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THE KEY ROLE OF DESIGN KNOWLEDGE IN DEVELOPING A RESEARCH METHODOLOGY FOR A RESEARCH PROJECT ON RE-DESIGN OF NINETEENTH-CENTURY PUBLIC PARKS (HYPPE)

KLUCZOWA ROLA WIEDZY PROJEKTOWEJ W ROZWOJU METODOLOGII BADAŃ DLA PROJEKTU BADAWCZEGO PRZEPROJEKTOWANIA XIX-WIECZNYCH PARKÓW PUBLICZNYCH (HYPPE)

STRESZCZENIE

W artykule zwrócono uwagę na teoretyczne tło przeprojektowywania XIX-wiecznych parków publicznych w Europie Środkowej i Wschodniej. Badania są częścią większego projektu — „Historia projektowania XIX-wiecznych parków publicznych w Europie Środkowej i Wschodniej; współczesne użytkowanie i przyszły rozwój” (HYPPE) zapoczątkowanego przez Wydział Architektury Krajobrazu i Urbanistyki w Budapeszcie, w którym uczestniczyło dziewięć różnych krajów w Europie Środkowej i Wschodniej.

Skoncentrowano się na teoretycznym tle stanowiącym podstawę dla badań i podejścia projektowego i zapewniającym różnorodność i podobieństwo miejsc, kontekstów i problemów projektowych. Produkt (plan i realizacja) oraz proces (projektowanie) odgrywały rolę w parkach jako skutek planowania i projektowania; z jednej strony rozgraniczamy ziemię, krajobraz i architekturę krajobrazu, z drugiej — w tym samym czasie różnica w podejściu pomiędzy nauką i projektowaniem odgrywa znaczącą rolę w relacji pomiędzy badaniami a projektowaniem.

W drugiej części omówiono tła i zasady stanowiące podstawę relacji pomiędzy konserwacją i rozwojem w historycznych założeniach parkowych. Podkreślono różne podejścia projektowe — od zachowawczej konserwacji do całkowitej rekonstrukcji. Zastosowanie tych zasad do XIX-wiecznych parków publicznych w Europie Środkowej i Wschodniej pokazuje, gdzie spotykają się ogólne tła i specyfika miejsca, historii i kultury.

W trzeciej części omówiono nowe wyzwania dla architektów krajobrazu, wynikające z oczekiwań społecznych wobec współczesnego planowania i projektowania. Transformacja energetyczna, gospodarka wodna i tworzenie zdrowego środowiska życia ludzi nie są rzeczami nowymi dla architektów krajobrazu, ale na tym etapie należy podjąć nowe działania, wykraczające poza to, co do tej pory było praktykowane. W tym przypadku na pierwszy plan wychodzi eksploracyjny i eksperymentalny charakter podejścia projektowego,

ponieważ są to aspekty bezprecedensowe i muszą zostać wypracowane poprzez praktykę, badania dowodów i wyobrażanie rozwiązań, wykraczających poza powszechną transformację energetyczną, zarządzanie wodą i tworzenie zdrowych środowisk dla ludzi. Dla architektury krajobrazu rdzeń wkładu stanowi syntetyczna i spójna koncepcja projektowania; poszukiwanie znaczącego i nowego porządku.

Słowa kluczowe: analiza precedensowa, architektura krajobrazu, gospodarka wodna, projektowanie i historia, transformacja energetyczna, tworzenie zdrowego środowiska życia ludzi

ABSTRACT

In this article we pay attention to some theoretical backgrounds for the redesign of nineteenth-century public parks in Central and Eastern Europe. The research is part of a larger project ‘The design history of nineteenth-century public parks in Central and Eastern Europe; contemporary use and future development’ (HYPPE), initiated by the Faculty of Landscape Architecture and Urbanism in Budapest, in which nine schools of landscape architecture in nine different countries in Central and Eastern Europe participate and collaborate.

We will focus here on some theoretical backgrounds, that form the foundation for a research and design approach, in which the diversity and similarity of the sites, contexts and design problems can be assured. Product (plan and realisation) and process (design) play a role in the parks as object of planning and design; on the one hand we distinguish between land, landscape and landscape architecture, on the other one — at the same time the difference in approaches between science and design play a role in the relation between research and design.

In the second part backgrounds and principles, that underpin the relation between conservation and development in historical settings of parks are dealt with. Different design approaches — from restoration to complete reconstruction are highlighted. Applying these principles to nineteenth-century public parks in Central and Eastern Europe shows, where generic backgrounds and specifics of site, history and culture meet.

In the third part the new challenges for landscape architecture, that society requires from contemporary planning and design is elaborated. Energy transition, water management and the creation of healthy environments for people are as such not new for landscape architecture, but in this stage new steps have to be taken, that reach beyond, what is already practised. Here the explorative and experimental character of the design approach comes to the surface because for these aspects there are no precedents yet, they have to be developed by practice, research on evidence and imagining solutions, that are beyond the usual practice of energy transition, water management and the creation of healthy environments for people. For landscape architecture a synthetical and coherent design concept forms the core of the contribution; the search for a meaningful new order.

Key words: landscape architecture, precedent analysis, design and history, energy transition, water management, creation of healthy environments for people

1. INTRODUCTION

In the next decades a number of 19th century urban parks in Central and Eastern Europe will have to be redesigned due to change of functions and deferred maintenance. An international research project on this issue was initiated by the Faculty of Landscape Architecture and Urbanism in Budapest (Csemez et al., 2018): ‘The design history of 19th century public parks in Central and Eastern Europe; contemporary use and future development (HYPPE) (Szilágyi, Veréb, 2014; Jámor, 2016; Fekete et al., 2018; Hodor et al., 2018; Rechner Dika, Toorn, 2018).

In this article we focus on some of the theoretical backgrounds, that underpin the research methodology such as the relation between research and design, between history and design and how to implement new challenges for contemporary landscape architecture in plans for the future.

1.1. Scope

The problem is framed around nine case studies — all cases are 19th century urban parks — in nine different countries, with differences and similarities in cultural backgrounds. The countries are located in or around the Carpathian basin and part of Central and Eastern Europe (fig. 1). Part of the research problem is developing a methodology, that is suitable as a basis for the redesign of the parks in the nearfuture.

1.2. Research questions

The research questions in this article focus on three specific theoretical issues:

- What is the role of research in design in this project?
- How to deal with the relation between conservation and development in the case of historical parks?
- How to relate future development of historical parks to the new challenges for landscape



II. 1. Projekt HYPPE; Zakres terytorialny badań. Lokalizacje (Belgrad, Bratysława, Brno, Budapeszt, Cluj Napoca, Kraków, Lublana, Wiedeń, Zagrzeb) w projekcie HYPPE, w fizycznym kontekście Karpat i Dunaju. Jedynie park w Krakowie znajduje się poza kotłiną Dunaju.

III. 1. HYPPE project; Locations of case studies. The locations (Belgrade, Bratislava, Brno, Budapest, Cluj Napoca, Cracow, Ljubljana, Vienna, Zagreb) in the HYPPE project, in their physical context of the Carpatians and the Danube Basin. Only the park in Cracow is located outside the Danubian Basin.

architecture such as energy transition, water management and the creation of healthy environments?

1.3. Research approach

The research approach is based on the principles of case study approach (Zeisel, 2006). The research method is adapted for this project and does imply the dynamics of land, landscape and planning and design as it is part of landscape architecture. It includes comparative analysis between publications, fieldwork, analysis of plans and maps.

Research materials comprise plans, publications, maps and earlier research from other disciplines on these parks.

1.4. Outline

In the first part we will investigate the role of research in design disciplines. What is the relation between research and design, and what types of research are used?

In the second part we deal with the relation between conservation and development in the case of historical parks. Historical parks cannot be conserved like a painting in a museum,

because the landscape changes even if man does not interfere.

In the third part we will pay attention to design principles, that can relate future development of historical parks to the new challenges for landscape architecture, such as energy transition, water management and the creation of healthy environments at a conceptual level.

1.5. Terminology

Some crucial terms and definitions we use, are described below:

Landscape architecture

There are many definitions for landscape architecture, we use the definition by the European Council of Landscape Architecture Schools (ECLAS):

Landscape Architecture is both — a professional activity and an academic discipline. It encompasses the fields of landscape planning, landscape management and landscape design in both — urban and rural areas, and at the local and regional level. It is concerned with the conservation and enhancement of the landscape, and its associated values for the benefit of current and future generations.

The definition implies:

- landscape architecture; planning, design and management,
- foundations; historical knowledge domains,
- different levels of intervention,
- actors around users in landscape architecture.

Land, landscape, landscape architecture

Distinguishing between land, landscape and landscape architecture is an important underlying principle in this research.

‘Land’ is related to the physical properties of the earth and is defined by natural forces including climate. Geology, geomorphology, soil science, hydrology, hydraulics, botany, vegetation science and applied planting design are all related to climate and climatology.

‘Landscape’ is related to, how man has occupied and used the land over time, here socio-economic forces play a role. Spatial economy, social sciences and geography underpin, how occu-

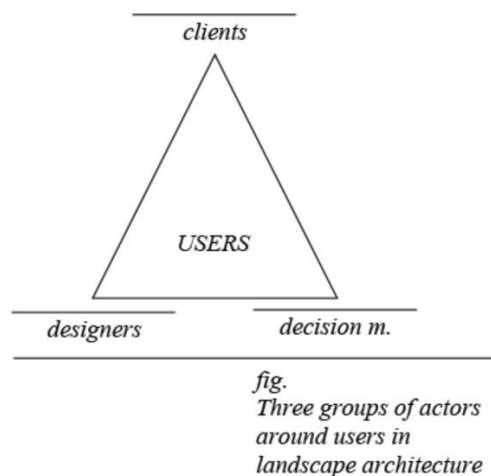
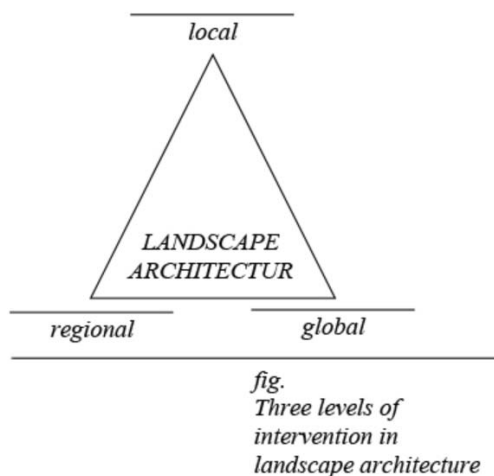
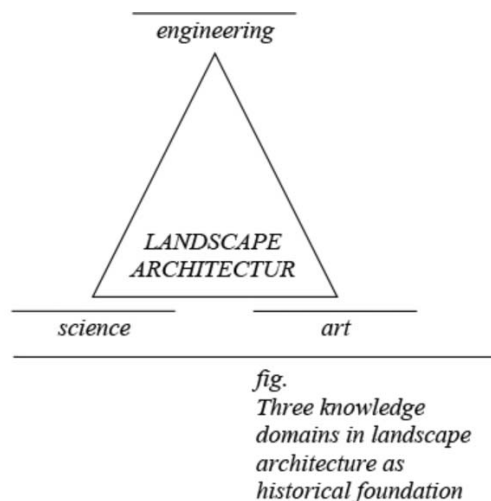
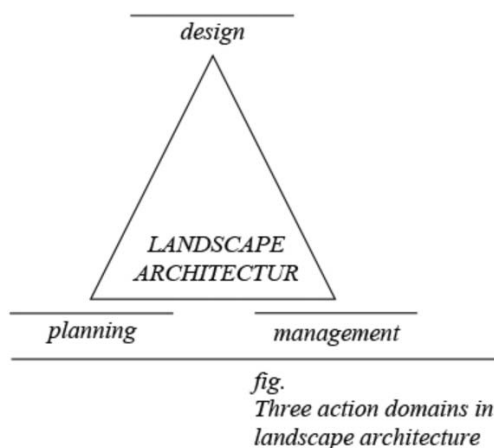
pation and land use relate to the land in an urban context.

‘Landscape architecture’ is related to design of land and landscape; cultural forces are the key source for all design. Here planning and design disciplines, cultural anthropology, design history and archeology form the basis for the study of design knowledge and design interventions (Rapoport, 1979).

The distinction between land, landscape and landscape architecture makes clear, that there are different forces behind the form of the landscape (fig. 3). The natural forces operate independently from the other two. Note, that the form of the landscape is not haphazard; there are different forces behind the form. The form cannot be traced back or explained completely in terms of one-dimensional cause and effect.

Design knowledge

Design knowledge is the knowledge, that is used in planning and design. Landscape architecture



II. 2. Diagram prezentujący definicję architektury krajobrazu.

III. 2. Definition of landscape architecture, a diagrammatic representation.

as a discipline has historically developed on the basis of three foundations: science, art, engineering. In contemporary philosophy of science often a distinction is made between different knowledge domains: declarative, procedural and tacit knowledge.

<i>changes, forces in land, landscape</i>	land	landscape	landscape architecture
natural forces; change	X		
socio-economic forces; development		X	
cultural forces; planning & design			X

II. 3. Ziemia, krajobraz i architektura krajobrazu oraz dynamika form krajobrazu i projektowania.

III. 3. Land, landscape and landscape architecture and the dynamics of landscape form and design.

Contemporary design knowledge comprises three knowledge domains declarative, procedural and tacit knowledge.

Declarative knowledge is knowing ‘what’, the sciences belong to this category. Research is domi-

nated by the scientific method, reduction, modelling and theory development form the core of scientific research. In landscape architecture all knowledge related to the landscape as a natural system is declarative knowledge.

Procedural knowledge is knowing ‘how’ and deals with methods and methodology. Methods can vary substantially depending on the subject, the goal and the knowledge domain. Even though methods play an important role in design — design methods — they are still largely implicit and research on design methods has just started to become more important (Jones, 1974; 1982).

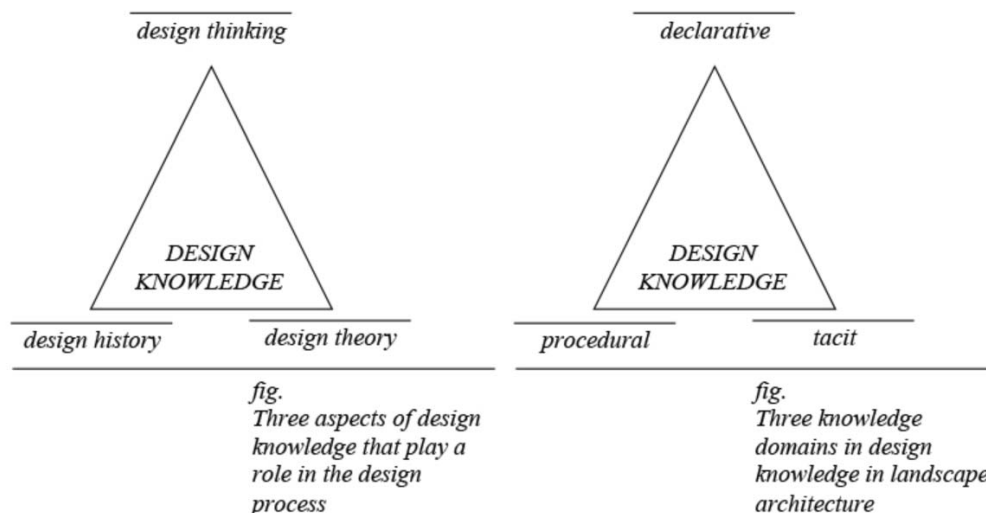
Tacit knowledge is personal knowledge based on experience, wisdom and insight. Conceptualising, imagining and hand drawing play a key role during the whole design process. It is strictly related to people. In design this knowledge is widely acknowledged, but seldom referred to as ‘tacit knowledge’ (Polanyi, 2009). Some people even suggest, that this is the dominant knowledge domain in all design. Think of the attention for famous designers and their viewpoints on the projects they realise.

One conclusion could be, that ‘tacit knowledge’ is the most important knowledge domain in design knowledge, but the relations between the three are far more important for daily practice and research.

In the design process a distinction is made between design thinking, design history, design theory (fig. 4).

Design thinking

comprises the perception, reasoning and plan making in the design process (Rowe, 1987).



II. 4. Wiedza projektowa w architekturze krajobrazu; aspekty i dziedziny wiedzy.

III. 4. Design knowledge in landscape architecture; aspects and knowledge domains.

Design history

In design projects, for which there have been made plans before, the design history and development of the plan(s) over time are also taken into account in the contemporary design process. In case of historical plans, for which several plans have been made, adapted and reworked, it is not always easy to decide, in what form this design history can be incorporated in the design. Even in a case of restoration, the phase, to which the plan will be restored is not always easy and remains a choice.

Design theory

Design theory is the theoretical framework behind design knowledge. It always comprises ontology, epistemology and methodology. For landscape architecture this is still a part of the research, that has to be developed further even though, there are some examples of design theories (Lynch, 1981; Murphy, 2005).

2. WHAT IS THE ROLE OF RESEARCH IN DESIGN IN THIS PROJECT?

For landscape architecture research has always been part of design in the form of a site analysis, as point of departure for any design project, see for instance the research Le Nôtre did for his parks (Mariage, 1990; Bouchenot-Déchin, Farhat, 2013; Farhat, 2006). Over the last 50 years there have been important developments in the relation between science and design in design disciplines. Around the 70s of the last century the idea was to model design and design theory to the scientific model of the scientific method of reduction, modelling, experimenting and theory development. With the emergence of 'designerly ways of knowledge', this changed completely and it gradually became clear, that design required a different approach to the theory and theory development (Cross, 1982; 2006).

Next to site and landscape analysis, gradually also other forms of research have developed. In contemporary landscape architecture, there is no design without research and no research without design (Birli, 2016). This research is partly scientific research, but partly also research in other knowledge domains. To clarify the differences between these types of research, we first present some theoretical backgrounds on the differences between science and design.

2.1. Difference between science and design

When in the 80s of the last century Cross launched his concept of 'designerly ways of knowing' (Cross,

1982), he not only distinguished between different types of knowledge (knowing that and knowing how) but also made clear the design knowledge was a specific type of knowledge, that could be distinguished from scientific knowledge. This distinction can be explained by comparing methods, types of knowledge, the role of theory and research between science and design (Donadieu et al., 2012; Donadieu, Toorn, 2014).

In landscape architecture we distinguish — next to the knowledge domains of science, art, engineering as historical foundations of the discipline — in the contemporary context three different types of knowledge, that form the theoretical background of design knowledge: declarative, procedural and tacit knowledge (Donadieu, Toorn, 2014). It means, that landscape architecture not only makes use of scientific knowledge, but also from other types of knowledge such as procedural and tacit knowledge (fig. 5).

How the historical foundations relate to the contemporary knowledge domains, that comprise design knowledge can be represented in a matrix:

<i>design knowledge landscape architecture</i>	science	art	engineering
declarative knowledge			
procedural knowledge			
tacit knowledge			

Ill. 5. Wiedza projektowa w architekturze krajobrazu; historyczne podstawy i współczesne dziedziny wiedzy.

Ill. 5. Design knowledge in landscape architecture; the historical foundations and the contemporary knowledge domains.

2.2. Design knowledge as core of research in landscape architecture

The historical development of the discipline and its foundations related to contemporary knowledge domains in design disciplines brings us to an overview of types and roles of research.

We usually distinguish between three types of research in landscape architecture.

- Design as research
 - design experiments
 - pilot projects
 - competitions
- Research on design
 - precedent analysis
 - research on evidence
 - post-occupancy evaluation (POE)
- Research in design
 - site analysis, landscape analysis
 - research on design history, design principles and specific research on users,
 - stakeholders, decision makers
 - design experiments during design process

2.3. What does this all mean for the project in terms of research methods?

Applying these theoretical principles to the 19th century urban parks in Central and Eastern Europe, we can outline backgrounds of research approaches and methods for the project. In this project, the analysis of the site will be a point of departure for all cases (research in design). Precedent analysis will be an important part of the analysis of the parks and the plan development (research on design). In the design

process for developing ideas, concepts for the future, design experiments will play a role in the plan development (design as research).

Analysing the functioning and use of the parks; historically and in contemporary context

The analysis of functioning of the parks is based on the distinction between different forces behind the form of the park, that determine form and use; the natural forces, socio-economic and cultural forces. Research will include, how the parks will function as part of the natural, socio-economic and cultural system and how different forces influence the form.

In the research on the parks as part of the natural system the main issue will be, what the role is, and how the parks function in the natural system.

This comprises the hydrological cycle, soils, land use cover and drainage, the different ecosystems and how people interact with this natural system (Leopold, 1968). All parks are related to rivers and river systems albeit in quite different ways and settings (Brilly, 2010).

The research of the parks as part of the socio-economic system comprise both quantitative and qualitative aspects. The value of parks for the citizens is a first issue to be analysed, which people, from what

SCIENCE	DESIGN
• method: testing hypothesis	
critique is fundamental to all science; Popper introduced the concept of 'falsification'	evaluating performance after realisation related to design means critique is still mostly personal, implicit and not consistent critique based on research on performance is rare
scientific method (more or less shared knowledge among scientists)	design method; not one overall method used by designers but rather an approach which is largely implicit
• types of knowledge: 1. declarative 2. procedural 3. tacit	1. tacit 2. procedural 3. declarative
• role of theory: theory defines development of science at large	practice defines development of the discipline based on demands from society; theory is in the practice
• role of research: paradigm plays key role in development of science; since theory is directing development	research is part of any design process but only contributes to the project itself; explicit design knowledge is not much developed yet
• the role of perception; in science there is a 'neutral observational language' largely based on quantitative measurement	in design perception and solution continuously interact with each other in an iterative process of plan development in which design thinking plays a key role

II. 6. Porównanie nauki i projektowania w kontekście wiedzy projektowej.

III. 6. Science and design compared in the context of design knowledge.

THE LANDSCAPE AS A NATURAL SYSTEM	<i>physics</i>			<i>natural forces</i>
	light air water materials climate			
	geology geological cycle soil science soil mechan.	hydrology hydrological cycle hydraulics	botany carbon cycle taxonomy horticulture applied planting design	
	ecology autecology synecology vegetation science landscape ecology			
THE LANDSCAPE AS A SOCIO-ECONOMIC SYSTEM	sociology	economy	psychology	socio-economic forces
	social groups user groups society	spatial economics transport economics	individual behaviour perception	
THE LANDSCAPE AS A CULTURAL SYSTEM	arts	culture studies anthropology ethnography archeology	language studies history geography	cultural forces

II. 7. Krajobraz jako system: dziedziny wiedzy, zaangażowane dyscypliny i siły związane z różnymi systemami.

III. 7. The landscape as a system: its domains of knowledge, disciplines involved and the forces associate with the different systems.

areas in the city do use the park, for what activities and why? A second issue is the use and potentials of the park for leisure and tourism, basically for people from outside the city. Parks and other green spaces are of growing importance for tourism; see the attention Paris and London pay to their historical parks for tourists.

An often forgotten aspect of parks and green spaces is the values, it adds to property and real estate; both residential and businesses have a preference for locations to green spaces, and the value of property close to parks is higher than locations without green space (Making, 2009).

Research on the parks as part of the landscape as a cultural system will focus on the historical values of park design and the role these green spaces have played in the use of outdoor space over time (Kostof, 1999). Also references to literature and the visual arts is an important issue. In many cases these parks represent iconic status in the development of the urban landscape as a whole and give it a distinct identity and meaning.

The historical values are also of growing importance for tourism; the way these values are 'readable' in the contemporary context do contribute to the identity and is also of interest for tourism and leisure.

Research of design history; learning from the past and investigating the local characteristics of the site

Giving form to these parks in a contemporary context is not only a matter of redesign of historical plans and existing sites but also to base the design principles on research on former and new functions, use and historical values (Chadwick, 1966; Csepely-Knorr, 2016; Tate, 2008). Analysing design principles behind the original plans from the past is done by means of precedent analysis (Toorn and Guney, 2011; Donadieu et al., 2012). Analysing the design history of these parks should lead to a typology of characteristics and an insight into the design principles behind the historical plans.

Developing a design concept

On the basis of contemporary program, site, design history, a design concept can be developed at different levels of intervention. This conceptual phase draws heavily on procedural and tacit knowledge.

3. HOW TO DEAL WITH THE RELATION BETWEEN CONSERVATION AND DEVELOPMENT IN THE CASE OF HISTORICAL PARKS?

In all planning and design of historical parks sooner or later the question of conservation vs. development will emerge as one of the first core questions. For the theoretical backgrounds we have elaborated three issues that play a role.

3.1. History and historicism in landscape architecture

History and historicism are important issues in the case of the redesign of historical parks. Toorn and Szanto (2014) describe and distinguish the two concepts based on different references.

History

History is the study of the past and the description and interpretation, of what happened in the course of time. Interpretation, reconstruction and narration are all part of the work of historians in general. Because history is based on the study of written texts, the use for landscape architecture is limited, because of the lack of social and cultural context found in artefacts, objects and other interventions. Historical information needs to be complemented by information from cultural anthropology, archeology, cultural geography, like Braudel introduced in the 20th century for instance in his *Grammaire des civilisations* (Braudel, 2008). Another example comes from Chouquer

(2000), who has worked out an approach for research of landscapes, in which he analyses the agricultural patterns, parcelling and the structure of agricultural settlements. The study of parcelling could also be of great use for the analysis of the form of the landscape as object of planning and design, and to gain insight into the development of human intervention. This study of parcelling hardly plays a role in the project on 19th century urban parks, but gives an idea of the scope of historical studies in gaining insight into landscape development over time.

Historicism

The term ‘historicism’ originates from the architecture in the 19th century, that made use of historical styles like for instance the Houses of Parliament in London. Classicism is a form of historicism in the sense, that it refers uniquely to the classics and not to historical styles in general, in landscape architecture we also see this phenomenon especially in the 19th century.

Jellicoe and Jellicoe (2006) mention for instance Tsarskoe Seio (St. Petersburg, 18th century) as example of eclecticism in landscape architecture, in which classical elements were used.

Colquhoun (1989) distinguishes three kinds of historicism based on definitions from the dictionary:

- 1) The theory, that all sociocultural phenomena are historically determined, and that all truths are relative; this can be seen as a theory of history.
- 2) A concern for the institutions and traditions of the past; this is a viewpoint.
- 3) The use of historical forms; a practice in art and design.

There is no guarantee, that the three have anything in common, according to Colquhoun.

3.2. What are the factors, that determine a design approach in historical settings?

Taking into account these historical backgrounds, how can they be incorporated in the plan development for the future?

All design projects in landscape architecture start their plan development in the case of historical parks, based on three points of departure: the new program for the park in question, the site and the design history.

First of all, the new program for these parks

The new program for each of these parks will come from the demands of its citizens for use of parks and green space. This could be different in the various countries, depending on the culture and the role the park has played in the historical develop-

ment of the country in its present situation. Former research on use and expectations of users can contribute much to the content of the program. Also, the experience with maintenance and management of the park is an important issue for the municipality and users.

In the case of the Maksimir Park in Zagreb there is a 'Public Institution Maksimir', in which not only the municipality is represented, but also the users, who have a special interest in the park.

The functioning of these parks as part of the natural system will need explicit attention given the growing problems with pollution, peak water discharges and urban heat islands.

The site

One of the most distinguishing features of each park is the site with its geological, hydrological and botanical characteristics. All three features are influenced by the climate, which results in a specific micro-climate for the park and its surroundings (Brilly, 2010; Bálint et al., 2011; Jones et al., 2005). Even though the general characteristics of the site may be well known, for plan development an extensive site analysis of the park and its direct surroundings will be necessary. The result of such a site analysis can also give an insight into possibilities and limitations for future development based on site characteristics. Moreover the results of the site analysis can be related to the research on social use of the site and give insight to, what extent the use is related to specific site characteristics.

The design history

The design history of the park in question can greatly contribute to the future identity of the park, because it is a characteristic feature, that is explicitly related to the local situation: the site, the client, the designer. Two issues are important considerations in developing a design approach.

First of all, how the design history influences the contemporary approach is a key question. Just restoring former plans is not at stake since the historical context has gone and will never get back again. Only the design principles from former plans could be used depending on the new program and context of social use of parks and green spaces in contemporary times.

Secondly, how the design history will be given form in the contemporary plan development; it deals with history and readability. How can the design history be a part of the contemporary plan development and future use?

3.3. Design approaches in nineteenth-century public parks

All nineteenth-century parks have historical values, that relate to cultural values at a national level, but also to the development of the city as an urban landscape over time (Gothein, 1914 [1; 2]; Lavedan, 1952; Gutkind, 1972 [1; 2]; Taylor, 2008). At the same time, it will be impossible to restore them, not only because of the cost, but also because of the new functions for these parks and the new context of society, that have emerged in the course of time.

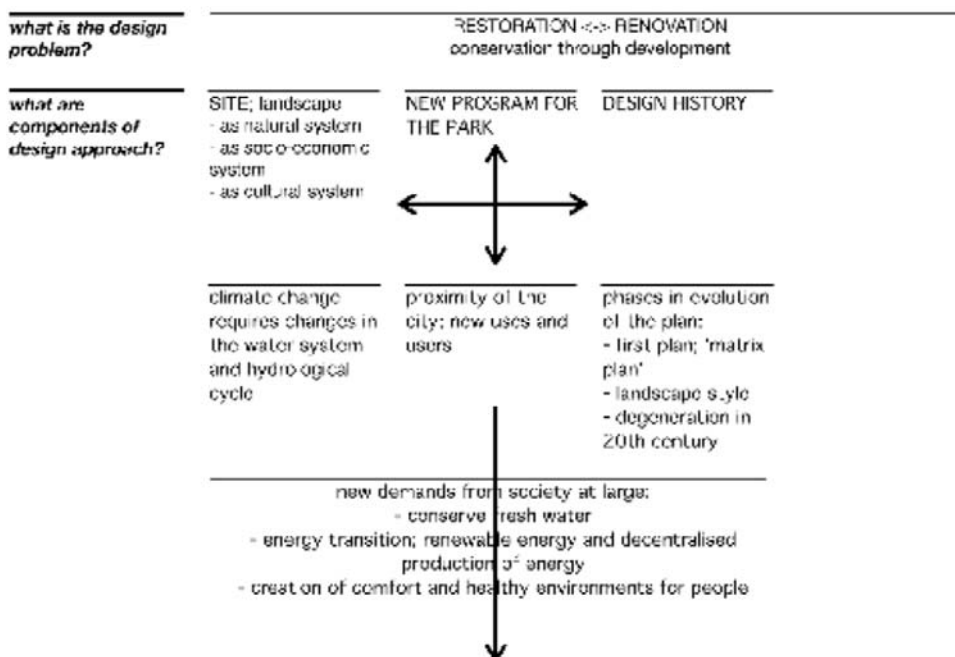
In landscape architecture we consider design as a form of transformation of the existing, *tabula rasa* does not exist, since there is always an existing situation. In the case of 19th century urban parks there is not only an existing landscape and context, but also earlier plans, that are part of the existing situation at this moment.

In general, we distinguish different levels, on which this transformation takes place: the strategic, structural and material level (Toorn, 2014 [1; 2; 3]).

Design intervention as transformation at the strategic level defines the direction of landscape development in the long run. In the case of these 19th century parks it places the parks in the context of place (the city) and time (historical development). The context of place relates the park to the urban green system as the natural basis for the urban landscape at large. In case of a historic setting we distinguish between three design approaches: restoration, renovation and reconstruction. Restoration comprises interventions, that try to bring back the historical form in a necessarily contemporary context. Since parks and gardens are living entities, that are part of the contemporary urban landscape, this is a bit of a 'fake', approach since you can never conserve landscapes, like you can conserve paintings or even buildings. Landscapes change always, even if man does not interfere; they are living systems. A second complicating factor is, to what phase you choose to restore? In the past historical buildings and environments have been changed almost constantly, so in any case of restoration, the first question is, to which phase in its development do you choose to restore?

It is quite clear, that restoration in this type of parks is practically impossible. The new functions defined by city and its citizens will lead to an approach somewhere between renovation and reconstruction.

If the strategic approach is defined, a second step comprises the choice between the different forms of



II. 8. Pierwsza część podejścia badawczego dla przeprojektowania Parku Maksimir w Zagrzebiu (oprac. Toorn and Rechner Dika, 2018).

III. 8. First part of a research approach for the redesign of the Maksimir Park in Zagreb (Toorn and Rechner Dika, 2018).

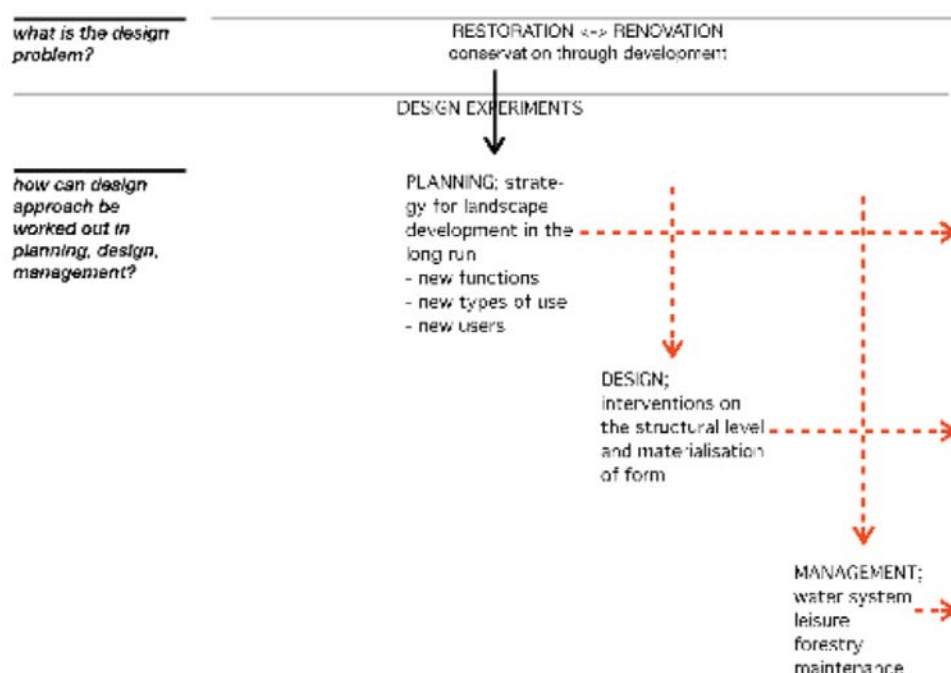
transformation at the structural level. How is the design intervention at the structural level related to the existing structure of the landscape and the park. We distinguish between insertion into the existing structure, adaptation of the existing structure or complete or partly change of the existing structure. The existing structure always includes the topographic form of the landscape defined by the geomorphology, the water system and drainage, the road system both inside, and outside the park.

On the basis of both the strategic, and the structural level, the third step is the materialisation of form at the level of element and materials.

Here different forms of transformation can be thought of such as adding an element (re)organising existing elements and the use of an element as catalyst for change.

Materialisation can be seen as giving form at the human scale by making use of design materials; ground, water, plantation; by metallising, hardening, pavement, by giving form to transitions (water & land, public & private, open & closed etc).

In figures 8 and 9 an overview of a research and design approach has been worked out by Iva Rechner Dika from the School of Landscape Architecture in Zagreb for the Maksimir Park.



II. 9. Druga część projektu i podejścia badawczego dla przeprojektowania Parku Maksimir w Zagrzebiu (oprac. Toorn and Rechner Dika, 2018)

III. 9. Second part of a design and research approach for the redesign of the Maksimir Park in Zagreb (Toorn and Rechner Dika, 2018)

4. HOW TO RELATE FUTURE DEVELOPMENT OF HISTORICAL PARKS TO THE NEW CHALLENGES FOR LANDSCAPE ARCHITECTURE, SUCH AS ENERGY TRANSITION, WATER MANAGEMENT AND THE CREATION OF HEALTHY ENVIRONMENTS?

After existing site and historical aspects of these parks, in the third part we will pay attention to the contemporary new challenges for landscape architecture as a design discipline.

4.1. New challenges for landscape architecture

The major challenges for landscape architecture today are: energy transition, water management and storage, the creation of comfort and well-being and of healthy environments for people.

Energy transition

Energy transition from carbon-based to renewable forms of energy is already well-known and widely accepted. It will eventually affect all people in their daily environment, but is especially for landscape planning and design one of the main tasks for the future. How to give form to these new energy landscapes at different levels of intervention?

This is not only a matter of simply changing to renewable forms of energy, such as hydropower, solar, wind, geothermal and other types of energy production. Key question is, that the whole organisation of energy production, consumption, storage and transport is going to change completely with these new forms of renewable energy (Stremke, 2010; Stremke, 2014; Pellerin-Carlin et al., 2017).

The principles behind energy transition are based on physics, thermodynamics. The application of those principles in design projects in landscape architecture in space and time, will be one of the major challenges for landscape architecture as a discipline, for which new solutions will have to be worked out.

Mapping the energy potential is a first step in search for potentials, for forms of renewable energy, that is specific for a site (Mackay, 2009). A second step is the locating of main points of consumption and of production of energy. After these steps the transport network and organisation of storage can be defined.

All together it means, that energy production will be more locally defined and decentralised.

There are also examples from history, from which we can learn, how the relation between energy and landscape played a role in the landscape as a living environment for people and in the landscape development over time.

We here draw attention to one example in Romania — the Maros River — and its long history since the Roman times. The Maros River is an interesting case, where the river as a landscape structure formed the backbone for settling, economic production, transport and energy in a remarkably integrated way (Lavedan, 1952; Fekete, 2007; 2015). As a design experiment Fekete and Toorn have developed a conceptual sketch for future landscape development for this region on the basis of energy transition and new economic functions for the future (Toorn, 2015; Toorn, 2018). The idea of drawing inspiration from historical landscape development for future planning and design of a region — without copying the historical situation — could also be applied to the 19th century urban parks.

Improvement of water management and water storage

The shortage of fresh water worldwide is not new and is typically a long term problem, that affects all countries (Cosgrove, Petts, 1990). Although, the local conditions of hydrological cycle and climate are different, the shortage of fresh water is a worldwide problem at a global scale. It is also a long term problem, that's why politics and politicians don't consider it a first priority.

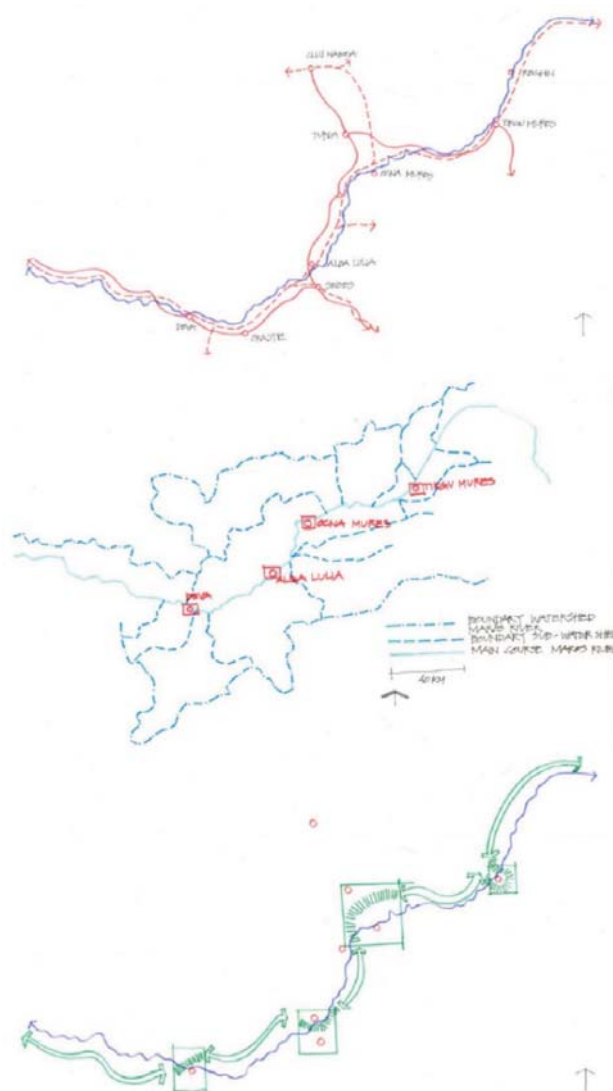
In any landscape architectural project, dealing with water is at stake in the form of starting from the natural drainage and the hydrological cycle to hydraulic interventions for drainage or/and irrigation depending on program and site.

Water management and planning and design on the basis of watersheds is already a well-known approach in landscape architecture. So, in this case there is experience and there are precedents (Jellicoe and Jellicoe, 1971; Marsh, 1983). The design principles are based on knowledge about the hydrological cycle, the watershed as a basis for plan making and hydraulics.

Here we will show two examples of application of the principles of watershed-based planning and design: a conceptual sketch for the Maros River in Romania (fig. 10, 11) and The Water Plan for the City of Rotterdam (fig. 12).

In any landscape architectural project, water plays a key role at all levels of intervention. Landscape architects think, work and design with the water systems approach, which is based on the hydrological cycle and the distinction of watersheds. The principles of the water systems approach are not new and common knowledge for all landscape architects.

At a European scale the Water Framework Directive (Directive, 2000; Chave, 2002; Kaika,



II. 10. Punkty wyjścia dla podejścia projektowego dotyczącego projektu doliny rzeki Maros. Na górze — istniejąca sytuacja doliny, położenie, główna infrastruktura. Pośrodku — rzeka i jej dział wodny, podwodne zlewiska i osady z własnymi działami wodnymi. Na dole — pierwsza zasada dotycząca poziomej organizacji doliny.

III. 10. Points of departure for a design approach for the Maros River valley. On top — the existing situation of valley, settlements, main infrastructure. In the middle — the river and its watershed, sub-watersheds and settlements with their own watersheds. Below — a first principle for the horizontal organisation of the valley.

2003) offers a legal and conceptual framework for spatial interventions based on the principle of watershed-based planning and design, and is by far the most challenging for landscape architects in entire Europe. The earlier mentioned example of the landscape development of the Maros River in Romania is also an interesting case for water management and its relation to landscape development at a regional scale (Hamar, Sárkány-Kiss, 1995; Sipos et al., 2014; Toorn, 2015).

The Water Plan for the City of Rotterdam (Jacobs et al., 2007), is a contemporary example, in which water management, storage and peak water discharges due to climate change are fully integrated with the landscape as a natural system, affecting and influencing both, the economy and the natural system.

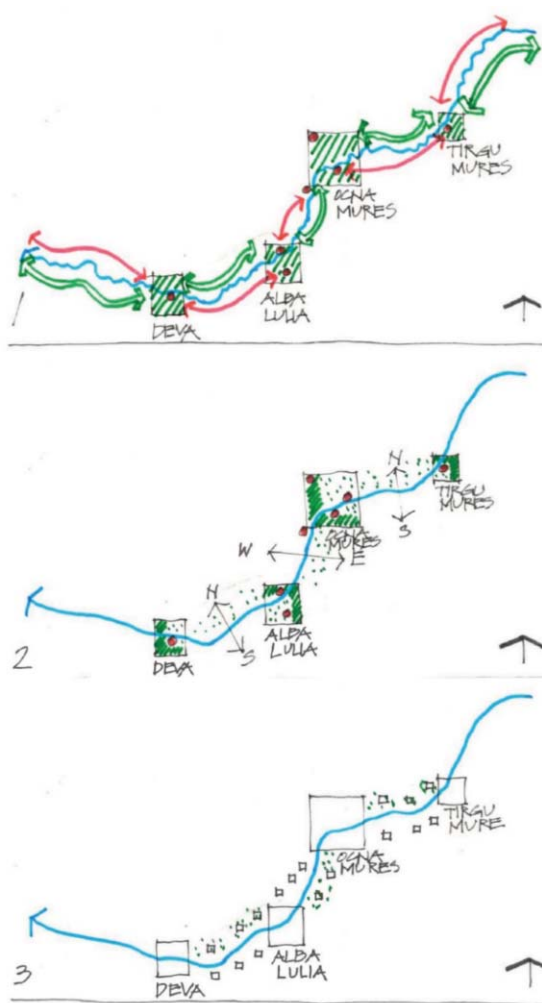
The creation of comfort in the daily living environment and healthy environments for people

The universal goal for all landscape architectural projects is the creation of healthy living environments for people. Sustainability is far too limited as a goal for landscape architects, in most cases it even does not take into account the social and cultural systems and focusses only on the ecosystem (Toorn, 2017). Comfort and well-being are concepts, that further define the field of interest for landscape architecture, and where many programs in landscape architecture are already engaged in: Versailles, Wageningen, Edinburgh, Budapest, Allnarp to name a few.

The problem of creation of healthy environments for people is certainly not new, what is new, is the contemporary context of air pollution, environmental pollution at a global scale. The World Health Organisation (WHO) provides explicit criteria for healthy environments, that could be applied directly to all landscape architectural projects (Barton et al., 2003). The goal of comfort, well-being and creation of healthy environments for people, that can be both a special goal and function as an integrative concept for the entire plan. Even though there are already many precedents from history, contemporary approaches and solutions can be quite different from historical ones (Frumkin, 2003; Bedimo-Rung et al., 2005; Schipperijn et al., 2010; Konijnendijk et al., 2005; 2013).

In Budapest the winning entry for the Millenaris Park did take into account the importance of urban micro-climate by opening up the valley, thus allowing fresh air from the mountains to reach the city centre (Bardóczy et al., 2011; Toorn, 2017).

No project in landscape architecture is designed and realised without taking into account issues of health, comfort and well-being. In the contemporary context the functioning of the landscape as a natural system demands for more attention: the providing of fresh air, clean water and soils, that can produce food of high quality without pollution. Traditionally this type of functioning was implicit and, in many cases, assured and not threatened. In today's urban landscapes almost all of them are in problem and need professional attention. It is here, where the professional qualities of landscape architects of knowledge of and insight into the natural system is at stake. This is not only a matter of knowing the ecological rela-



Il. 11. Podejście projektowe do projektu rzeki Maros na różnych poziomach interwencji:

Poziom strategii

Strategia rozwoju krajobrazu w dłuższej perspektywie czasowej obejmuje rozwój krajobrazu rzeki, zabudowy i połączeń.

W tej części rzeki wyróżniliśmy cztery grupy osiedli związane z nią: Devia, Alba Lulia, Ocna Mures, Tirgu Mures. Obszary te funkcjonują jako węzły komunikacyjne połączone linią kolejową oraz drogami dla samochodów i rowerów. Odcinki pomiędzy tymi węzłami zostały zróżnicowane — lewy i prawy brzeg zmieniają się na przemian w ruchliwy (z głównymi drogami) i cichy (brak dróg przelotowych dla samochodów, tylko dla wolnego ruchu, jak na przykład rowery). W ten sposób odcinki uzyskały bardziej wyrazisty charakter, funkcję i zastosowanie.

Poziom struktury

Strategia jest dalej rozwijana na poziomie struktury poprzez określenie wytycznych dla klastrow osadniczych jako centrów i połączeń między nimi. Dla rzeki Maros opracowaliśmy podejście projektowe polegające na naprzemiennym wykorzystaniu w przyszłości poprzez zmianę systemów dróg między lewym i prawym brzegiem (Toorn i Fekete, 2016). W ten sposób utworzono zróżnicowanie i warunki dla różnych rodzajów użytkowania w przyszłości, w tym magazynowania wody, wypoczynku, produkcji energii poprzez wykorzystanie energii wodnej i systemów solarnych.

Poziom elementu

Historyczne rezydencje mogą być wykorzystywane jako „katalizatory” rozwoju społeczno-gospodarczego zarówno w produkcji żywności, jak i drewna, ale także w turystyce. W zależności od lokalizacji tego, co pozostało i potencjału strony, mogą one służyć jako punkty wyjścia dla rozwoju gospodarczego.

Obok historycznych rezydencji można także rozwijać nowe, nie w formie historycznej, ale jako współczesne ośrodki rozwoju gospodarczego ze zintegrowanym systemem produkcji żywności, drewna, energii i stymulowania nowych działań turystycznych, takich jak: wędkarstwo, turystyka, kolarstwo górskie, spływy kajakowe i inne.

III. 11 Design approach for the Maros River at different levels of intervention:

Level of strategy

The strategy for the landscape development in the long run comprises a developing the river landscape, settlements and connections. In this part of the river we have distinguished four concentrations of settlements related with it: Devia, Alba Lulia, Ocna Mures, Tirgu Mures. These concentrations of settlements are areas, that function as hubs, that are connected by train line and by roads both for cars and slow traffic (bicycles).

The stretches between these hubs are treated differently — the left and right banks alternate in busy (with main roads) and quiet (no through roads for cars, only for slow traffic, such as bicycles). In this way the stretches will get a more distinct character, function and use.

Level of structure

The strategy is elaborated further on the level of structure by defining guidelines for the settlement clusters as hubs and the connections between them.

For the Maros River, we have developed a design approach of alternating future use by changing the road systems between left and right bank (Toorn and Fekete, 2016). Thus creating differences and conditions for different types of use in the future, including water storage, leisure, energy production by making use of hydropower and solar systems.

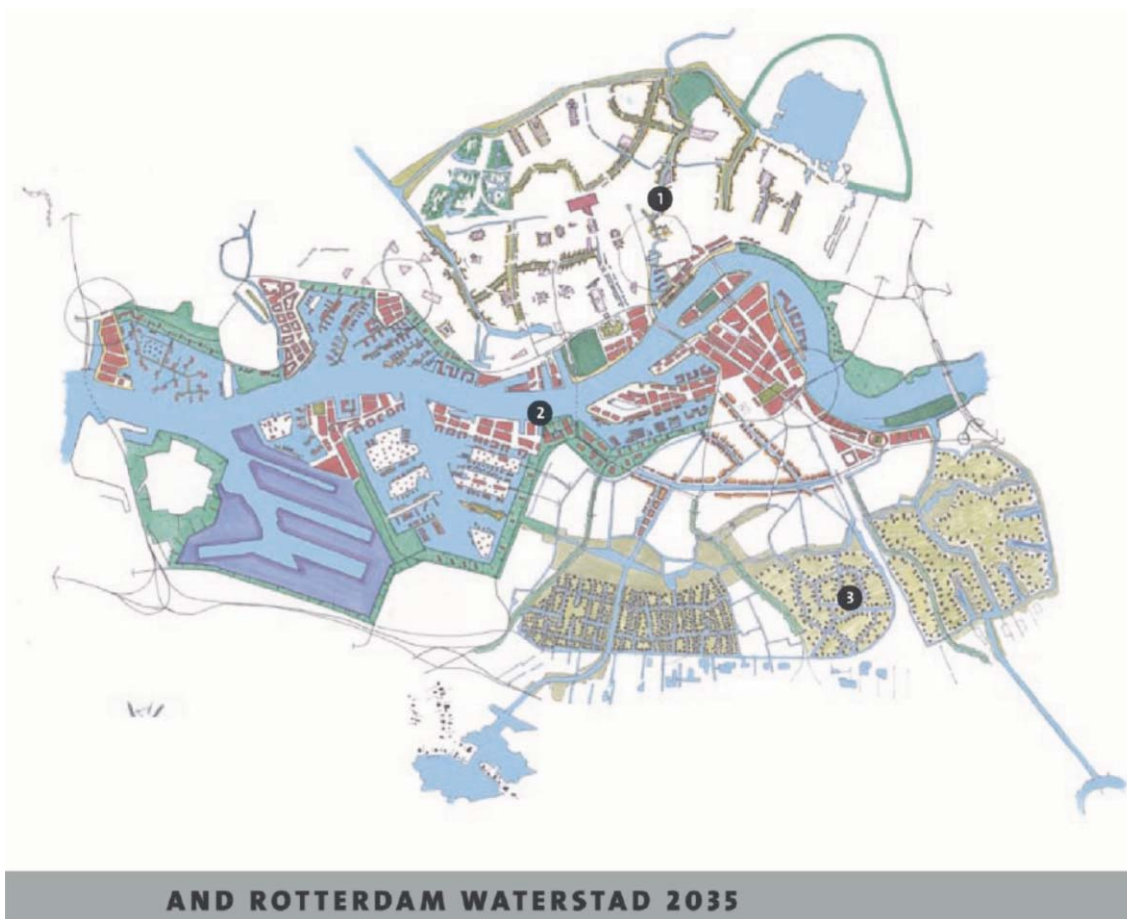
Level of element

The historical mansions can be used as ‘catalysts’ for socio-economic development both for the production of food and timber, but also for tourism. Depending on location, what is left and potential of the site, they can serve as starting points for economic development. Next to the historical mansions, also new ones can be developed, not in historical form, but as contemporary centres of economic development with an integrated system of production of food, timber, energy and stimulating new touristic activities, such as fishing, hiking, mountain biking, wild water canoeing and other ones.

tion, but goes much further — into knowledge of geological materials, hydrological systems in relation to climate.

Climate does not only play a role as a global factor, that influences all physical aspects of the daily

environment, but determines — at the same time — the micro-climate in urban landscapes. The creation of comfort in different micro-climates is still a major task for professional design in the outdoor environment. In this field, landscape architects have a great



AND ROTTERDAM WATERSTAD 2035

Il. 12. Plan wodny dla Rotterdamu (Jacobs et al., 2007). Wyróżnia się trzy główne systemy wodne: rzeka (2), lewy brzeg z osadami morskimi i rzecznyymi (3), prawy brzeg — głównie z glebami torfowymi (1). Poszczególne projekty, które zostały już zrealizowane, to Zuiderpark na lewym brzegu i niektóre z „wodnych placów”.

Ill. 12. Water Plan for Rotterdam (Jacobs et al., 2007). It distinguishes three main water systems: the river (2), the left bank with marine and river sediments (3), the right bank with predominantly peat soils (1). Specific projects, that have already been realized, are the Zuiderpark on the left bank and some of the ‘water plazas’.

experience, but the design principles also have to be developed further for the design of future daily environments for people in the cities (Lenzholzer, 2010).

For landscape architecture the major challenge is not only in giving form to each of these challenges, but also to the integration of the three. Already, more than a decade ago Catherine Ward Thompson from Edinburgh started to do research on the design aspects for landscape architecture and integrate them into the teaching program at Edinburgh. She is, by far, the most interesting researcher on the specific relations between landscape architecture and the creation of healthy environments (Ward Thompson, 2011; Ward Thompson et al., 2010).

She approaches the issue of creation of healthy environments for people from different points of view in a contemporary context: environmental pollution, lack of physical exercise for different social groups, social and psychological well-being and cultural factors, that relate to well-being. To translate these

different viewpoints into an integrated approach for planning and design of landscapes is a specific task for landscape architects in the creation of daily living environments for people. At this moment her research is the best resource specifically for designers, that work on the creation of healthy environments.

4.2. What can design contribute to these new challenges?

These new challenges demand for a substantial amount of specialised knowledge from many different disciplines. Landscape architecture is transdisciplinary by nature.

The very first special task of designers is to give form to future environments for people. A daunting task not only because of giving form as such, but especially, because the question is to give form to a future, that is fundamentally unknown. Specific for landscape architecture is to give form to a living environment with living materials. These



Il. 13. Park Millenáris w Budapeszcie — zwycięski projekt w konkursie z zakresu architektury krajobrazu wykonany przez biuro Újirány Landscape Architects w Budapeszcie.

Ill. 13. The Millenáris Park in Budapest — the winning entry for a landscape architectural competition by the office of Újirány Landscape Architects in Budapest.

basic dynamics of landscape form and design also demands for specific design methods, that focus rather on process, development and change than on static forms such as architectural buildings.

While many specialists already work on these problems from a scientific and technical point of view, for landscape architects the main task is to integrate and synthesise these inputs into a new meaningful order (Romitelli, 1997; Ward Thompson, 2011). This search for coherence and unity based on a conceptual idea comprises quite different aspects.

First the synthesising between conceptual idea and material form after realisation. Recently Nico Tillie, a Dutch landscape architect, finished his PhD research on a synergetic approach for landscape architecture applied to case studies in Rotterdam (Tillie, 2018). He shows examples of integration between water management, energy transition and urban horticulture in Rotterdam.

Secondly, to organise site, functioning and use in new, meaningful order, and finally to integrate the different levels of intervention into a new landscape form, that is fit for use by people, but that — at the same time — also expresses an identity.

Readability of the landscape and its development over time is an important issue in this search for unity and identity. Design can play an important role in the realisation of these challenges, especially on the aspect of integration and the conceptualising them at different levels of intervention (Toorn, Fekete, 2018).

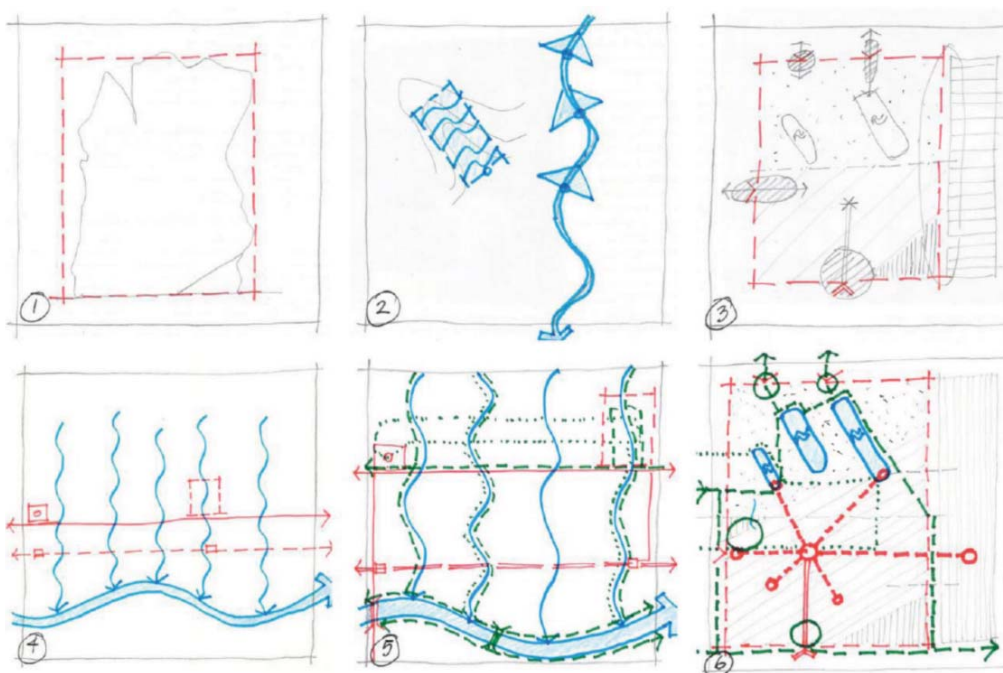
Core of this search for coherence in place and time is the conceptual approach, in which imagining, invention and conceptualising towards development of new forms for the daily environments of people.

4.3. How can these new challenges be applied to nineteenth-century urban parks?

Integrating both the heritage aspects and the new challenges is the key problem in the planning and design of the 19th century parks in Central and Eastern Europe. Recently Rechner Dika and Toorn (2018) did a first conceptual design experiment on the future development of Maksimir Park, which gives an impression, how these theoretical principles might be applied to different parks, in this case — Maksimir Park in Zagreb (fig. 14).

Il. 14. Koncepcja rozwoju jako podstawa przyszłego planowania i projektowania parku Maksimir w Zagrzebiu (Toorn i Rechner Dika, 2018).

Pierwszą kwestią do rozwiązania jest określenie granic i sformalizowanie ich (# 1). Drugim krokiem jest poprawa magazynowania wody i infiltracji do podziemi, aby zmniejszyć spływ do rzeki Savy, jednocześnie budując jednostki wodne w potokach i zbiornikach wodnych (# 2). Trzecim krokiem byłoby zreorganizowanie użytkowania parku i zintegrowanie go z systemem parku w Zagrzebiu poprzez poprawę połączeń z miastem



w celu zmniejszenia ruchu. Obejmowało by to również przeniesienie zoo do lepszej lokalizacji w mieście, z większą przestrzenią. Koncepcja parków systemowych, w których parki są nie tylko uważane za elementy, ale także za części miejskiej zielonej struktury jest bardzo interesująca dla Zagrzebia ze względu na związek z systemem wodnym, ponieważ samo miasto jest również częścią tego samego systemu wodnego. Z punktu widzenia krajobrazu jako naturalnego systemu, parki powinny uwzględniać kierunek głównego przepływu wody, czyli północ à południe. Z punktu widzenia użytkowania i użytkowników ważne są połączenia wschód-zachód, łączące centrum miasta z parkiem Maksimir.

Koncepcja projektu (nr 3–6)

Współczesny program parku obejmuje nowe funkcje, zastosowania i wymagania od ogółu społeczeństwa. Interwencje projektowe w kontekście gospodarki wodnej byłyby tworzeniem nowych zbiorników. W przypadku transformacji energetycznej regulacja strumieni i przepływów wody może być wykorzystana do wytwarzania energii elektrycznej.

Rozszerzenie parku na zielony system miejski i poprawa dostępu do terenu przez transport publiczny i ruch (piesi, rowerzyści) byłoby problemem stymulowania ruchu fizycznego w kontekście tworzenia zdrowych środowisk (Barton i in., 2003).

Reorganizacja użytkowania odnosi się do zwiększenia liczby użytkowników lokalnych z okolic parku, tworząc w ten sposób cztery różne strony parku, co obejmuje również ponowne zdefiniowanie granicy. Przybywa także coraz więcej turystów, którzy odwiedzają park jako zabytek kultury. „Matryca” od pierwszego planu została zaadaptowana wokół punktu belwederu na wzgórzu, tworząc linie widoku w różnych kierunkach.

III. 14. Concept development as a basis for future planning and design of Maksimir Park in Zagreb (Toorn and Rechner Dika, 2018).

The very first issue to tackle is the defining of the boundaries and formalise them (#1). Second step is the improvement of the water storage and the infiltration into the underground to diminish the run-off into the river Sava, at the same time building hydropower units in creeks and water reservoirs (#2). A third step would be to reorganise use in the park and integrate into the park system of Zagreb by improving connections to the city for slow traffic. This would also include to displace the zoo to a better location in the city, with more space. The concept of park systems, where parks are not only considered as elements, but also as parts of an urban green structure, is very interesting for Zagreb, because of the relation to the water system, since the city itself is also part of that same water system. From a viewpoint of landscape as a natural system, the parks should take into account the structure of the main water flow, that is north à south. From the viewpoint of use and users the East–West connections are important; connecting the city centre with the Maksimir Park.

Design concept (#3–6)

A contemporary program for the park includes new functions, uses and demands from society at large. Design interventions in the context of water management would be the creation of new reservoirs. For energy transition the regulating of creeks and water flows could be used for generating electricity.

The extension of the park into an urban green system and improving access to the site by public transport and slow traffic (pedestrians, cyclists) would be issues to stimulate physical movement in the context of creation of healthy environments (Barton et al., 2003). Reorganising use refers to the increase of local users from the neighbourhoods around the park, thus creating four different sides of the park, which also includes redefining the boundary. Also an increasing number of tourists will come and visit the park as cultural monument. The ‘matrix’ from the very first plan has been adapted around the belvedere point on the hill, creating view lines in different directions.

In a third phase in the research project on the redesign of 19th century public parks we will organise in each school a design studio, in which students can explore and experiment in developing first concepts for the future of these parks on the basis of the information on site, design history, use and management from the two preceding phases. These first concepts will be presented and discussed with the municipalities and users to gain insight into this new design problem, scope and eventually contribute to a new program for the future planning and design of the parks.

5. CONCLUSIONS

Theoretical foundations

Key theoretical backgrounds in the redesign of 19th century urban parks in Central and Eastern Europe are the relation between design and research — on the one hand and how to find a balance between conservation and development in a historical setting — on the other hand. This type of design knowledge is just emerging. It is clear, that the research and design in all case studies, has a strong explorative and experimental nature.

Changing functions of urban parks

The traditional role of parks as green spaces in the city — sometimes referred to as the ‘lungs’ of the city — are still important in the contemporary urban landscapes, because pollution is everywhere, and is a problem especially in cities.

But nowadays, there is also a new phenomenon related to parks — they are not only green elements in the city, but do also function as part of the urban green structure, that contributes to the structure of the urban landscape, that can contribute to the identity of the city.

Contribution of design

The dimension design adds to the problem of new functions and uses for historical urban parks, is the most characteristic landscape architecture can contribute. It comprises conceptualising, integrating and synthesising the relation between design idea and realised material form, the different levels of intervention and to organize, that spatially in a meaningful form.

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