URBAN RIVERFRONTS AND FLOODS – PRACTICE, RESEARCH AND TEACHING OF LANDSCAPE ARCHITECTURE

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Lucie Radilová is a chartered landscape architect and art historian. Projects by the Sendler–Radilová Landscape Architecture Studio, where she serves as the lead landscape architect, have received dozens of awards in the Czech Republic and abroad. She is a jury member for architectural competitions, and since 2023 she has been sharing her experience with landscape architecture students at the Faculty of Horticulture, Mendel University in Brno.

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ABSTRACT: The paper addresses the issue of urban riverfronts from the perspective of landscape architecture in research, teaching, and practice, with a focus on flood events. Using examples from the Czech Republic and Slovakia, it examines the planning and implementation of flood control measures in active flood zones and identifies legislative and institutional barriers. It presents three theoretical approaches (Water-Sensitive Urban Design, Sponge City, Room for the River) and emphasizes the role of the state policy, interdisciplinary cooperation, and community involvement in implementation. The practical part describes experiences with teaching at Mendel University in Brno. The studio topic for the winter semester of 2024 were rivefronts in the town of Jeseník, unexpectedly shaped by a devastating flood. The adaptation of cities to climate change requires experts capable of multidisciplinary cooperation and a holistic approach to the problems of urban riverfronts, with an awareness of the connections in the landscape beyond the city limits. Linking research and teaching in landscape architecture can significantly support the transfer of innovative methods into practice.

KEYWORDS: riverfront; landscape architecture; urban planning; flood adaptation; active flood zone; resilience to floods; education; Jeseník

INTRODUCTION

The exhibition of studio works by students of the Master's degree program of Landscape Architecture at the Faculty of Horticulture at Mendel University, which took place in the Moravian Regional Library in Brno in 2023, became the impetus for starting cooperation with the city of Jeseník. The opening was attended by Ing. arch. David Zatloukal, who approached us with an offer to deal with the options for solving the urban riverfronts of the Jeseník rivers. In August 2024, everything was ready – and then it started to rain. Floods devastated Jeseník and wiped out our preparations. When the water receded shortly before the start of the semester, a message came from Jeseník - come, we need you! In addition to the journey into an uncertain situation, a complete change in the studio assignment awaited us. There was no time for preparation, it was agreed that this time the studio would take place differently - by making decisions on the spot, according to the current situation, teaching through direct experience in crisis planning and design. We had no prior theoretical preparation regarding flooding in the context of urban public space. There was not enough time to prepare and carry out standard research. Through discussions among the participating teachers, three research questions were selected, the solution of which during the semester was to help students in searching the ideal form of the Jeseník´s riverfronts:

• What problems are associated with the implementation of public space in the active zone of the floodplain in the Czech Republic?

• What current theories and innovative approaches addressing active flood zones can be inspiring for our cities?

• What circumstances help to implement planned innovative projects?

PRACTICE (LANDSCAPE ARCHITECTURE STUDIO SENDLER–RADILOVÁ)

Lucie Radilová, from the Landscape Architecture Studio Sendler–Radilová in Brno, undertook the task of identifying problems associated with the implementation of new urban riverfronts in the Czech Republic using selected examples from design practice.

Example 1_Green spine of the city of Žďár nad Sázavou[1]

The conceptual territorial study aimed to define the spaces connected to the Sázava River, their functional use and architectural and landscape character. The city of Žďár nad Sázavou is set in the landscape, and it was the landscape character of the river banks that formed the starting situation for most of the locations being designed. The character of classic "hard" embankments was applied in the concept only within the historical center. Most of the designed public spaces had a more park-like character, as they directly connected to existing city parks.

Given that the Sázava River is designated as an active flood zone (AFZ), the originally proposed interventions were significantly limited during negotiations with the relevant state administration bodies. Most of the interventions were rejected with reference to the provisions of the Water Act (No. 254/2001 Coll.), according to which it is not possible to reduce flow profile or carry out construction within the AFZ. The nature protection authority also pointed out the risk of disrupting the continuity of the riparian vegetation that was a part of the Territorial System of Ecological Stability biocorridor.

The concept was completed in 2019, when the preparation of the pilot project "Living Farčata–pier and sandy beach" in the Farská humna park began. Taking into account the financial possibilities and the opinions of the competent state authorities, only an acupuncture intervention was carried out: the installation of a recreational pier, sandy beach and barbecue area within the park's shoreline. The project received support from the Nadace Proměny funds and in the year 2019 territorial consent.

During the engineering process, further compromises were made, which negatively affected the final architectural quality of the design. The pier had to be moved further away from the river (the question of whether it can still be called a “pier”), the sandy beach was replaced by a gravel lawn. The grill and oak seating beams, on the other hand, were assessed as permissible elements within the framework of the AFZ. The implementation took place thanks to the initiative of volunteers from the association Žijeme Žďárem in the same year.

Since then, the city has been striving to ease strict restrictions not only from the Vltava River Basin Authority, but also from the Department of the Environment through other projects. Let us hope that some of the

remaining planned riverside public spaces, for example around the cultural center called “Prostor kultury”[2] or in Libušín Park[3], the intentions outlined in the Green Spine of the City concept will be fulfilled.

Example 2_Revitalization of the Janka Kráľ Park[4]
The project was commissioned as a detailed feasibility study with a follow-up architectural study for the area of Sad Janka Kráľa and the adjacent Tyrš´s Riverfront in Bratislava. From our team's perspective, the project was attractive mainly due to the strong character of Tyr Riverfront and the dynamics of the Danube, in which we saw an opportunity to design a contemporary and high-quality public space.

In cooperation with engineer Martin Mišík (a specialist in water management and water structures), we, following the logic of "if the flow rate cannot be reduced, it must be increased," set about designing modifications involving virtual dredging of the riverbank to define the space with a combination of natural and technical measures. Their balanced combination had a positive impact not only on flood protection, but also on biodiversity enhancement and adapting the area to climate change.

The design variants were subsequently converted into hydraulic models, which confirmed the correctness of the chosen strategy. The result was mutually beneficial. The risk of extensive damage during floods was reduced (this section of the Danube has long been highly vulnerable in the long term in the context of its connection to the critical flow point Bridge of SNP), and at the same time a design of a public space of European standard was created. It was gratifying that the design received the support of all representatives of the relevant state administration bodies, including the river administrator (SVP) and the monument care. We even obtained approval for locating extensive catering facilities in the form of mobile container buildings with its own flood plan.

The proposed modifications to the Tyrš´s Riverfront have the potential to become an effective part of a comprehensive flood protection system for the center of Bratislava, designed for a thousand-year flood. The only significant problem turned out to be the issue of mooring existing floating facilities, which would have to be relocated to implement the measures. This obstacle seemed insoluble, until the moment when the contract with us was unilaterally terminated without giving any reason[5]. And so ended a rather fairy tale about a European riverfront.

Example 3_River Park Pilsen[6]
The topic of the riverfront was rather marginal in this territorial landscape study, although almost the entire area under consideration is located in the active flood zone, and the proposal therefore had to respect the conditions arising from the law. The initial proposal was relatively generous, inspired by the experience gained while working on the Danube, and in cooperation with engineer Marek Viskot (a specialist in water management and water structures), we focused on improving the flowability of the area. The key measure was to enlarge the meander of the Mže River, which was to contribute to improving the conditions for subsequent vegetation arrangements and amenities. However, it turned out that the Vltava River Basin is not the Danube River Basin, and we were unable to defend the proposal for mobile park facilities (toilets, café). However, the proposed vegetation structures and sports facilities were approved to a satisfactory extent. The design of the residential riverfront in the enlarged meander worked with proven and conservative principles: fortifications up to the level of two-year water, grassed banks, concrete and stone elements of furniture, i.e. a pragmatic, minimalist solution, without ambitions for revolutionary architecture. It was this modest concept that received a positive opinion from the river administrator. The territorial landscape study was approved and registered, however, the implementation of part of the riverside remains conditional on the termination of the lease agreement of the allotment gardens on city land, and from our point of view it is therefore postponed indefinitely.

During the course of individual projects, it became clear that the original idea of creating architecture comparable to foreign implementations was naive. It is clear that although the legislative and technical conditions for designing in an active flood zone are generally similar, the results achieved often differ significantly. Our direct experience in practice therefore shows that:

- Realized result of planning and design is largely dependent on the interpretation of legislative and technical conditions by watercourse administrators and the relevant state administration bodies.
- It is reasonable to believe that high-quality implementations in the Czech Republic are more often the result of political interest and will than a manifestation of an enlightened and accommodating approach by responsible institutions.

RESEARCH (DEPARTMENT OF GARDEN AND LANDSCAPE ARCHITECTURE, FACULTY OF HORTICULTURE, MENDEL UNIVERSITY IN BRNO)

In her final statement, L. Radilová came to the conclusion that there is an absence of an enlightened and supportive institutional approach from responsible institutions that would support the emergence of innovative strategies. Theoretical research, which was carried out improvised in a short time (October, November 2024) at the Institute of Garden and Landscape Architecture of the Faculty of Horticulture at Mendel University in Brno,[7] followed up on this formulation and focused on two research questions:

- What current foreign approaches to addressing active flood zones could be inspiring for planning and designing riverfronts in the Czech Republic?
- What circumstances help innovative urban waterfront projects to be implemented?

The research methods included identifying suitable information sources (Google Scholar, Scopus databases, monographs and professional journals in the specialized collection of the Department of Garden and Landscape Architecture library and the MENDELU library, currently published monographs and monothematic issues of journals, websites of landscape and urban studios, strategic, research, government and development organizations, professional groups and societies were used), their classification, study, comparison and analysis with the aim of distinguishing the most prominent currents of opinion and theories. In the second step, inspiring theories were selected with regard to the conditions in the Czech Republic, critical evaluation, selection of representative examples of the implementation of innovative projects and search for information on the circumstances that most significantly contributed to their emergence. Due to research limitations (lack of time, absence of grant funding, activity beyond the scope of planned research), it was not intended, nor could it be, an exhaustive answer to the research questions, but rather an attempt to extract key information and convey it to students.

Results
In current thinking about ways to deal with floods in cities, a significant paradigm shift can be noted from the “flood-safe city” (a city that is resistant, resisting floods using flood protection in the form of building

[1] Radilová, L., Ryška, Z. (2019) Green spine of the city: territorial study. Žďár nad Sázavou: Investment Department of the Žďár nad Sázavou Municipal Office.
[2] M&P Architects; Landscape Architecture Studio (2019). Žďár nad Sázavou: OSRI of the Žďár nad Sázavou Municipal Office.
[3] The study is being prepared by students of the Landscape Architecture department at the Department of Landscape Architecture of Mendel University in Brno under the supervision of L. Radilová. The client was the OSRI of the Žďár nad Sázavou Municipal Authority (2019).
[4] Hornáková, M., Sendler, Z., Radilová, L., Mišík, M. (2023). Revitalization of the Janko Kráľ Park: a study feasibility. Bratislava: Metropolitan Institute of Bratislava (MIB).
[5] See Sárközi (2023)
[6] Radilová, L., Viskot, M.; Ateliér Sendler–Radilová (2024). Pilsen River Park: territorial landscape study. Pilsen: Department of Conception and Development of the City of Pilsen.
[7] It was carried out by the first author of this article.

[8] or example, Schielen and Roovers (2008) encourage society to prepare for a different perception of floods. If society is prepared, a flood is not a crisis event, but a natural phenomenon. What is being addressed is not flood protection, but flood safety.

[9] While browsing the extensive database of projects and realizations in the field of landscape architecture at Landezine.com, we can see in the Flood Section Resilience view 52 projects from around the world (Netherlands, Denmark, Switzerland, Germany, Sweden, Finland, China, France, Canada, USA, Ireland, South Africa, Chile, Australia, Taiwan, Luxembourg, Oman), which, according to the specifics of the given country, reflect new ways of dealing with flood events.

[10] CRC for The Water Sensitive Cities (CRCWSC, http://watersensitivecities.org.au/) brought together world-renowned subject matter experts and industry leaders to conduct research that would transform water management in Australia and overseas, develop socio-technical solutions to urban water management, education and training programs, and engage industry to enable cities to manage water wisely. The center collaborated with more than 80 research, industrial and government partners.

[11] Commonwealth Government's Cooperative Research Centre (CRC) program, which supports diverse research centres to commercialise cutting-edge research and innovation, primarily from Australian universities and research institutions, and produce graduates with practical experience in the field (Eastern Metropolitan Regional Council, undated).

[12] In the field of soil bioengineering, 10 strategies were tested over 11 months – a solution was sought that would ensure the good functioning of the park as a floodplain. A variety of plants and substrate materials were used to stabilize the banks, and several processes were used to naturally purify the water.

and structural solutions) to the "flood-resistant city" (a city that is resilient, flexibly adapting through nature-based solutions. The seeds of thinking in this direction can be found, according to Liao Kuei-Hsien (2012) date it to the beginning of the second millennium.[8] Urban rivers should be understood as dynamic and variable systems that evolve in space and time with an acceptable degree of unpredictability. In other words, a flood will come, the city is prepared for it, it will partially hold it back, absorb it, accumulate it, and release the rest without causing any major damage. That this was not just a theory, but an intensively growing innovative approach, is also confirmed by the comment of the jurors of the American Society of Landscape Architects (ASLA) awards given in 2015: "We've all seen projects that aspire to return water to its natural condition. This seems remarkably believable." (ASLA Awards Jury, 2015). Currently, the principle of "urban resilience to floods" is a common part of the development strategies of cities all over the world.[9]

The principle described above is the basis for three main current theories addressing flood events and flooding: Water Sensitive Urban Design, Sponge City and Room for the River.

Theory 1_Water-Sensitive Urban Design

Water-Sensitive Urban Design (WSUD) is a comprehensive approach to sustainable urban planning and design that restores the natural water cycle by mimicking natural hydrological processes. It involves a fundamental rethinking of the city's relationship to floods and its implementation can bring about ecological, economic, social and cultural sustainability. WSUD minimizes the impacts of urbanization on waterways, seeks ways to manage rainwater, supply drinking water, treat and recycle wastewater and maintain the cleanliness of watercourses. The aim is to restore the natural water balance, reduce flood risk, improve water quality and strengthen the social and environmental role of water in the city (Hoyer et al., 2011).

A similar concept is called Low Impact Development (LID) in the USA, Sustainable Drainage System (SuDS) in the UK, and in the Czech Republic, Rain Water Management (HDV in Czech). However, Rain Water Management in the Czech Republic represents only a part of WSUD. WSUD is a less well-known concept here and is usually identified with the principle of Blue-Green Infrastructure (BGI). Since BGI refers to systems of natural and semi-natural elements with the aim of reducing storm water runoff, increasing biodiversity, adapting cities to climate change and creating an aesthetically valuable environment it can be seen as a means for partial implementation of the WSUD concept.

The successful implementation of WSUD projects depends on interdisciplinary collaboration, especially between landscape architects, urban planners and water managers. Government research programs, such as the Cooperative Research Centre for Water Sensitive Cities (CRCWSC),[10] established in Australia in 2012 with funding until 2021, are significantly contributing to changing approaches to the design and management of cities and municipalities.[11] Projects in Elwood, affected by regular flooding, have shown that participatory planning and the involvement of local communities strengthen the legitimacy of the program and the responsibility of residents and create conditions for good public acceptance of innovative solutions (CRC FOR WATER SENSITIVE CITIES, undated).

Singapore's water scarcity has been a driving force for national policy and innovation to such an extent that the Asian city can be considered a model for WSUD application. The situation in the city is also complicated by the increasing intensity of torrential rains, causing frequent flooding and inundation. One of the systemic measures to address flooding was the reconstruction of Bishan-Ang Park Mo Kio (doc. 2012). The reconstruction was carried out as part of the Active, Beautiful, Clean Waters (ABC Waters) program, which is a long-term initiative of Singapore's National Water Authority (PUB). The National Parks Authority (NParks) was also involved in the planning and implementation of the project. While PUB was concerned with the efficiency of the new riverbed, NParks specialists focused on quality public space. A series of discussions, openness to new solutions, local community involvement and information campaigns contributed to the fulfillment of the common goal (C40 CITIES, undated).

The project involved transforming a concrete drainage channel into a river meandering through the park with dynamic, nature-based plantings, designed by Ramboll studio Dreiseitl. A comprehensive approach to planning and design integrated water supply, flash flood management and river ecosystem restoration (including bioremediation). The planned innovative solution needed to be supported by extensive experimental research into appropriate technologies,[12] they were minimized costs of moving materials and felling existing trees and used various recycling methods (C40 CITIES, undated). Benefits that projects like Bishan-Ang Mo creates go beyond protecting the city from floods. They have a positive impact on strengthening local community relationships, enabling recreation, improve the health of residents, increase property values, provide new job opportunities, increase biodiversity (by 30% in Bishan Park), and cool the built environment.

Theory 2_Sponge City

The Sponge City concept has been evolving since around 1997 by prof. Kongjian Yu and his team (now Turenscape) to the present. Kongjian pointed out that "natural wetlands along rivers can act as sponges, retaining water during floods and replenishing water during droughts." (Turenscape, undated) In 2001, Kongjian and his colleagues proposed the "Ten Strategies for Urban Ecological Infrastructure Construction," one of the first systematic discussions on ecological stormwater management. The main strategies of Sponge City include ensuring clean water, protecting against drought and floods, recharging groundwater, protecting diverse habitats, providing recreational opportunities, and providing an aesthetically pleasing, high-quality environment for urban residents. In 2004, these ten strategies were incorporated into the "Technical Concept for Construction of the China Ministry of Construction, and in the period 2011–2013, the first three cities were implemented, where the Sponge City theory was piloted under the leadership of Kongjian Yu (Suining, 2011, Qian'an, 2010 and Xixian New Area, 2013). Subsequently, in 2014, Sponge City principles were given attention by the Ministry of Housing and Urban-Rural Development, which issued "interim technical guidelines" for their construction. Three years later, the Chinese government's work report listed the promotion of Sponge City urban construction as one of the four major government priorities (Turenscape, undated). It is therefore not surprising that the urban development of "mushroom" cities has been strongly supported by the Chinese government, including through large-scale landscape planning projects.

The principle of the Sponge City is essentially simple: using an interconnected network of blue-green infrastructure elements (parks, gardens, permeable surfaces, biotope lakes, wetlands, etc.), the city absorbs rainwater with the aim of managing floods or inundations and subsequently droughts, improving water quality, reducing the environmental impacts of urbanization, and creating a sustainable water cycle. WSUD and the Sponge City principle are conceptually

very similar. They similarly focus on sustainable management of the water cycle in cities and use natural and nature-based methods. WSUD originated as a holistic approach to integrating the water cycle into urban planning, Sponge City is a system perhaps more focused on water purification and reuse also with the help of technical measures and places more emphasis on urban and regional planning.

Theory 3_ Room for the River

National Strategy Room Room for the River was launched after major floods in the Netherlands in 1995. The aim of the programme was to give rivers more space to safely accommodate and discharge higher water levels. A comprehensive government program for the design of large rivers—Room for the River 2.0—was launched from 2006–2015. The main goal is flood protection, landscaping and improvement of the overall environmental condition, including urban public spaces. Specifically, the strategy concerns four large rivers, for which 40 projects have gradually been created.

This approach was already reflected in 2000 in the "Flood Protection Strategy for the Czech Republic" (2000, p. 20), which states: "The basic trend currently applied in flood protection abroad is to limit economic activities in flood areas instead of trying to protect these areas from floods at all costs. This trend, known as "giving water space ", has not yet been supported in Czech legislation and most of the funds are still devoted to restoration in flood areas ." Today, 25 years later, we can state that the first timid flood protection projects using riverbed expansion in built-up areas have been completed, and we can start to assess their functionality.[13]

The Dutch government's strategy was preceded by thinking of a "space for the river" for the Isar in Munich, Germany. The origins of the Munich embankment improvement project can be dated back to 1970, when a professor of landscape architecture at the Technical University of Munich Alwin Seifert published a memorandum entitled "Isar North, Inside and South of Munich – A Restoration Plan" (Bämler and Czisch, 2023). The plan was supported by the public, which created political pressure and initiated the establishment of working groups of local residents to draft principles for the restoration of the Isar. In 1980, the first official document was approved with the support of the Bavarian Ministry of the Environment. In 1995, the interdisciplinary working group "Isar Plan Munich" was founded based on earlier city council resolutions. The project involved the State Water Management Office Munich, the City of Munich (Department of Public Construction, Regional Planning and Building Office), the Ministry of Health and the Environment and the Isar-Allianz (an alliance of NGOs). Public participation was ensured through comprehensive communication techniques. The effective cooperation of all the above-mentioned entities was one of the key factors for the project's success (Schaufuß, 2016).

Implementation also required legislative changes and a new wastewater management plan (modernization of wastewater treatment plants along the Isar River) or an increase in water flow, which was blocked by historical agreements with energy producers. The actual implementation of the project began in 2000 and lasted until 2011. The riverbed was widened by 50–90 m, the banks were reinforced with gravel, lowered and expanded into a new recreational area (Zingraff, 2023).

The examples show that the implementation of innovative WSUD, Sponge City and Room for the River projects is mostly contributed by government support and policy, involvement or initiative of local communities, academic, research, civic and other organizations, interdisciplinary cooperation and a suitably set legislative environment. Despite the partial legislative framework (obligation to manage rainwater, protect groundwater and surface water), methodological and construction-technical tools (standards) and national strategies, the WSUD, Sponge City and Room for the River theories are still insufficiently applied in the Czech Republic and require an active approach. Essential for the successful implementation of similar projects is long-term and intensive government support, appropriate funding for research and innovation, well-advised participatory planning methods, incorporation of principles suitable for the conditions of the Czech Republic into legislation and adequate financing (including the costs of long-term care). And last but not least, education, both for the professional and lay public.

LANDSCAPE ARCHITECTURE TEACHING (DESIGN STUDIO IV)

Wende et al. (2020) precisely describe the creative essence of landscape architecture, which, like urbanism and architecture, is increasingly struggling with increasing complexity. Understanding all related processes and the ability to work with them is essential for creating a built environment. At the same time, technological development and the growth of cities have increased the dynamics of processes and ideas about future development are increasingly uncertain. Landscape architects are learning to work with the dynamics of processes from the beginning, their basic building elements are constantly developing, growing, dying, changing their size and shape. The landscape, whether rural, urban or other, is changing in time and space at every moment. Wende et al. (2020, p. 141) continue: "If … we view the landscape as a holistic and dynamic "system of systems", then it is understood as an expression of the dynamic interaction between ecological, social and economic processes. These various processes are continually altering the landscape, making the dynamics of transformation a key issue in research and design." From the above, it is clear that the role of landscape architecture in the planning of waterfronts (and all other public spaces) is indispensable. The question that we address especially in the planning and design studio´s for landscape architects is how to teach understanding and receptive creative work with the "system of systems."

At this point, we will briefly present the course and results of the Design Studio IV, which took place in the winter semester of 2024 under the leadership of Ing. Viktor Filipi and Mgr. Ing. arch. Adam Lacina,[14] who explains:" Initially, before the devastating floods in September 2024, the assignment for the city of Jeseník had a completely different dimension. Originally, it was supposed to be about modifying the embankments of two rivers forming the backbone of the city, the Bělá and the Staříč. The students were supposed to look for a solution that would make the rivers within the city accessible and increase their attractiveness. After the flash floods, the topic was changed and the aspect of flood protection was emphasized. And since both rivers flowing through the city are located in the Jeseníky Protected Landscape Area, nature protection and nature-sensitive treatment of streams turned out to be another key theme of our approach. The assignment was coordinated with the management of the city itself and the city architect, Ing. arch. D. Zatloukal. The cornerstone of the design was a field survey, which, due to the situation, dysfunctional logistics and the sensitivity of the topic, was ultimately concentrated in one day. The streets were largely cleared of mud and debris thanks to the work of locals and volunteers, but damage to houses, the riverbed and the infrastructure were widespread."

The three-phase assignment began with broader-scale

[13] We are thinking, for example, of the medially well-known riverfront of the Svratka River in Brno. The 3 km long construction began in 2022 and was completed in the summer of 2025.

[14] The studio is taught in the first semester of the master's degree in the follow-up study program Landscape Architecture.

planning and was to be refined to selected design detail:

1_study of the issue of floods, analysis of the broader context of floods in the cadastre of the city of Jeseník and proposal of measures in the landscape of the cadastre. Objective: to try to determine the causes of the devastating floods in the city and landscape, to understand the effects of human activity and the principles of flood phenomena, to propose changes in the surrounding landscape leading to the protection of the city's urban area from high water and to explain them to the public.

METHODS: field research, study of recommended and other sources, own research on the issue, lecture by L. Radilová (experience from practice), landscape analysis. It is an exaggeration to say that the method of "throwing into the water with the instruction "Swim!" was applied.[15] Joint work.

In this phase, the preparation of an educational flood brochure for the city of Jeseník was chosen as a specific teaching method. It was also included in the final outputs of the studios, unplannedly, based on the surprising finding for the students that the floods in Jeseník influenced more the methods of farming in the surrounding landscape and its geomorphology than the course of the rivers through the city and the properties of the riverbeds. Of course, flood protection measures in the area of the city riversides are important, but in the specific context of the city in the foothills of the Jeseníky Mountains they will be effective only in combination with comprehensive measures in the surrounding landscape. To create the brochure, the students first had to study the problems being solved, propose ways to solve them and think about how they could explain everything to the public in a comprehensible way, i.e. look for the form and content of the message as well as the visual language.

2_detailed landscape and urban analysis of the Staříč and part of the Bělá riversides. Objective: to understand the key characteristics of selected locations and their connections to the surrounding area, identify their problems and formulate design principles.

METHODS: standard analytical process deepened in the water management. Interpretation of analyses in the form of problem maps and design starting points. Feedback during the studio critique with the participation of city representatives and invited experts. Lecture and consultation by Ing. Marek Viskot (Moravian River Basin). Work in five-member teams.

3_design. Objective: to examine, design and present possible solutions for specific public spaces in relation to watercourses and probable future flood events.

METHODS: principle of "research through design"– solutions for public spaces, adaptation to flood events. Feedback during the studio critique with the participation of city representatives and invited experts. Lecture summarizing the conclusions of the research on current theories and practices. Communication with the professional and lay public by preparing a presentation in the form of posters that were displayed and presented at a public exhibition in Jeseník. Each student individually.

Evaluation of the studio's progress:

Positives:

• The opportunity to start the studio with a field survey shortly after the floods was a powerful experience and motivation for the students.

• Opportunity to introduce students to the issues of planning and design in the active zone of a flood area, in contact with the reality of the affected city

• The feeling of meaningful work that can really help, not "put in cold storage"

• Space for simplified specific research without connection to project challenges and generating new teaching materials, knowledge and experience

• Positive responses to the originally unplanned flood brochure and the exhibition of student projects

Negatives:

• Planning and design would require more detailed field research

• The higher level of necessary improvisation (positively assessed by teachers) was not met with understanding by students; most would prefer a predetermined content and scope of tasks and outputs.

• The whole group working together did not work, it would be more appropriate to divide the tasks into smaller groups throughout the semester

• The issue of floods is extensive, requiring a more intensive dive and a more robust package of analyses than has been possible

• The results of the parallel basic research were only available in the second phase of design and could not significantly influence the course of the studio

The studio for the city of Jeseník was a creative laboratory opening up new topics and opportunities. Our assignment was followed up by colleagues from the Institute of Landscape Planning, who in the next semester worked with the same students on the issue of landscape planning with an emphasis on protecting the Jeseník Mountains from flood events. The studio demanded flexibility and independence from the students, and its management was demanding in terms of organization and communication. Although the connection of research and design did not go as planned, the research continues and will enrich future teaching. Interdisciplinary connections between students of related fields in the form of mixed work teams, which has already proven successful, are also desirable.

Despite the negatives mentioned, it is undeniable that the positives of teaching in the form of direct experience with the topic being addressed prevail. Design Studio IV and its unplanned continuation in the following semester made for students possible to learn about multi-layered planning and design driven by the dynamics of natural processes. If they strengthened the ability to question the status quo, to experiment, and persevere in finding and promoting new solutions and procedures, we were successful.

CONCLUSION

Urban waterfronts are key public spaces where flood protection needs meet with requirements for quality public space and ecological sustainability. Successful practice requires not only an adequate legislative framework, open-minded administrative authorities and government/local government support, but also the ability to find innovative, nature-based solutions, active community involvement and multidisciplinary cooperation. Successful implementation of these projects requires the connection of experts from various professions, such as landscape architects, urban planners, water managers and others. Government research and support programs or state policies and strategies are key for financing, developing and implementing comprehensive solutions.

The challenges of today are aimed at adopting a new paradigm: a change in the perception of floods as a cyclical phenomenon, against which the city does not have to fortify itself in a medieval way, but to which it adapts and accepts its dynamics. Research and teaching of landscape architecture are of fundamental importance in supporting the implementation of

[15] Retention capacity, water erosion, hypsometry, land use, forestry, drainage lines, flooding, problem map. Special note for understanding: "throwing somebody (who cannot swim) into the water with the instruction "Swim!" is a Czech adage that means, that a good way how to learn something new is to be "thrown" into the problem and have to learn how to solve it themselves.

these changes, developing innovative methods and preparing experts who can comprehensively solve the problems of urban riversides. In situ experience of students is optimal (out of their comfort zone) and important is to try to strengthen their flexibility, courage to experiment, perseverance in finding solutions, ability to work in multidisciplinary teams and personal resilience.

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