore, landscape can be conceived as a living system, which is to say a complex and dynamic network of subsystems that are constantly changing in response to natural processes, social demands, and technical possibilities. As such, the landscape is an interface between nature and society which manifests itself in a material space made up of both structures and processes.

To understand the coherence and heterogeneity of landscape in space and time, it is important to study the chorological (horizontal) and topological (vertical) relationships (Zonneveld 1995; Antrop and van Eetvelde 2019). A practical and widely used method entails analysing the landscape in layers and organising them according to the level of influence and dynamics of change (Braudel 1966).

11.5.1   Layers Approach

Unpacking the landscape in layers is a way of grasping the different systems and subsystems and their relationships (based on Nijhuis 2020). This dissection into layers should not be seen as a static or hierarchical arrangement. Rather, it is about discrete layers that influence one another to a greater or lesser degree, and that influence may also change over time. There are many types of layer-based analysis, such as the triplex model in which a distinction is drawn between the abiotic (relief, water, soil), biotic (flora and fauna) and anthropogenic (human activity) layers (Vrijlandt and Kerkstra 1976). Another well-known layer model divides the landscape into substratum, networks, and urbanization (De Hoog et al. 1988). Although useful in their application, neither model explicitly addresses the social and cultural aspects. Alternative layer-based approaches stress that the concept of the relation between the physical environment (hardware), human activity (software) and cultural, institutional, and conceptual ideas (orgware) is essential to understanding the landscape and its genesis (Braudel 1966; Dobrov 1979; Tvedt and Oestigaard 2014). In this perspective, the following layer-based analysis seeks to understand the landscape as a dynamic interaction between human beings and nature (Nijhuis 2020).

- *The natural context (layer 1):* The natural context is made up of relief, water, soil, geological substructure, and climate, together with the corresponding ecosystems. This layer should be seen as an exogenic, physical factor, with specific features that are also subject to change, such as geological and geomorphological

processes like plate tectonics, erosion and sedimentation by wind and water. Natural succession, as when open grassland turns into a forest or into a semi-open park landscape because of natural grazing, is a concrete example of this process. The natural context should not be regarded as a discrete factor, but as a central and inextricable component of the system that in large part determines how the landscape can be used. The dynamics of this basic condition are characterized by a slow, often almost imperceptible process of change, repetition, and natural cycles (Figs. 11.8 and 11.9).

Fig. 11.8 Fragment of a tracing of the natural landscape around Versailles (France) in which relations between topography, hydrology and geology are studied. Note the black cross in the lower right corner, which is the Grand Canal of Versailles Palace (Source: Mazas and Freytet 1992)

Fig. 11.9 Vegetation map of Southern Florida, 1943. Vegetation maps are critical for understanding biodiversity patterns through space and time as an expression of the interaction between biotic and abiotic factors (Image courtesy: The University of Florida, George A. Smathers Libraries)

- *Human modifications and interventions (layer 2):* Human activity is part and parcel of the use of the natural context for living, working and recreation. Human beings appropriate the natural environment through activities such as road building, land reclamation, diking and canalization of watercourses, the construction of towns and villages, drainage, and irrigation, which manifest as, among other things, different subdivision patterns and water infrastructure. Throughout history, that appropriation process has led to a succession of sometimes drastic changes in the landscape. The dynamics of this layer are related in the long term to social, economic, and cultural history.

- *Culture, organisation, and politics (layer 3):* This layer comprises the cultural, spiritual, and religious conceptions of the natural context and our engagement with it, including the state of science and technology, organisational forms, political movements, design concepts and aesthetic ideals. Water, for example, has different meanings in different cultures, which can find expression in landscape architectural treatments in parks and gardens. The reclamation of the peatlands in the western Netherlands, for example, was in part motivated by geopolitical and economic considerations. Another example is land reclamation for food production, housing, recreation, and nature development in the IJsselmeer area. The dynamics of this layer relate to the relative short term, linked to people and politics.

The landscape is thus a relational structure that connects and influences 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.

11.5.2   Landscape as Long-term Structure

Key to the landscape as living system is the notion of the *longue durée*, the landscape as a long-term structure that changes over time in the process of 'sequent occupance' (Sauer 1925; Whittlesey 1929). Time is thus an essential factor in understanding landscapes. Over time landscape underwent transformations resulting from selections based on possibilities and evaluation. Some structures, patterns and forms were preserved; others continue to develop or are replaced by new ones, resulting in a rich historical and typological variation (Bobic 1990). Spatial transformation or series of transformations usually balance more permanent landscape structures and others more prone to rapid change. The more permanent ones tend to be resistant to change and, over time, become more robust (and even inert). Those asynchronous transformations turn the landscape into a layered whole in which physical traces of time can reinforce or contradict one another. These phases provide a window on a range of chronologies, events and meanings that connect the traditional and the contemporary, the tangible and the intangible. In that respect, the landscape is so rich in meaning that it can be 'read' as a biography, as a palimpsest

that illustrates the key activities that have contributed to the formation of that land-scape (Samuels 1979; Corboz 1983). Knowledge of these historical traces is one of the starting points for new transformations of the landscape: the addition of new 'layers'. The evolution of the landscape is inherent in the 'erasure' and the 'writing' of history. As we see it now, the landscape results from a gradual process of selection in which some elements remain and others change or are replaced.

By analysing the stratification of the urban landscape and its development over time on several scale levels and relating them to each other, it becomes clear which landscape structure – and the related landscape patterns and elements – determine the character of the landscape. The landscape structure is the physical basis formed by the coherent, supporting parts, without which the landscape cannot function (Vroom 2010).

Maps and mapping play a decisive role in studying landscapes and their development over time (Nijhuis and Pouderoijen 2014). They are used as a means to identify the landscape structures, patterns and the related natural and cultural processes – but also to understand the related design challenges and opportunities. For example, an urban settlement entirely located in the lowlands requires a different design strategy than one that originated on higher grounds and partially extends into the lowlands. To determine these and other characteristics, visual representations like maps, but also sections and three-dimensional drawings, as well as infographics and scale models are natural tools for visual thinking and visual communication (Nijhuis 2013). Visual thinking is a way of generating information by creating, inspecting and interpreting a visualisation of the previously non-visible (seeing the unseen), while visual communication refers to the effective distribution of information in visual form (DiBiase 1990, cf. Zube et al. 1987). Maps as a product and the process of mapping are both important means for visual thinking and visual communication to understand landscapes. Maps help us to reflect upon emerging insights, appraise the landscape in its totality and observe the relationships between the parts and the whole (MacEachren 1995).

11.6 Strategy Formation and Design Explorations

Based on a proper shared understanding of how the natural and urban system functions, the challenges and potentials that need to be addressed the process of strategy formation and design explorations can start (Fig. 11.10). Strategy formation is about making plans that direct or guide courses of action on the long term into the future (Mintzberg 1994). One could say it is about outlining a path to get from here to there. Often, these outlines are broadly defined while details are allowed to emerge with them, providing flexibility. Strategy formation is in this regard a planning procedure to help guide design explorations and making plans (cf. Mintzberg 1994). Landscape and urban design devise courses of action aimed at changing existing situations into preferred ones (cf. Simon 1969). Design aims towards invention, that is, finding spatial solutions and 'making them possible'. Spatial design as such
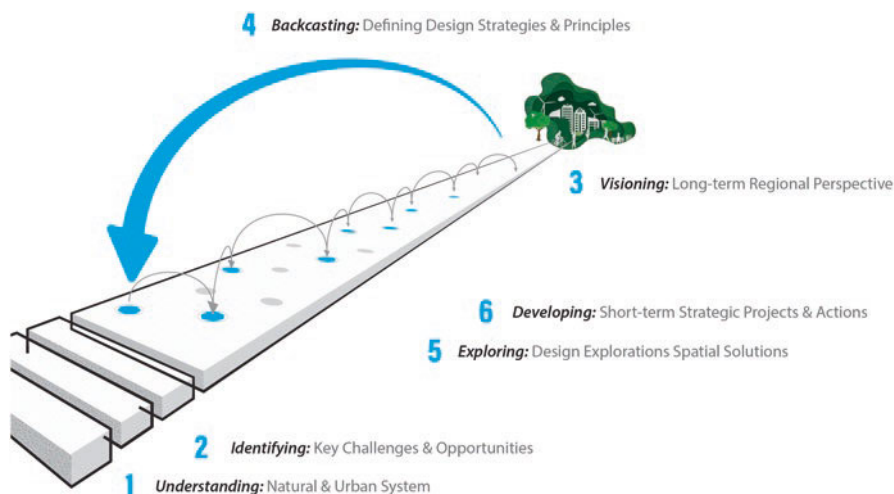
Fig. 11.10 The process of strategy formation and design explorations while utilising knowledge of the natural and urban landscape (Steffen Nijhuis, TU Delft)

translates abstract strategic notions into physical structures and lay-outs addressing several scale-levels. Spatial design is a synthesising activity and is about putting things together rather than taking them apart; integration rather than reduction; it is about relations between things and not the things alone (Meyer 1997; Sijmons 2012). In this respect, design explorations are used as a vehicle to make spatial problems visual, to generate solutions, explore possibilities and to express cultural values by means of spatial form. But how do strategizing and design explorations relate to each other?

11.6.1 Envisioning, Design Models, Backcasting, Adaptive Design Principles

Strategy formation in landscape-based urbanism entails creating a long-term regional vision or perspective that utilises knowledge of the natural and urban systems to address the identified challenges and potentials. Usually, a regional design is used to envision a desirable future expressing what the urban landscape should or can look like. The regional design provides strength and direction and gives meaning to what stakeholders want to achieve together. It provides a sense of focus and belonging when a vision is shared. Long-term perspectives also should address ways to deal with uncertainty, as we cannot gaze into a crystal ball to see the future. A common way to get a grip on uncertainty in spatial planning and design is scenario study (Veeneklaas and van den Berg 1994; Schoonenboom 1994; Lindgren and Bandhold 2009). Scenario study combines realism, prediction and imagination

to identify robust developments and the 'no regret measures' (Dammers et al. 2013). So, in scenario study the emphasis is not so much on the differences (expressing the uncertainty), but on the commonalities (most likely to happen); the structures, locations and developments that pop up in every scenario.

Based on this understanding, the long-term regional vision can be shaped and spatialized by employing certain adaptive regional design models. A regional design model is a conceptual spatial scheme or plan by which a vision or objective is converted into a spatial arrangement that expresses the desired spatial structure of an area. The design model is an expression of a mental construct that is legible and open to interpretation. In the practice of landscape-based urbanism, three types of adaptive regional design models can be recognised that aim to guide spatial developments throughout the scales: area, framework, and corridor models (Nijhuis 2019) (Fig. 11.11).

– Area design models provide for a landscape mosaic in which zones for long-term, sustainable conditions for 'low dynamic functions' (network) are created as well as expanses of land in which 'high dynamic functions' may flourish (mosaic) on the short term. Examples include Plan Stork (the Netherlands) and Masdar City (Abu Dhabi, United Arab Emirates).
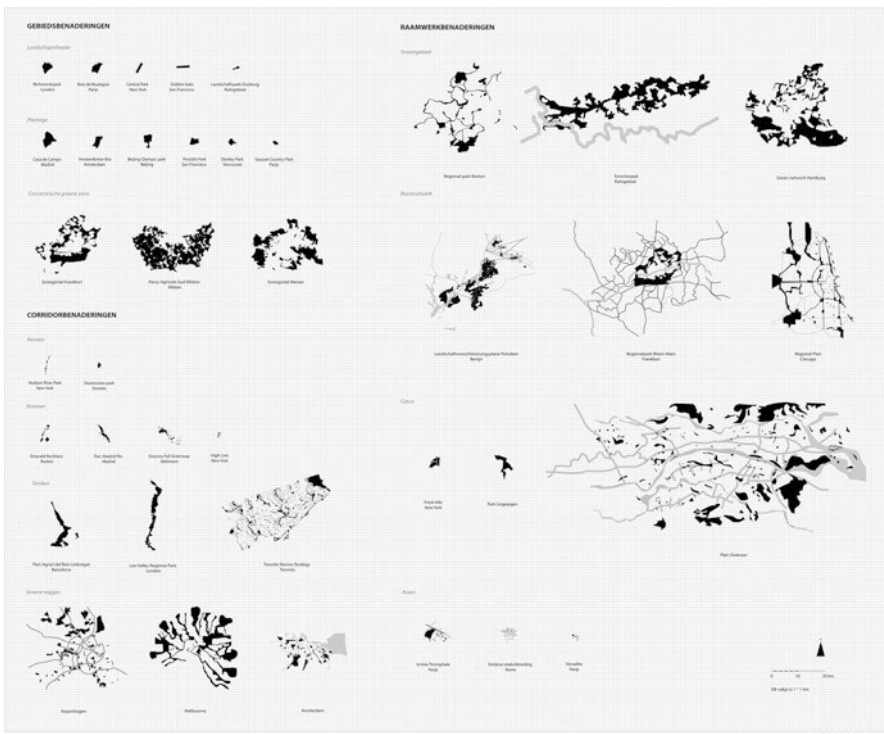

Fig. 11.11 Examples of landscape-based regional designs that follow area, framework and corridor design models (Steffen Nijhuis and Mei Liu, TU Delft)

- Framework design models focus on the development of long-term and coherent landscape networks of landscape structures to support spatial development, safeguard resources and spatial coherence and create conditions for local developments. Usually, this approach focusses on open-space planning (the inverse of the existing urban tissue). Examples include the Boston Metropolitan Park System (US), the Emscher Park (Ruhr area, Germany).
- Corridor design models provide for or develop supporting landscape structures as armatures for urban and rural development that direct, facilitate and create conditions for urban development and stimulate social and ecological interaction. Examples include Rio Madrid (Spain) and the High Line (US). In the daily practice the regional design models are employed in an interchangeable and complementary manner and are thus not exclusive.

Regardless the chosen adaptive design model, in the process of envisioning regional design is aimed at adapting the model to the spatial context through (regional) design. Here, the design process is focussed on the spatial translation of the vision that is geared towards the development and protection of coherent and robust 'strong' landscape structures, such as river corridors, metropolitan park networks, while employing associated natural processes to guide and shape spatial transformations on the long term (Figs. 11.12, 11.13 and 11.14). In a constantly changing environment, the landscape structure is a strong basis for, on the one hand, safeguarding the 'carriers' of the area. On the other hand, creating conditions for developments aimed at bringing about cohesion and adding spatial qualities when adapting to new developments or tackling challenges.

When the long-term regional vision in the form of a regional design is established, the next question is 'what do we need to do today to reach this vision and how can we adapt to changing circumstances?' This question can be answered by a process of backwards reasoning – called backcasting. Backcasting allows planners and designers to determine design strategies and principles and to consider what is realistic, but not necessarily what is realistic today (Robèrt et al. 2012). The focus is on the long-term regional vision, not just the current situation, charting the best possible way in the right direction (Robèrt et al. 2012). Adaptive design principles are powerful means in this regard. A design principle refers to a basic idea or rule that explains or controls how something happens or works. Examples of adaptive design principles (Lenzholzer 2015; Prominski et al. 2017; Sim 2019; Stafford et al. 2021; World Bank 2021) include but are not limited to sustainable water management, public space design and nature-based solutions (Fig. 11.15). These principles represent generalised design knowledge that is detached from a certain context and is applicable to other contexts (Nijhuis and Bobbink 2012). It offers, as it were, a 'toolbox', providing an overview of available design principles with essentials and leaving out particularities (Steenbergen et al. 2008). In that regard, principles are adaptive as they need to be contextualised as well so they can be adjusted given changing circumstances, while maintaining the focus on the overall objective. So, adaptive design principles can be adjusted according to the context and needs. To summarise: the long-term vison in the form of the regional design and the related

Fig. 11.12 The Girona Green-Blue Park System (Girona's Shores 2019) by EMF Landscape Architecture is an example of a long-term vision translated in a contextual landscape-based regional design which is conceived as a framework for spatial development. The framework constitutes of green, water and recreative networks connecting the city of Girona (Spain) with its surrounding territory and guides urban developments. The landscape framework also incorporates parks, gardens, cultural-historical elements, forests and agricultural land. The plan builds on local projects and initiatives. (Image courtesy: EMF, Estudi Martí Franch)

Fig. 11.13 Bird's-eye view of the landscape-based regional design for the Girona Green-Blue Park System. (Image courtesy: EMF, Estudi Martí Franch)
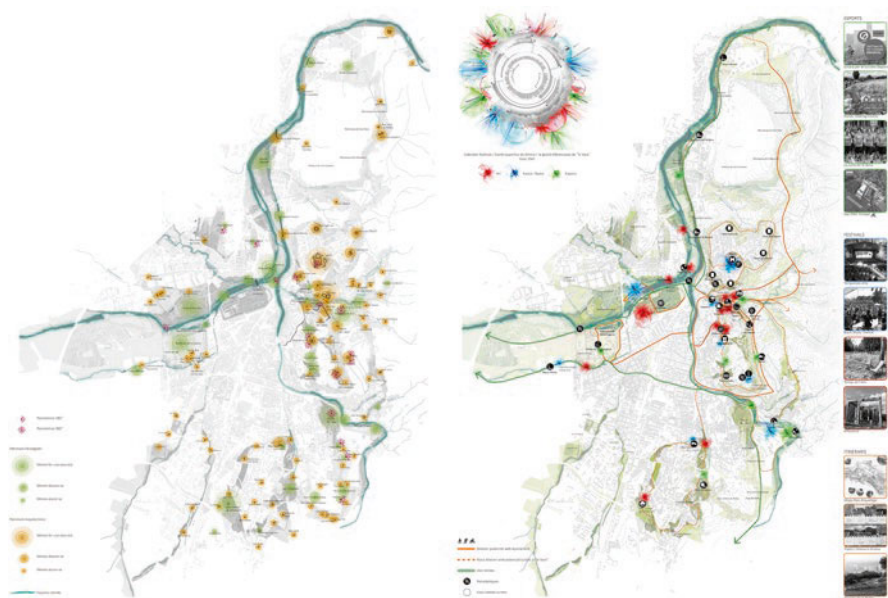

Fig. 11.14 The green-blue network (left) and the recreative network (right) that are part of the Girona's Park System. (Image courtesy: EMF, Estudi Martí Franch)

adaptive principles does not provide a blueprint for the future but guides a more or less open-ended design process in which strategic projects and design explorations play a key role in the achievement of sustainable urban landscapes.
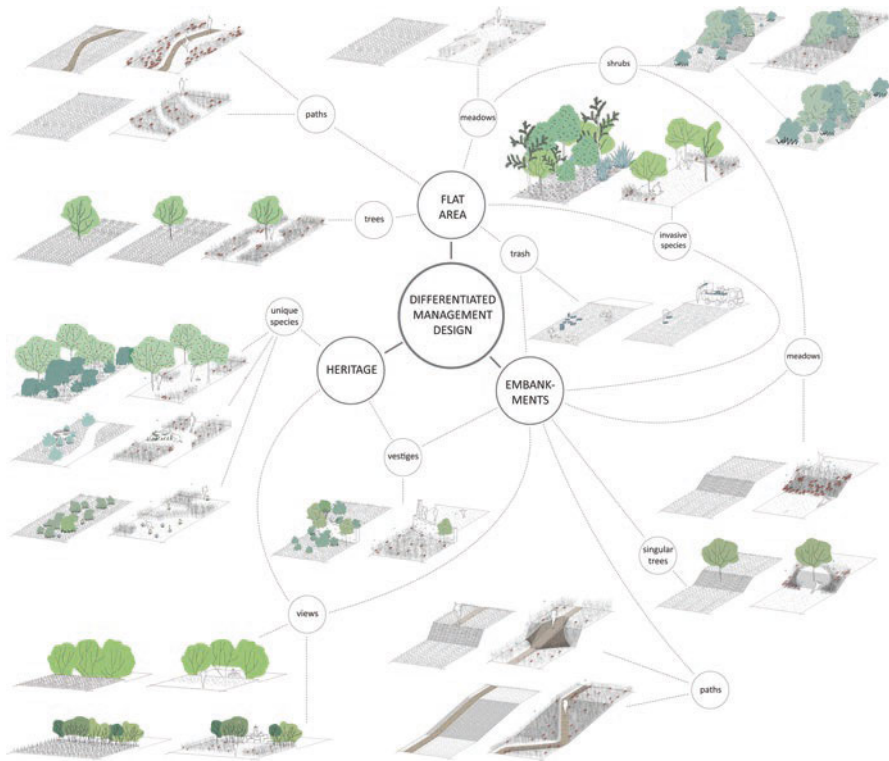
Fig. 11.15 Set of adaptive design principles employing natural processes and elements for working with flat areas, embankments and heritage in Girona's Park system. (Image courtesy: EMF, Estudi Martí Franch)

11.6.2 *Strategic Pilot Projects: The Role of Design and Action Perspective*

In strategy formation, the identification of strategic pilot projects is crucial to realise the ambitions as formulated and mapped in the long-term regional design. In this perspective, a pilot project is an initial and relatively small-scale implementation to prove the viability of the approach, principle, or idea, which can be a construction project, an urban or landscape development project or a research project. The regional design usually entails many potential projects varying in scale and focus but are needed to translate ambitions into reality. The pilot projects can be defined based on local 'bottom up' initiatives, usually building on existing initiatives and networks, such as a neighbourhood park, community gardens, a housing project or as 'top down' projects that transcend the locality and need regional coordination, such as river regeneration projects and green-blue infrastructure. What the pilot projects have in common is that they contribute to the realisation of the long-term perspective by short term actions and implementation. The purpose is to think together, contextualise the adaptive design principles through design and implement the ideas in practice (Figs. 11.16, 11.17 and 11.18). Through the pilot project

Fig. 11.16 Design of a stretch of the Ter River. This is a crucial pilot project for the Girona's Park system and aims to bring the neighbourhoods at both sides of the river perceptively and mentally closer by opening of transversal views to the river and between the banks. The project also includes the recovery of two river beaches by making use of fluvial sedimentation, the recovery of a wide strip of ecological valuable grassland, and the elimination of exotic invasive flora. A compensatory balance is sought between increased social ownership and environmental restoration measures. (Image courtesy EMF, Estudi Martí Franch)
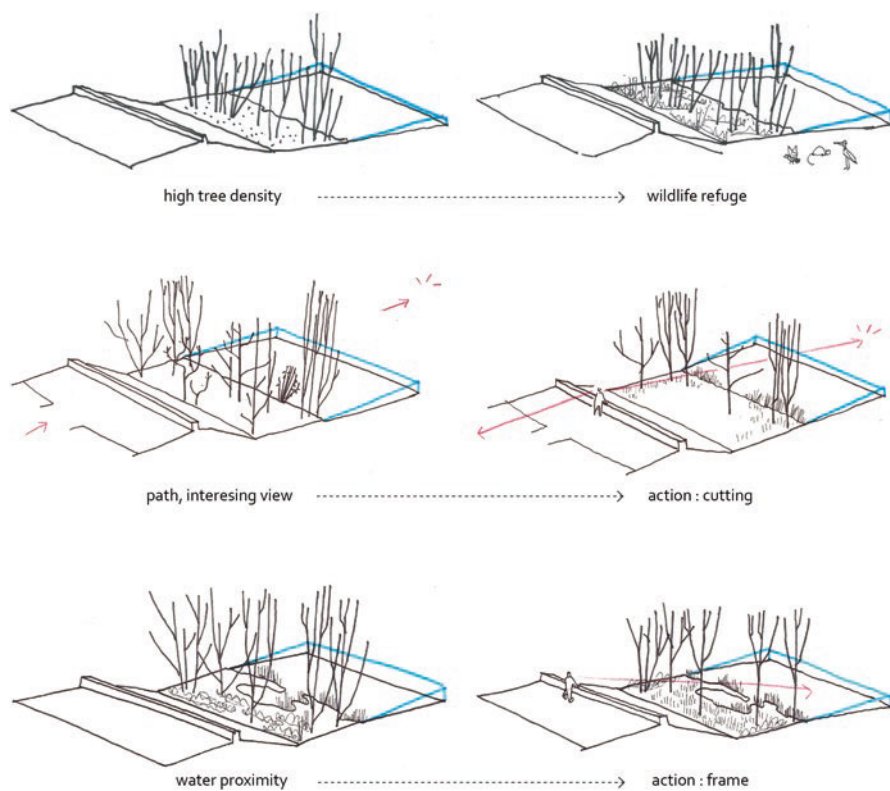
high tree density -> wildlife refuge

path, interesing view - - - - - - - - - - - - - - - - - -> action : cutting

water proximity -> action : frame

Fig. 11.17 Design principles for the banks of the Ter River. (Image courtesy: EMF, Estudi Martí Franch)
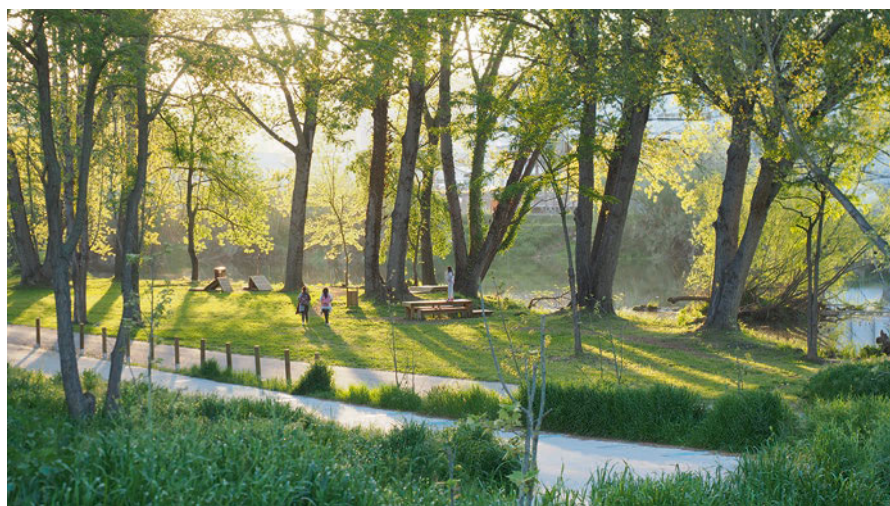

Fig. 11.18 Situation after the design intervention. (Image courtesy: EMF, Estudi Martí Franch)

designers, policy makers, citizens, academia, and industry are, as it were, united in a 'Community of Practice' (or 'Living Lab') to experiment, co-create and test in a real-life environment, delimited by geographical and institutional boundaries (Maas et al. 2017; Schliwa and McCormick 2017). Experimenting together in a responsible way, monitoring, and learning from mistakes, creates an informal space in which innovation is key and everyone is equal (Ahern 2011). This fits well with the social and political conditions needed to arrive at solutions on a policy and practical level. The strategic nature of the pilot projects is expressed by the fact that it should contribute to the realisation of the bigger ambitions in tangible ways, but also in intangible ways by building alliances of stakeholders, to develop governance models that guide and facilitate implementation and leverage innovative business models that are needed for a realistic action perspective.

What is the role of design in such an approach? As emphasised by the earlier definition, it is that design is regarded as a process or action that is 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-technical tool with which one thinks and acts in a structured way to generate ideas and explore possible solutions. This method is called 'research through design' (Nijhuis and De Vries 2019). In research through design, goal-oriented searching is central in a process where thinking and producing go hand in hand. Mechanisms of research and design are combined with imagination, creativity, and innovation (Nijhuis and De Vries 2019). During this process, a conscious or unconscious synthesis takes place that in some way precipitates into a visual form, by drawing, mapping, or modelling with analogue or digital media.

Design explorations are therefore a powerful research method with which complex spatial challenges can be approached integrally and creatively. A structured design process will be used in which important aspects are clearly revealed and the tasks are further translated and concretised in spatial terms. The adaptive design principles as formulated in the strategy formation phase are adapted and applied in the local context. Through these design experiments knowledge is acquired by studying the effects of actively and systematically varying design solutions in a specific context. Spatial design as such helps to identify challenges and potentials of the urban landscape and to suggest possible solutions. This is done by making matters explicit with drawings and sketching the context in which they can be realised. In this sense, the design explorations can also help to identify how stakeholders think about future developments at different scales. By visualising ideas and programmes of requirements and positioning them in the space, one can identify possibilities and limitations and formulate questions that require further investigation. Design results provide a context for conversations and observations about the importance of landscape structures and elements and allow for the discussion of solutions and measures with their spatial qualities. In the context of landscape-based urbanism, design explorations are used as a systematic search for possible solutions to a spatial problem. At the same time the design exploration makes clear which landscape structures and elements, for example from an ecological of cultural-historical point of view, should be preserved too.

11.7   Conclusion

Landscape-based urbanism is about cultivating the region in such a way that it will thrive. It is like gardening at the regional scale – a permanent search for the balance between intervening and letting happen, between the tamed and the wild, the desirable and the uncontrollable, the artificial and the natural. In the process of gardening, one works with the material at hand, but also manages, intervenes, and adds new elements to achieve an attractive result. Here, traditional ecological knowledge and local knowledge are an inevitable source of knowledge for management and design. In literal and figurative terms, it provides valuable knowledge about when and what to let grow, or how to cut down, prune, plant, or seed. Or how to create or change spatial conditions in which the region as a garden can thrive, while building on natural and social processes relevant for the context one is working in. Clear structures provide direction and at the same time allow for flexibility and spontaneity. Analogously, landscape-based urbanism finds and directs urban developments and transformations through creating strong landscape structures. As such, regional design is not about creating blue-print plans, but about producing roadmaps to realise and regenerate living ecological and social-economic systems that lead to a more sustainable and inclusive future urban landscape. The physical landscape structure and accompanying natural processes are used to create favourable circumstances for future development and to direct and influence spatial developments in a positive way at multiple scale-levels. Every scale-level has its own structures and influences the scale above and below, like a fractal. Top down and bottom-up initiatives and projects – short-term interventions – substantiate coherent development of the region – long-term strategy. In these projects, knowledge-based spatial design is employed as an integrative, multi-scale and transdisciplinary way to move forward in which thinking together, co-creation and implementation are at the core.

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