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Urban green areas as the starting point for planning hydroelectric and urban developments: the case of the Sava River in the City of Ljubljana

1 Introduction

The article presents starting points and results of the special expert guidelines for development of the wider Sava River space in the Municipality of Ljubljana, which were commissioned by the responsible Department of spatial planning and undertaken by the project team: Aleš Mlakar, Ph.D., landscape architect, Anja Musek, landscape architect, Martina Tepina, architect and assist. prof. Maruša Zorec, architect, consultant Marko Fatur, civil engineer, with associates Ana Tepina, diploma candidate in landscape architecture and Rok Velikonja and Andrej Blatnik, students of architecture. The responsible coordinator and caretaker of the project on the client's side was Marjan Cerar, architect. The purpose of the expert guidelines was preparation of the landscape and urbanistic layout of the Sava River space and Northern branch of Bežigrad. It was also the basis for the new municipal spatial acts, as well as one of the foundations for future preparation of detailed municipal spatial acts, public competitions and probable preparation of a national spatial plan for the chain of hydro-electric power plants on the Sava River.

The article focuses on methodological and content starting points used in preparation of the design layout and management of urban green areas in the wider Sava River space, which are seen as exceptionally important. The spatial planning part of the pre-investment study for construction of the chain of hydro-electric power plants on the Sava River (Fatur and Hudoklin, 2007), commissioned simultaneously as the expert guidelines under observation, pointed out the necessity and sensibility of comprehensive development undertaking in the wider accumulation area. Moreover, the urban development concept for the northern stretch of the Bežigrad branch proved to be unclear, especially its confluence with the natural landscape. Urban green areas of the Sava River space, simultaneously a link and independent spatial and functional entity, thus became the starting point for planning hydro-electric and urban developments, whereby the specifics of such a spatial planning issue demanded an adapted method for finding solutions.

2 Resolving real spatial planning issues

In the last years the project area was already the subject of several expert undertakings, which however were never

officially completed in the form of planning acts. Since these expert guidelines wanted to have a purpose they were founded on approved materials and solution from working papers, supporting the new spatial planning acts being prepared for the City of Ljubljana. (Šašek Divjak, 2007; Jordan, 2007) The aim of these expert guidelines was to harmonise the solutions, build upon them and connect them into a comprehensive entity, thus actively contributing to the optimisation of spatial arrangements in the new generation of planning acts.

The expert guidelines stem from planning analysis, which is the basis of spatial planning operation. The planning analysis was more than mere gathering or structuring of data, it was a quest for solutions – a collection of answers to uncertainties tied to implementation of desired spatial developments or resolution of spatial issues. It was dedicated to gathering information needed for designing spatial solutions and conducted in a manner to serve both the preparation of contents on the strategic planning level, as well as later preparation of contents for the implementation level. One must be aware that the undertaking doesn't flow in defined sequences, but demands incessant checking of strategic decisions on the detailed planning level.

The layout is mainly directed towards resolving four sets of evidenced issues:

- Issues in the urban area – rehabilitation of programmatically weak or degraded housing and other urban areas, designing the ending of Dunajska Street and hierarchy of pertaining street space;
- Traffic issues – redesign of traffic links and design of new traffic links and spaces for stationary traffic;
- Landscape issues – rehabilitation of degraded parts of the natural and cultural landscape, complementing programmatically weak landscape developments and incomplete edges or spatial passages;
- Conflicts between various interests in space and conflicts concerning use and development of activities with protected, safeguarded or endangered areas.

3 Confronting different spatial systems and interests

These Expert guidelines follow the understanding that spatial planning is a method for harmonising interests in space. The duty and right of such planning is that these interests are recognised on time and harmonised in expert guidelines and planning acts, which should be expressed in clear spatial concepts at various levels and in such scales and conditions for developing or safeguarding space, which disallow ambiguity in explanations of stipulations in detailed planning procedures.

Expert guidelines should transcend the logic of passive spatial planning, on one hand "planning from initiatives" and strict environmental protection policies, on the other. Active spatial planning tries to supersede the present planning practise, which is focused on dealing with mainly small, but also larger investment initiatives and incessant servile

amendments of planning acts. In dealings with investors the most important necessity is respect for directives stated in strategic acts. All possible future initiatives of course cannot be foreseen in planning acts, yet it is still possible to predict what developments in particular city parts we desire, present them in the urbanistic and landscape layout, direct investments to suitable areas and at the level of municipal detailed plans allow enough manoeuvrability for adaptations to future spatial development specifics. A clear prior strategic guideline means simultaneous increase in economic efficiency of investments, since it enables ongoing diminishment of uncertainty about possible (permissible) implementation of particular investments in a given space.

Definitions of planning guidelines for particular areas always had the big picture in mind, specifically concerning the urbanistic layout, as well as elements of the landscape, which was envisaged in its entirety, stretching across several spatial units. Despite the present territorial structuring of Ljubljana, as seen in planning acts, the project area is dealt with as a homogenous or functionally complete space, to which a characteristic planning concept can be sensibly applied.

Solutions in the expert guidelines are founded on simultaneous dealing with different spatial systems – city, landscape, traffic, hydroelectric power plant system, i.e. systems with their internal logic and mutual interlocked functionality. Design of urban green areas is integrated in the urbanistic layout, as well as proposals for development of particular spaces lying immediately by the accumulation. One of the more delicate issues in the project area is the undefined relationship between the city edge and neighbouring landscape, therefore special attention was given to this issue. Another planning challenge was the confrontation of two urban

subsystems – the ending of Dunajska Street, a metropolitan feature, and the gentle system of rural villages on the Sava terrace. The most important deliberation was on how to intertwine the two systems alongside the complicated traffic situation of the Dunajska Street and planned street railway.

In the connecting sense, also the hydroelectric power plants on the Sava River are dealt with as a multi-layered project, which cannot be dealt with only from the energy production aspect, but also from the widest spatial and social context. The chain of power plants cannot be seen only as objects with (negative) spatial influences, but moreover as a development opportunity – the motor of actual realisation of the recreation space along the Sava River, which has remained a stated, yet unrealised desire for years. Furthermore, the project has to be understood as an opportunity to clear the degraded areas along the river – illegal dumping and gravel pits.

4 Devising alternative development scenarios

Proposals for solutions of the entire area were prepared as design scenarios, which offer insight into the areas various development possibilities – concerning scope, typology, use, intensity and orientation of building. There were several reasons for checking different solutions. Design of alternatives and ensuring possibilities of choice amongst them is in fact the basic condition for optimising the decision-making process. It would be incorrect to state that only one offered solution is acceptable, without acknowledging that there are also other possibilities for achieving the set goal (Marušič, 1993).

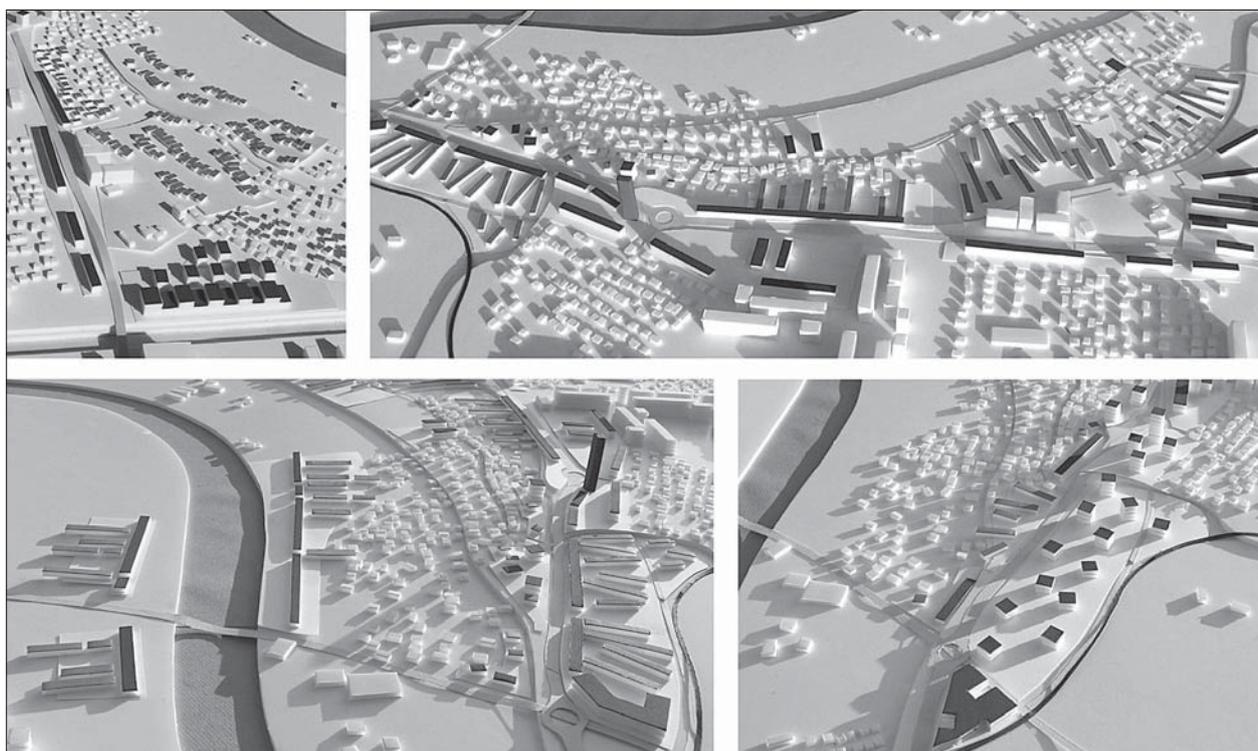


Figure 1: Examples of design scenarios (source: Mlakar et al., 2007).

By comparison and choice of the best possible alternative, legitimacy of decisions increases, while uncertainty about correctness of the taken decision diminishes, since we become aware that there are no better solutions. For successful assessment of acceptability of spatial developments it is therefore essential to present proposals as scenarios. Decision-making at various levels – professional, political or wider public – can be significantly easier if different possibilities are offered. On the contrary achieving concordance, which is typical in procedures for adoption of spatial planning documents, is diminished to simple agreeing or disagreeing or adapting to various spatial interests. Physical space is the place where various different interests meet, some completely contradictory (development, safeguarding, partial interests of different interest groups ...), but simultaneously the bearer of development has various possibilities for attaining the desired goal at ones disposal, whereby each represents different economic and technical requirements, environmental effects or social acceptability.

Organising public competitions for particular smaller compact areas is the logical conclusion of this concept. Even public competitions are a method of comparison and selection.

These scenarios were represented on a model, which enabled clear presentation of spatial arrangements and ensured presentation changeability. It had a fixed part (extant preserved buildings), while the spaces dealt with in the layout were changeable (e.g. different building typologies). The method proved to be very useful in discussions with the client and other contractors that were producing spatial guidelines for the new spatial planning acts.

5 Rehabilitation as the planning direction

Rehabilitation was the driving principle for intervention. The space is a vulnerable and valuable landscape. Before any expansion of settlement occurs and aligned to principles of sustainable spatial development, it is sensible to rehabilitate degraded urban and inadequately exploited areas. Such rehabilitation has to be tied into the ideology and real societal needs and not a goal in its own right, signifies conscious superseding of the extant condition and establishment of a

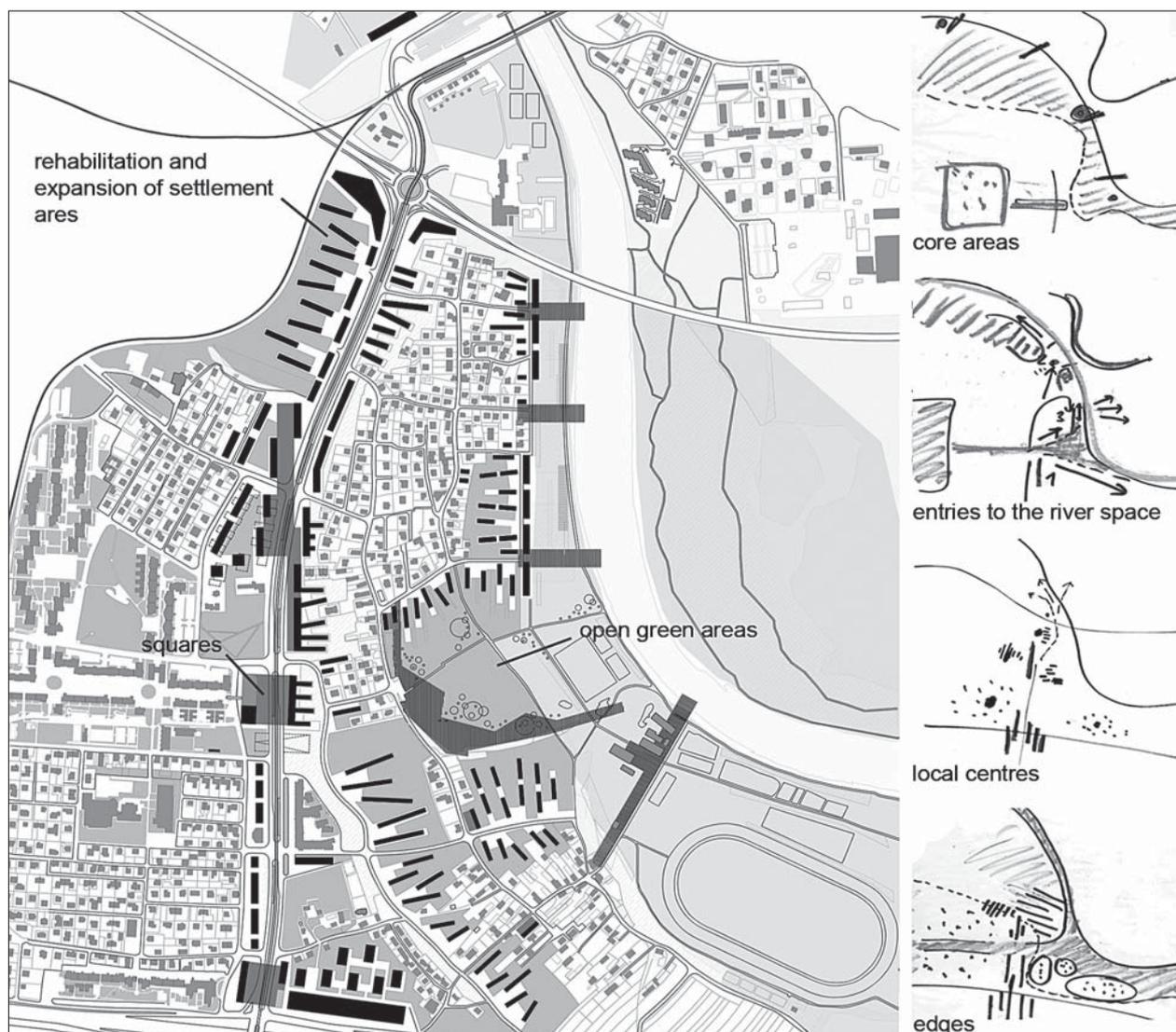


Figure 2: Urbanistic layout (source: Mlakar et al., 2007).

new balance. It demands simultaneous execution of measures for achieving planned developments and project approach, meaning utilisation of instruments of direct, comprehensive spatial territorial development or objects for diminishing spontaneity in rearrangements or execution, also implying for example resolution of property relations.

Rehabilitation areas will therefore inherently demand production of detailed planning documents. This is a method of active spatial intervention and active resolution of issues, which as a rule include all aspects of spatial management: architectural, engineering, utilities, energy supply, functional, social, economic, environmental, cultural, but also qualities of the living environment. Transparency of the work, argued decisions and tolerant dialogues are needed. In most cases it causes contradicting attitudes in different publics, thus participation and their inclusion are essential (Marušič et al., 2004).

Simultaneously to rehabilitation of urban areas, future development of the area significantly depends on rectification of degraded landscapes, especially illegal dumping sites and gravel pits. Dovjež is stressed as an example of comprehensive clearing. After the dams on the Sava River are

built, the level of subterranean waters will rise and we can expect flooding of the former gravel pit and extant separation area. Moreover the activity is seen as unsuitable for the area. The area should transform into an area of substitute habitats, since building of the accumulations will cause the destruction of valuable natural habitats (especially wetlands and sand banks). The type and size of particular habitats will be decided after careful nature protection assessments of the proposed developments. The area should be designed as an education centre with necessary infrastructure (information centre, viewing points, information infrastructure, parking, toilets) and become one of the programme cores of the wider Sava River recreational area.

6 Urban green surfaces as part of the urbanistic layout

One of the most important starting points for the proposed urbanistic layout was comprehensive design of public open spaces and green areas. Under the pressure of economical construction and largely also because of inadequate responses from the profession itself, we have been witnessing the

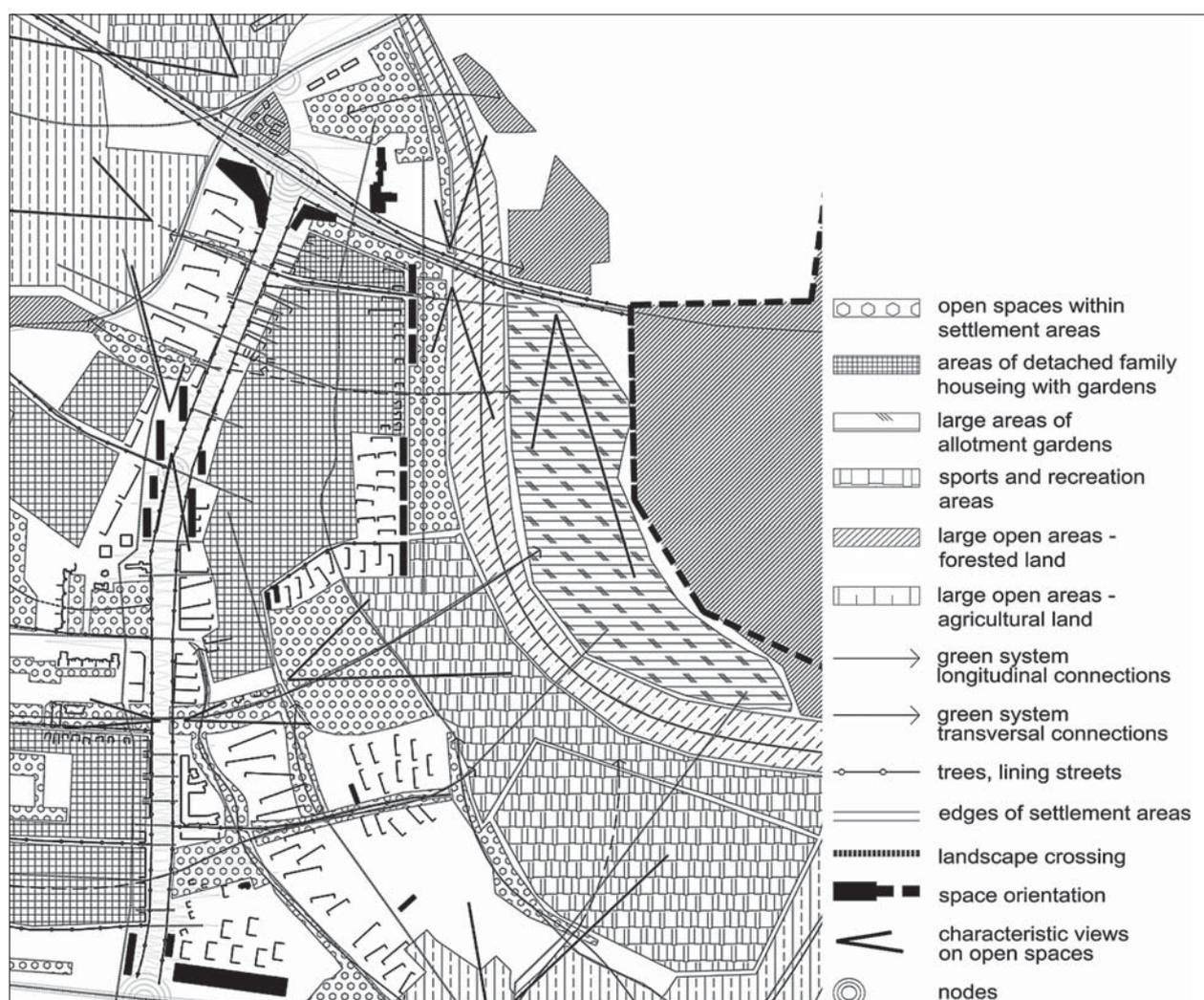


Figure 3: Layout of the green system (source: Mlakar et al., 2007).

emergence of inadequate new living environments. Contrary to such practise, this layout is built from the hypothesis of planning "human-friendly living environments".

The urbanistic layout (Figure 2) is built on a programmatically strong, distinct and clearly structured Dunajska Street, concerning both structure and also building heights, which should transform into a public space of a modern avenue. The street ending in the Ruski car area is clarified, while its continuation into the Sava River space is modified to the neighbouring morphology. New buildings in Mala vas, part of the new developments by the river, complete the settlement. Permeability in the East-West direction is important for the area, as well as opening towards the river. The layout is based on establishing clear traverse connections across the green spaces, which is enabled by the new building structure, with clearly defined city quarters, edges and centres.

For purposes of document preparation the concept was represented by regulation (land use, intensity, heights and building type) in those areas that haven't been completed as yet, i.e. development areas and rehabilitation areas. (Figure 3)

The green system (Figure 3) is planned as part of the city's green system, but is simultaneously autonomous within the project area. Urban green and open spaces are functionally and ecologically tied into a system that is formed by:

- Large open areas – Sava River with riverbank vegetation, agricultural land and homogenous forested areas;
- Smaller open spaces within settlement areas – green surfaces, such as parks, playgrounds, green patches, graveyards, remnants of natural vegetation or agricultural land; larger areas of detached family housing, whose gardens form a network of open spaces; sports and recreation areas at the ending of Dunajska Street and in Stožice; the network of trees, lining the new Dunajska Street and Nemška Street, as well as perpendicular routes from Dunajska Street that strengthen the traverse links.

The rationale of the green system lies in connections of larger open spaces with traverse and longitudinal links that are formed by smaller green surfaces. It was determined that in detailed planning extant green surfaces in built-up areas have to be preserved and adequate and connected new green surfaces provided in areas of settlement expansion, which will function as traverse or longitudinal links between larger open areas in the built-up area's hinterland. The dyke is emphasised as a landscape phenomenon, which should be strictly safeguarded before any developments in areas, where it is still natural.

7 Developments along the Sava River

Because of its natural characteristics, preserved cultural landscape and good accessibility the area has good potentials for development of leisure activities. The layout emerged from our belief that directly along the river and as part of the proposed developments for energy production comprehensive spatial arrangements could be designed – circular longitu-

dinal path, rowing centre with islands, footbridges, passages across the dams, sports grounds, substitute habitats, links to the hinterland and recreation centres. To improve the functionality of the recreation area it is important to ensure links and permeability in the north-south direction throughout the area and not only the ending of Dunajska Street.

The proposed solution maintains the concept defined in the study *The Sava riverbank space – spatial structuring and programme definition* (Simoneti et al., 2001). Amendments stem from clarified solutions for the hydro-electric power plants (Stojič and Kryžanowski, 2007), which were formerly largely not identified, and proposed urbanistic solutions from the presented project. Directions for planning the Sava River space emerge from comprehensive insight into spatial developments that should, from the professional aspect, become part of the hydro-electric power plant project and those spatial developments that link to the Sava River indirectly or should be planned in mutual communication.

The concept is based on designing different core areas. The area along the river, in its entire course, is connected and complemented with designed open and built spaces of the northern stretch of the Bežigrad branch. The core areas are connected by the multi-functional path along the river. It links into the path, which is proposed along the entire chain of hydro-electric power plants on the middle Sava in parts, where it is sensible because of recreational uses and simultaneously feasible because of spatial limitations, but also their regional character. Additional bridges across the Sava River are also proposed.

Cultural landscapes and forests by the river are preserved as much as possible. The area of Roje along the river is listed in the NATURA 2000 (Sava–Medvode–Kresnice). The basic directive is to limit the width of dams and preserve natural riverbanks, especially on the left riverbank. The water level in reservoirs is optimised with respect to limiting interventions and ensuring replenishment of aquifers by raising the water level. In order to preserve nature, this area should be devoid of programme cores, only smaller resting places and recreation points can be developed.

At the ending of Dunajska Street the park becomes a programme core for the recreation area by the river. On the city level it has multi-layered significance: it is the secondary ending of Dunajska Street (its primary, urban ending is in the Ruski car area), spatial node (knot) and transitory space to the city's recreational hinterland. The park stretches from the new by-pass road or Dunajska Street at the passage across the river to the Gameljne HE power plant. The programme is denser in the south-eastern part; the cultural landscape is safeguarded towards the west, while the forests are safeguarded northwards.

In the Jarški prod area the proposal presented parallel to the planning of hydro-electric power plants is taken on board, i.e. development of a still-water rowing centre. The centre includes complementary facilities and accesses, building of an island or several programmatically diverse islands on natural ground, building of a foot and cycling path across the Sava River.

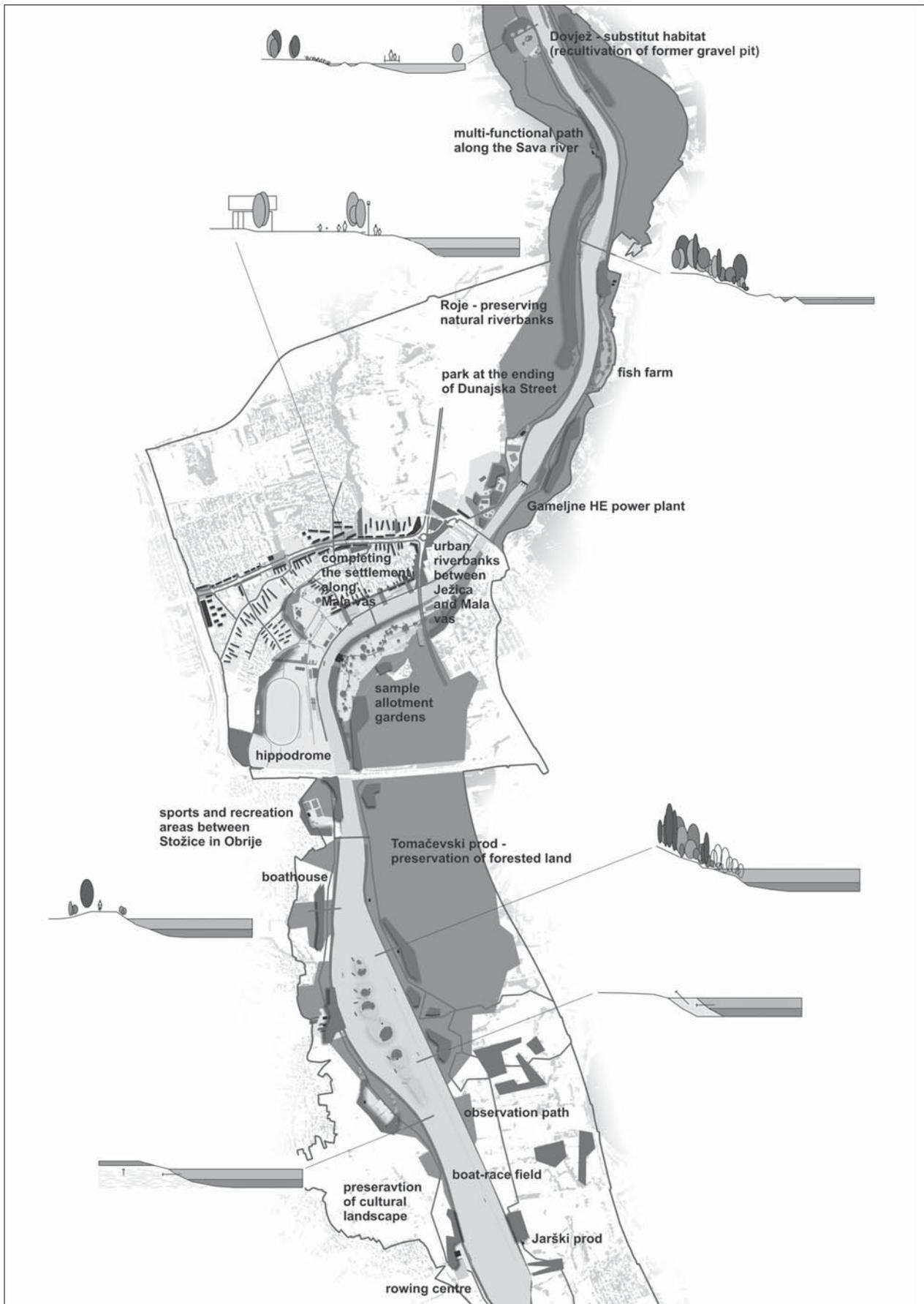


Figure 4: Layout of the Sava River space with principles of riverbank design (source: Mlakar et al., 2007).

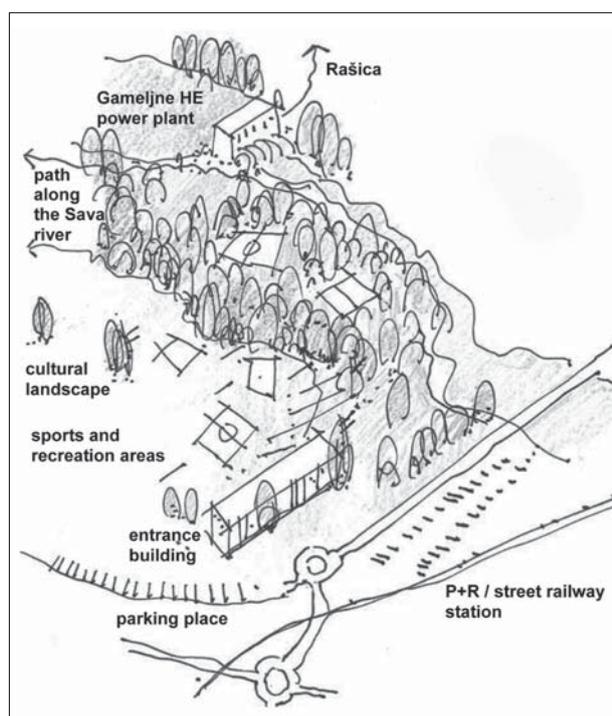


Figure 5: Concept of the urban park at the ending of Dunajska Street (source: Mlakar et al., 2007).

8 Active designing of riverbanks

Guidelines for designing the immediate space of the accumulation were harmonised with solutions proposed in the pre-investment technical-spatial documentation for hydroelectric power plants on middle Sava (Stojič and Kryžanowski, 2007), which was completed parallel to the expert guidelines presented in this article. The most important method is active design of the Sava riverbanks. This means the line and form of the new riverbank aren't conditioned by the random combination of reservoir water level, height and terrain configuration, but adaptations to specific environmental characteristics and land use demands. The design of riverbanks can be summarised in several principles (Figure 4) that can be applied in particular segments of the accumulation and combined or adapted to real conditions of the physical space:

The principle of riverbanks without special design is possible only in the sections where there are no specific limitations, safeguarding clauses for particular spatial features or necessary adaptations to infrastructure.

The principle of preserving natural riverbanks can be used in areas that are crucial for nature protection. Natural riverbanks are to be preserved to the utmost. This means that the extant level of the Sava River should be maintained or could be raised to a level that doesn't compromise the natural features. This principle should be applied mostly in the Roje area.

The Principle of increasing the reservoir volume by gravel excavation is the principle that can be applied if the water

level or width of the reservoir on other parts of the accumulation has to be limited because of nature protection regimes, while adequate quantities of water are nevertheless needed behind the dam for power plant operation. The principle should be applied also for execution of other simultaneous developments (for example the rowing field in the Jarški prod area). The obtaining of such material would be seen as exploitation of a natural resource. It could be used for building and developments within the hydro-electric power plant development project or as an independent activity, whereby the activity of excavating gravel would be stopped for a certain period in other dedicated areas.

The Principle of raising agricultural land at the edges of the accumulation should be applied if the water table would rise because of the higher level of the Sava River, thus compromising agricultural activities. The principle should be used in combination with another measure tied to water movement and changed water table characteristics, i.e. watertight curtains. In the project area this principle will probably be applied in the Sneberski prod area.

The Principle of developing multi-purpose paths along the riverbank should be applied alongside the entire chain of hydro-electric power plants, wherever it is suitable for recreational uses and simultaneously feasible in view of spatial constraints. In general the path should follow the path needed for maintaining the dams and dykes. Its width and method of levelling can vary, depending on the type and scope of use.

The Principle of developing (flood containment) dykes should be used in parts, where the hinterland of the accumulation (settlements, agricultural land and infrastructure) will have to be protected from high waters or to limit the reservoir width. In certain parts (e.g. between Ježica and Sneberje) low embankments (from 1:10 to 1:30) should be built to ensure safeguarding of the landscape characteristics and enable access to the river.

The Principle of developing protective walls should be applied in particular areas where the rising level of the Sava River could endanger nearby residential and economic buildings (if proven that such protection would be more rational than their removal) and infrastructure (roads, railway and bridges).

The Principle of developing sustainable park surfaces could be used in parts of the accumulation alongside urbanised areas, such as Brod, Ježica, Mala vas and Stožice. Introduction of street furniture is possible.

The Principle of creating substitute habitats is an alleviation measure for important nature protection areas because of loss of living environments, above all sand banks, back waters, spawning pools and wetlands. The provision of substitute habitats is proposed for the gravel separation in Dovjež and the Beričevo pastures (which is outside the project area dealt with in the expert guidelines, but nevertheless an important link for the comprehensive development of the Sava River area).

9 Conclusion

The expert guidelines showed high and multi-layered development potentials for the project area and simultaneously stressed the obligation to preserve quality landscape characteristics of the Sava River space. Degraded urban and inadequately used spaces in the northern stretch of Bežigrad also prove to be areas of sensible renewal. The guidelines for renewal lie in the redefinition of Dunajska Street into a public space of an urban artery, but simultaneously it would be sensible and possible to comprehensively rehabilitate the wider area along the central traffic artery and particular areas in its hinterland along the Sava river with respect to quality urban rudiments and safeguarding of landscape characteristics at the settlement edges.

The solutions in the expert guidelines respect the construction of hydro-electric power plants as one of the legitimate spatial interests. The purpose of expert guidelines wasn't to judge the validity of these spatial developments but to actively participate in their planning. This means early activation of environmental (protection) mechanisms and measures for ensuring synergetic effects on spatial planning and decision-making processes. The fact remains that the Sava River space is spatially and environmentally exceptionally vulnerable and that negative effects of the hydro-electric power plants are substantial. Early establishment of environmental influences on spatial development is the basis for planning the development, whereby environmental degradation can be diminished and simultaneous spatial development enabled. Although the purpose of such expert guidelines is above all the advancement of safeguarding directives, public interests and guidelines delivered by independent spatial planning stakeholders, their findings can be applied as warnings to investors about necessary further activities, which are recommended to avoid conflicting circumstances. Thus, by the process of spatial planning also the economic efficiency and legal security of the planned investment can be increased.

It is of key importance to understand the chain of hydro-electric power plants on the Sava River as a multi-layered project, i.e. not only in its immediate energy production sense, but in its widest spatial and social context. In the preparation of the pertaining spatial planning act the most important endeavour will be the formation of a suitable partnership and guarantees given for the active role of the city, which shouldn't be limited to the usual submission of guidelines by spatial planning stakeholders.

An important fact is that we have to be aware that a spatial plan cannot and shouldn't manage only a narrow area, needed for the implementation of hydro-electric developments, but has to manage the entire Sava River space. Clear definition of goals is key, which is a precondition for successful continuation of the planning process. One of the primary tasks of spatial planning is harmonisation of interests in space. These will undoubtedly have to be harmonised even before preparation of the national spatial plan begins and will have to be evident in clear spatial concepts at all levels. Resolving differences in later planning stages would be financially and time-wise too demanding and the results unpredictable.

Hereby we have to point out the simultaneous implementation of measures for achieving planned developments and the project approach. Spatial projects are seen as instruments of direct, comprehensive spatial development in a given area. The project approach disallows coincidental development, ensures management of land property relations and is the key factor in strategic safeguarding, development, clearing, rehabilitation, increasing living qualities or market competitiveness of space, where ordinary regulation doesn't allow realisation of spatial development goals. In short, it ensures certainty of implementation of the planned. To reduce uncertainty of procedures and results of spatial planning it will be necessary to establish or define:

1. Relevant interests in spatial management (environment, nature, cultural heritage) and other spatial groups (e.g. administrative, aesthetical, ecological, historical, narrative, recreational, economic, increase in living quality, interest groups and individuals ...), which should be adequately included in the procedures of preparation of the national spatial plan. Thus uncertainty can be diminished concerning respect for particular interests.
2. Operative development programmes, which will facilitate implementation of interests – real set of activities, uses and development projects. Thus uncertainty can be diminished concerning implementation of particular interests.
3. Goals of protection and development (e.g. preventing the destruction of particular entities, changes into the desired condition, enabling use of parallel activities, improving accessibility, increasing distinctness, increasing educational and economic potential, adaptation to different users, support for other projects, integration in education programmes, resolving real issues ...). Thus uncertainty can be diminished concerning definitions of particular contents of the detailed spatial plans.

Because of its natural characteristics, preserved cultural landscape and good accessibility the area along the Sava River has great potentials for development of leisure activities. It is therefore sensible to design a comprehensive spatial layout directly along the river as the basis and superstructure of the planned hydro-electric power plant installations. Thus the Sava River recreational area, which has been defined as such in planning documents for a long time, can become feasible.

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