

Comprehensive Renewal Programme for the Historic Urban Core of the City of Zagreb



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for the Historic Urban Core
of the City of Zagreb



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1

Foreword

The earthquakes that hit Zagreb in 2020 caused the greatest damage to the most vulnerable part of the urban structure - the historic city core. As many times in history, a natural disaster accelerated processes that were needed but had been delayed for years.

The formal framework for creating the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb was the Act on the Reconstruction of Earthquake-damaged Buildings in the City of Zagreb, Krapina-Zagorje County, Zagreb County, Sisak-Moslavina County and Karlovac County. The above-mentioned act appoints the Institute for Physical Planning of the City of Zagreb as the programme developer.

The Institute did not focus its work on the Programme on the rapid remediation of damage caused by natural disaster, but instead immediately began to reflect on the long-term process of comprehensive renewal of the historic urban core in cooperation with multidisciplinary expert groups. A total of 15 interdisciplinary teams with almost 200 scientists and experts participated in the research.

An ambitious vision of the urban development of the green city centre was set already at the beginning of the Programme development. The document set the year 2050 as its horizon, and it aimed to be fully aligned with the EU Green Plan and EU policies aimed at climate neutrality.

The Programme scope in terms of space includes 168 Lower Town blocks and 36 *insulae* of the Upper Town and Kaptol, which is a total coverage of over 400 hectares. The specific characteristics of the area required a different elaboration of the Programme for the area of the Lower Town and for the area of the Upper Town and Kaptol.

The numerous layers of challenges that the earthquake only disclosed and that physical planners and other experts faced in the task of considering the comprehensive renewal of the historic urban core, calls for new approaches. During the Programme development, the Institute inaugurated an urban/planning breakthrough by introducing a series of topics that until then were not an integral part of the physical planning regulatory framework or urban practice, such as early participatory processes, connecting urban and strategic planning, energy transition, adaptation to climate change, economic and property-right relations possibility of implementation, principles of the 15-minute city and circular management of buildings and space.

With regard to the historic urban core, expert interdisciplinary teams researched and elaborated: structural models of renewal (seismic hazard and stability of the existing building stock - age and maintenance), conservation models of renewal (models of protection and preservation), design models of renewal (affordable housing and sustainable mixed amenities), models of improving mobility and transport systems (sustainable mobility), models of preserving identity systems, models of improving the quality of life (sociological analysis), models of energy efficiency, energy transition and decarbonisation, models of adaptation and mitigating the consequences of climate change, models of circular management of buildings and space, models of quality planning and management of the development of green infrastructure by introducing Nature-based Solutions, property-right relations models and the feasibility of solutions, and models of possible financing.

Bearing in mind the wide array of topics and sectors covered by the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb, its role in steering planning activity with a high degree of respect and consensus of various professions and the inclusion of local residents in all phases of the planning process is evident.

This Programme was created as a proposal for the rehabilitation, reaffirmation and repositioning of the urban planning profession and urban plans in solving the spatial challenges that lie ahead. The synthesis of individual recommendations, guidelines and prerequisites is presented at the level of short-term, medium-term and long-term measures for eleven thematic areas, regardless of whether they relate to urban planning or spatial management.

The Programme does not have an implementation character, but it represents a good starting point for comprehensive changes to the General Urban Plan of the City of Zagreb, which are underway and in which we will be able to address part of the spatial challenges. The special planning challenge for us (as a parallel planning task) is the initiation of the development of an urban and conservation plan for the urban renewal of the Historic Urban Core of the city of Zagreb, in which most of the findings, guidelines and recommendations of these background expert documents could be incorporated to give them an implementation dimension.

And finally, since I was not personally involved in devising the content structure and framework of the Programme from its inception, I would like to thank the leaders of the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb at our Institute - colleagues Jadranka Veselić Bruvo, PhD and Nives Mornar, who created the matrix of Programme tasks and expert groups, coordinated and led the preparation and realisation of the planning synthesis, and who are most meritorious for the comprehensiveness and management of this project.

Nikša Božić, MArch

Head, Institute for Physical Planning of the City of Zagreb

2

Introduction

The urban renewal of the existing protected urban fabric of the Upper Town and Kaptol and the Lower Town, the most valuable historical, cultural, urban and identity heritage of the City of Zagreb, represents the biggest challenge in recent city history. The city's medieval area and the city as it was in the late 19th and early 20th century should be secured against the highest possible seismic loads, while preserving its appearance and making it the most attractive city area for living, working and visiting.

To rehabilitate, reaffirm and reposition urban planning, for the first time in more than thirty years, the Institute for Physical Planning of the City of Zagreb gathered a wide multidisciplinary platform of scientists and experts to draft a proposal for an urban vision and a comprehensive programme of renewal and development of the historic urban core.

In addition to renewal which primarily focuses on achieving the highest degree of safety of the building stock while respecting the preservation of morphology, ambience and atmosphere of the city and achieving sociodemographic balance, urban planning ambitions also aim at modernization in the form of green development and accelerated energy transition to renewable energy sources and climate neutrality.

The Comprehensive Renewal Programme became a thematic and substantive breakthrough in contemporary urban planning practice by using a method of thematic modelling of the space of the Historical Urban Core of the city of Zagreb and interdisciplinary programming of spatial values, constraints and sustainable urban potentials, and a new platform was created - **urban programme agenda - principles as well as recommendations and guidelines** as a way of achieving **development goals of comprehensive urban renewal** of the Historical Urban Core and the City of Zagreb as a whole.

After gathering **thematic data** and conducting **fundamental analyses**, identifying **development-related issues and needs**, and establishing **strategic goals** to be achieved, **projects, measures**, and **activities** reflecting the ways to achieve the said goals are proposed and **requirements** for their realization highlighted.

The components of sectoral research and thematic spatial modelling are: seismic hazard and stability of the existing (aged and poorly maintained) building stock - structural models of renewal, protection and preservation models - conservation models of renewal, affordable housing and sustainable mixed amenities – design models of renewal, models of improving mobility and transport systems / sustainable mobility, models of preserving identity systems, models of improving the quality of life - sociological analyses,

“It is not only about the renewal of houses and monuments, but also about the restoration of the living habitat in which 37,000 inhabitants live and it should remain so, because without inhabitants the city is just an empty shell.”

(Academician Branko Kincl, Croatian Academy of Science and Arts, Scientific Council for Architecture, Urban Planning and Spatial Planning, 16 April 2020)

models of energy efficiency, energy transition and decarbonisation, models of adaptation and mitigating the consequences of climate change, models of circular management of buildings and space, models of quality planning and management of green infrastructure development by introducing NBS (**Nature-Based Solutions**) system with regard to the pluvial flooding drainage, property-right models and the feasibility of solutions and models of possible financing.

By parallel management of multi-sectoral processes via the proposed **participation platform** involving all active participants in the City planning process, a **comprehensive pattern / model** was generated according to which the activities of identifying **principles** and drafting **recommendations and guidelines** aimed at achieving **development goals** of comprehensive urban renewal as well as establishing the criteria for prioritisation / evaluation of projects and activities (short- term, medium- term and long-term) and ultimately determination of **performance indicators** for implementation monitoring and evaluation.

Bearing in mind the wide array of topics covered by the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb, its role is evident in steering the planning activity, depending on the goals and priorities in accordance with the Vision of Urban Renewal and Development – **GreenCentre 2050** and on thoughtfully and carefully balanced regeneration, revitalisation and reconstruction projects with a high degree of respect and consensus of all professions and the inclusion of residents from the very beginning of the process.

The programming of the comprehensive urban renewal of the Historic Urban Core of the city of Zagreb is focused on integrating urban and strategic planning, namely on the improvement of the spatial and urban layer by adding the economic component and the sustainable solutions feasibility component, all in accordance with the new climate / energy policies that have not been notably present in physical planning until now. At the same time, strategic planning gets the necessary spatial platform and framework.

This Programme provides frameworks for a sustainable manner of space usage, conditions for the use, protection and management of space, and it will represent an urban expert base / planning basis for the creation of a new generation of physical planning documents and/or drafting of amendments to the existing ones, especially of the General Urban Plan of the City of Zagreb, focused on climate neutrality in 2050.

2.1 Legal Basis

The Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb is drafted in accordance with Art. 12, paragraph 3 of the Act on the Reconstruction of Earthquake-damaged Buildings in the City of Zagreb, Krapina-Zagorje County, Zagreb County, Sisak-Moslavina County and Karlovac County (Official Gazette No. 102 /20, 10/21, 117/21). Based on the same provision, the Institute for Physical Planning of the City of Zagreb has been entrusted with drafting of the Programme. Based on the conservation evaluation and the degree of earthquake-caused damage on buildings - blocks - *insulae*, it is necessary to propose sustainable models of renewal.

Also, Art. 102 of the applicable General Urban Plan of the City of Zagreb (Official Gazette of the City of Zagreb No. 16/07, 8/09, 7/13, 9/16 and 12/16 – consolidated version) establishes the obligation to prepare a comprehensive study of the Lower Town area as a basis for drafting of the physical planning documents.

Although most European cities started urban renewal processes and systematic and structural transformation of their degraded central city areas 30-40 years ago, the City of Zagreb has not yet begun the process of comprehensive and systematic renewal and revitalisation of its centre.

2.2 The Scope of Drafting the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb

By analysing

- administrative boundaries: boundaries of the Lower Town and Upper Town – Medveščak city districts,
- protection boundaries: conservation-based boundary of the protected Historic Urban Core of the city of Zagreb,
- protection system boundaries: zoning of the area of cultural asset into protection system zones “A” and “B”, and
- analytical bases and planning solutions: the scope boundaries used for drafting the Urban Development Plan for the Lower Town (draft, 1989) and the Urban Development Plan for the planning and revitalisation of the Upper Town and Kaptol (1979),

and on the basis of prioritising the functional spatial units of the Lower and Upper Town and Kaptol and the possibility of comparative analyses with spaces covered by plans from the 1970s and 1980s for the scope used in

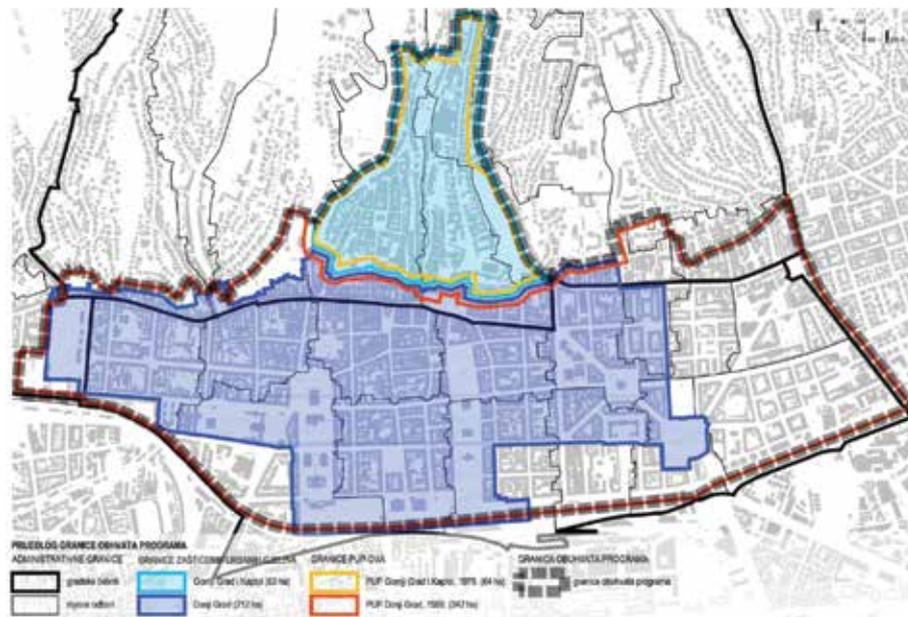


Fig. 1: Cartogram – Analysis of the scope used in Comprehensive Urban Renewal Programme development

The area of the Lower Town scope is 351,58 hectares and of the Upper Town and Kaptol 58,44 hectares (totalling an area of 410,02 hectares).

drafting of the Comprehensive Renewal Programme for the Historic Urban Core, the scopes determined in previously drafted implementation plans were aggregated.

The researched area in terms of space includes 168 Lower Town blocks and 36 *insulae* of the Upper Town and Kaptol.

The area of the thoroughly researched area of the Blok_19 Pilot Project is 3,245 hectares. The block area is delineated by Ilica, Frankopanska, Dalmatinska and Medulićeva streets, for which two scenarios of a possible design models of renewal were created, all with the aim of exploring spatial options).

2.3 Strategic, Physical-planning and Other Documentations

The background for the research and development of the Comprehensive Renewal Programme for the Historic Urban Core is the existing strategic and physical planning documentation on the area:

- Development strategy of the City of Zagreb (strategic goal 4 Improvement of spatial quality and functions of the City; strategic goal 6 Improvement of the development management system);
- Development Strategy of the Zagreb Urban Agglomeration (strategic goal 3 Improvement of the environment, nature and space management);
- General Urban Plan of the City of Zagreb (Official Gazette of the City of Zagreb No. 16/07, 8/09, 7/13, 9/16 and 12/16 – consolidated version) establishes in Art. 102 of the applicable General Urban Plan of the City of Zagreb the obligation to draft a comprehensive study of the Lower Town area as the basis for the drafting of physical planning documents;

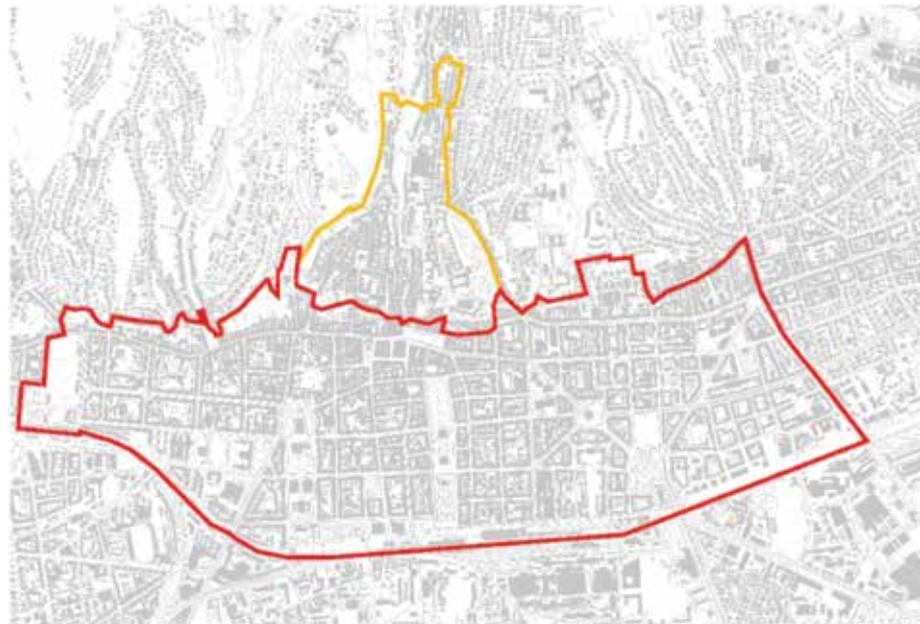


Fig. 2: Cartogram – scope: the Lower Town (red line), Upper Town and Kaptol (yellow line)

The last detailed plans for the Historic Urban Core of the City of Zagreb were prepared in 1979 (Urban Development Plan for the development and revitalisation of the Upper Town and Kaptol) and 1989 (Urban Development Plan for the Lower Town)

- Catalogue Zagreb_Lower Town_Blocks, Institute for Physical Planning of the City of Zagreb, 2009; reprint 2020;
- Urban Development Plan for the Lower Town, Urban Planning Institute of the City of Zagreb, 1989;
- Urban Development Plan for the development and revitalisation of the Upper Town and Kaptol, Urban Planning Institute of the City of Zagreb, 1979;
- Studies, architecture and urban design competitions and draft physical-planning documents: City Centre Development Programme (CDP), Urban Planning Institute of the City of Zagreb, 1967; Urban Development Plan (UDP) of the city centre, Urban Planning Institute of the City of Zagreb, 1971;
- Individual urban development plans or programmes for creating urban development plans.

The existing strategic, physical and urban planning documentation is an unavoidable starting point for reflection on and proposing of a new planning framework.

Most of the development challenges that preoccupied urban planners already forty years ago are still topical nowadays. However, a completely different political platform, economic and ownership system, a more considerate attitude towards space, new standards and requirements as well as the use of the state-of-the-art technological solutions, a return to an interdisciplinary approach to physical planning with the important role of participation of residents and stakeholders from the very beginning of the programming and planning process, call for a different approach and a new planning paradigm.

2.4 Conservation Basis

An integral part of the General Urban Plan of the City of Zagreb is the Conservation Basis - General and special conditions for the protection and preservation of immovable cultural assets, prepared by the City Institute for the Conservation of Cultural and Natural Heritage (September 2004-September 2008; revision 2010; addition 2012; amendments 2015).

The Conservation Basis established the protected Historic Urban Core of the city of Zagreb, and valorisation was conducted according to the principle of conservation and value of the spatial and architectural structure, as well as the zoning of the area of cultural asset into protection zones “**A**” (Area of exceptionally well-preserved and particularly valuable historical structure) and “**B**” (Area of different degree of conservation of historical structure).

As a cultural asset, the Historic Urban Core of the city of Zagreb is characterised by historical stratification and diversity of morphological, typological, spatial and ambience characteristics of individual areas, as well as the diversity of the degree of value and preservation of the historical structure.

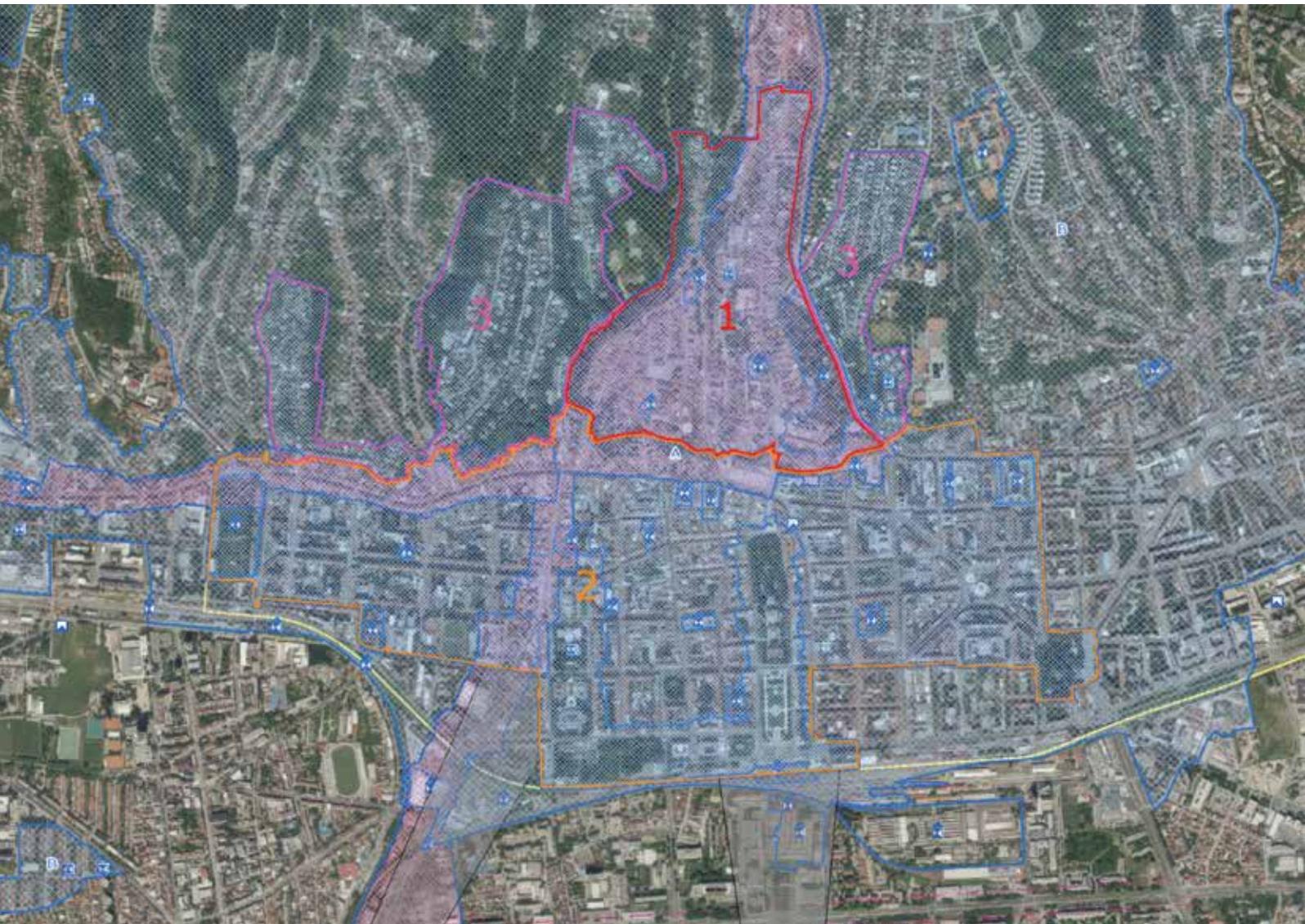
Considering the above-mentioned characteristics, the Historic Urban Core of the city of Zagreb was zoned, and the following protection systems were defined:

“A”- An area of exceptionally well-preserved and particularly valuable historical structure that applies to spatial and architectural structures of pronounced urban design and architectural, cultural and historical, landscape or ambience values, of have pronounced significance for the city image, and with a building substance of high monumental value that, as the architectural heritage of Zagreb, defines its historical urban matrix, thus this system of protection encompasses the historical core of the Upper Town and Kaptol with historical lower suburbs and the central city square, and the area of the Lower Town, which was planned and mostly completed by the end of the 19th century.

This zone corresponds to the regime of comprehensive conservation protection of the historical urban structure, landscape features and individual buildings, within which it is necessary to preserve all the important characteristics of the spatial and architectural structure, determined by the topography, historical architectural substance and diversity of uses and amenities.

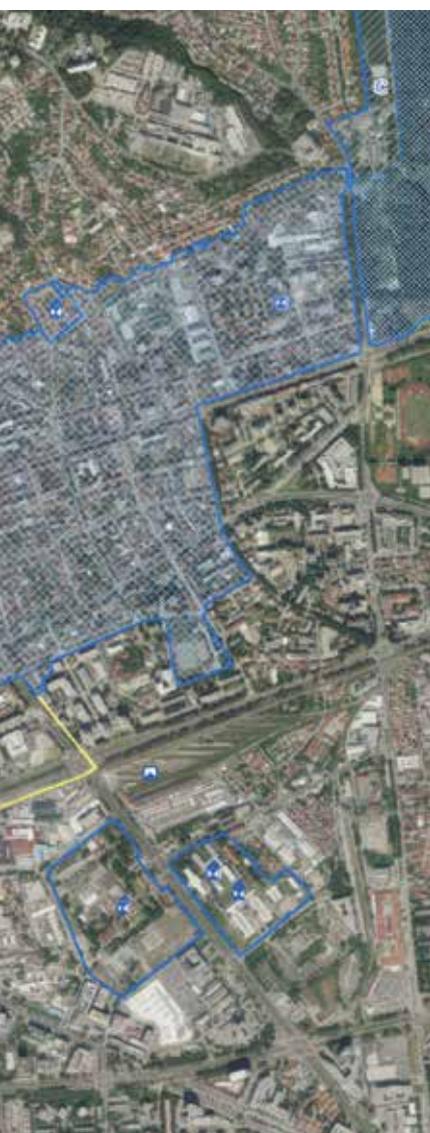
The protection resulting from the monument properties of the historical urban structure, landscape and ambience values, and individually protected cultural assets must be carried out comprehensively, which implies preservation and

Fig. 3: Cartogram – Conservation Basis:
Historic Urban Core of the City of Zagreb



“Since the earthquake, the qualification for area “A” has no longer been “an area of exceptionally well-preserved and particularly valuable historical structure”, but rather an area of heavily damaged architectural structures.”

(Snješka Knežević, Ph.D., art historian and retired scientific advisor, 2023)



restoration of the original characteristics, the elimination of causes and consequences of vulnerabilities and ensuring the optimal monument characteristics presentation of the cultural asset.

The Conservation Basis establishes general protection prerequisites as well as special protection requirements for the areas 1 - the Upper Town and Kaptol and 2 - the Lower Town.

All interventions in spatial and architectural structure in the historic city centre for the area of the Upper Town and Kaptol as a completely morphologically and structurally defined space are conditioned by the obligation to respect preserved values and to integrate into such a historically conditioned environment.

All interventions in spatial and architectural structure in the Lower Town area as a completely morphologically and structurally defined space are conditioned by the obligation to respect and promote the value of the space - urban concept elements and historical matrix, historical architectural structures, and integrating the intervention in such a historically conditioned ambience.

Detailed conservation prerequisites on and studies of the block must be drafted for all complex planning interventions in the area of zone “A” of the Historic Urban Core of the city of Zagreb that significantly change the spatial and architectural structure / morphology.

Since the earthquake, the qualification for area “A” has no longer been “an area of exceptionally well-preserved and particularly valuable historical structure”, but rather an area of heavily damaged architectural structures, while its urban structure (blocks, *insulae*) has remained preserved. Therefore, when considering the renewal, the criteria of all intervention types for renewal of architectural structures should be considered, as well as the possible change of the urban structure that could happen by the renewal.” (Snješka Knežević, Ph.D., art historian and retired scientific advisor, 2023: A Review of the study Topography of the Identity of the Historic Urban Core of the city of Zagreb, Prof. Bojan Baletić, Ph.D., Faculty of Architecture, University of Zagreb, January 2023)

“B” Area of different degree of conservation of historical structure

applies to parts of the Historic Urban Core of the city of Zagreb with valuable elements of historical and architectural structures of preserved to a different degree.

In this area, a system of partial conservation protection is applied and interventions are allowed in terms of adapting functions and amenities to modern needs, but without significant changes to the preserved elements of historical structures.



3

Drafting Process and Methodology: Innovative Approach to Urban Planning – Green Urban Renewal

3.1 The Term “Urban Renewal”

Urban renewal entails a series of planning measures and prerequisites aimed at addressing the functional and qualitative transformation of economic, social, cultural, and environmental deficiencies within the degraded central historical area of the city. Urban renewal is a long-term process of rethinking the reconstruction concept of the entire area through a comprehensive, systematic renewal.

Most European cities initiated these processes of long-term systematic and structural transformation of their central historical areas some 30-40 years ago, when, in response to the demographic stagnation in cities, they switched from urban expansion policies to the concept of urban consolidation, aiming to raise the quality of neglected and overlooked city areas, including the renewal of the city centres. These processes are now undergoing their final phase.

Although there have been numerous reasons for initiating a comprehensive renewal so far, such as inadequate spatial management, unmaintained existing building stock, poor living conditions, unresolved property rights, inadequate social and age structure of residents (ageing population), buildings lacking elevators, large floor area apartments frequently inhabited by one person unable to maintain the residential building, small households (1-2 family members), a large number of protected tenants, inadequate traffic system (including stationary traffic), poor quality, slow and insufficient public transport, inadequate traffic infrastructure, amenities and activities being increasingly removed or fully absent from the city centre, the trend of touristification and apartmentisation, etc., the earthquake has made an additional push to initiate reflecting on a reconstruction concept for the entire protected Historic Urban Core through a comprehensive and systematic urban renewal encompassing buildings/blocks - *insulae*/, groups of blocks, spatial units, historical area, traffic, amenities, development of blocks and courtyards, public spaces, street sections, as well as demographic revitalisation...

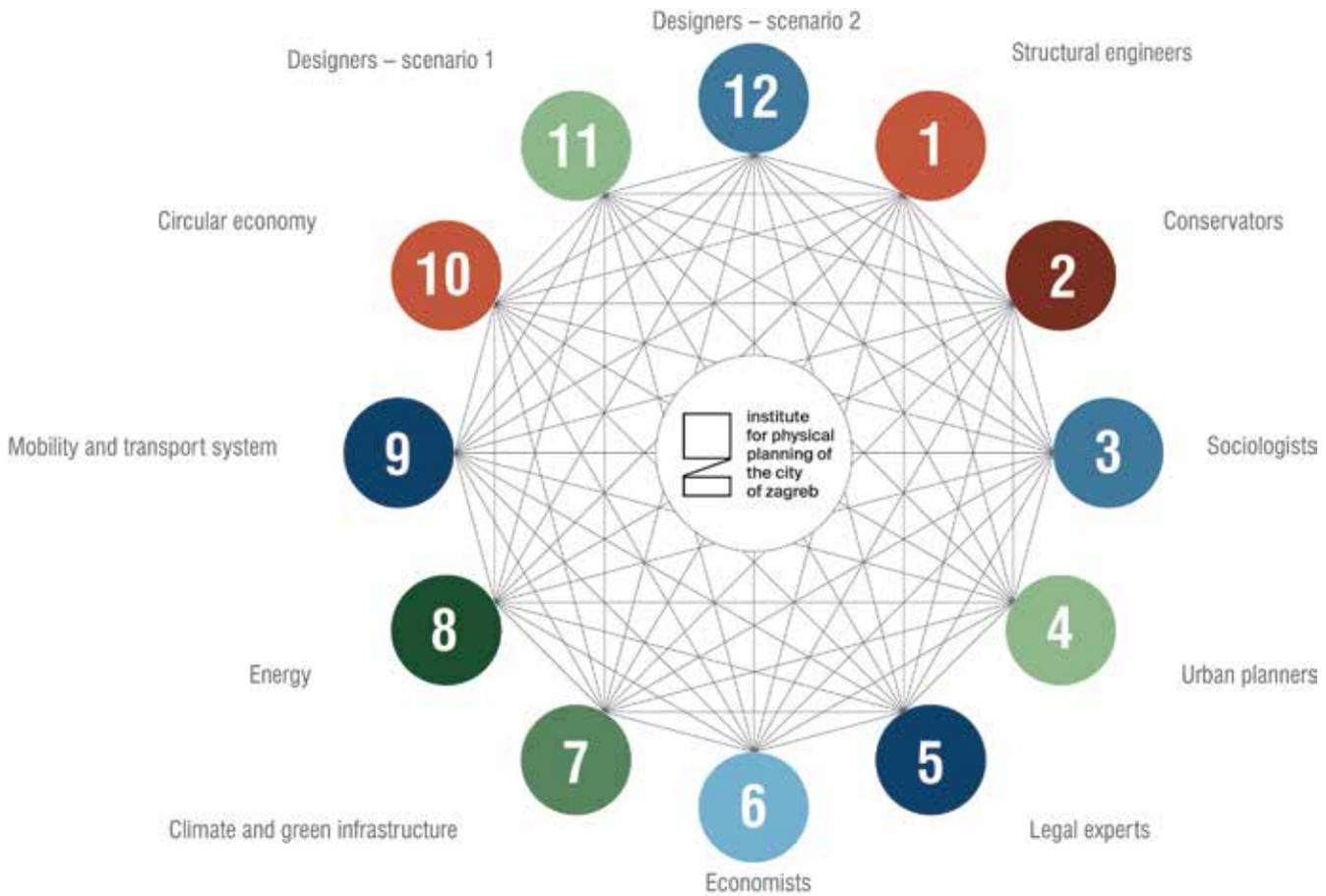


Fig. 5: Inter-sectoral coordination in developing the Comprehensive Renewal Programme

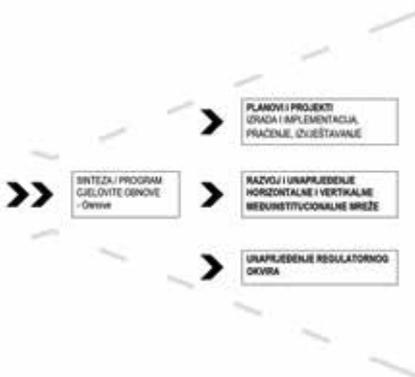
The focal point of our work on the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb is the interaction between urban planning and strategic economic development, i.e. the outcomes of interdisciplinary cooperation *in situ* that impact the urban area.

In particular, we would like to highlight the innovative approach of integrating urban and strategic planning, which we believe would enhance physical and urban planning by adding an economic component and taking into account the feasibility of spatial solutions, all in line with the new climate/energy policies that have not been intensively represented in physical planning so far. At the same time, strategic planning would gain the necessary spatial basis and framework.

In terms of topics and content covered, the Comprehensive Renewal Programme is a breakthrough compared to the previous urban planning practice since it introduces new (and forgotten) issues. As such it is aligned with the EU Green Deal:

- seismic hazard and stability of the existing building stock
- sociological analysis
- climate change adaptation and mitigation
- energy efficiency, energy transition and decarbonisation
- circular building and space management
- property rights and feasibility of solutions
- macro-economic analysis and financing opportunities.

22. OŽUJKA 2021.



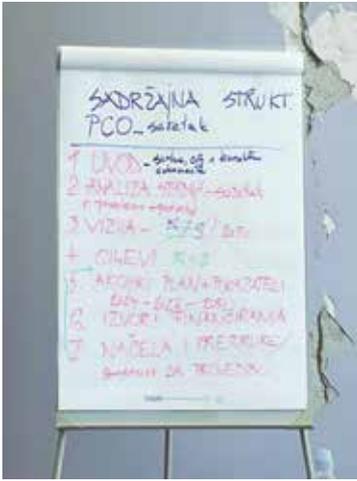


Fig. 6: Cross-sectoral coordination. Institute for Physical Planning of the City of Zagreb, October 2022

Using the thematic mapping method for the Historic Urban Core of the city of Zagreb and interdisciplinary programming of values, constraints and sustainable urban potentials, a new platform was created – consisting of an urban planning agenda, projects, measures and activities aimed at achieving the developmental goals for the Historic Urban Core and the City of Zagreb as a whole.

At the same time, the integration of physical planning measures was proposed in the Climate Change Adaptation Action Plan to encourage development towards climate neutrality through the creation of Green Renewal Plans for cities and their parts. Such an approach is applicable not only to the Historic Urban Core of the city of Zagreb, but also to other areas of the City of Zagreb as well as other cities across Croatia.

Development scenarios timelines - physical-planning documents by their very nature provide frameworks for interventions in space, but do not determine either sequence or priorities, only the planning framework for action. Thus, urban plans do not include emphases on strategies, priorities, or the steps of spatial interventions, while various solutions or alternative options are, by the definition of unambiguity, difficult to implement without plan modifications.

After gathering thematic data and conducting fundamental analyses, identifying development-related issues and needs, and establishing desired strategic goals, projects, measures, and activities reflecting the ways to achieve said goals are proposed.



Fig. 7: Cross-sectoral coordination.
Faculty of Architecture, University of
Zagreb, January 2023



3.3 Balanced Hierarchical Multidisciplinary Approach to All Sectoral Research

To tackle such a task, experts from all fields were mobilised, forming an integrated professional platform aimed at a comprehensive systematic renewal of the Zagreb city centre that will preserve the urban identity of the Historic Urban Core of the city of Zagreb, its ambience and sights, improve housing and preserve neighbourhoods, ensure carefully planned block amenities and activities, improve mobility and the use of public space, establish a green infrastructure system, enable energy transition and adaptation to climate change, provide a strategy designed for the seismic hazard resilience of cultural heritage buildings and help carry out comprehensive seismic remediation of the valuable building stock of the City of Zagreb as well as prompt a review of

Fig. 8: Field tour of the Block_19,
February 2021





Fig. 9: Poster advertising the survey conducted as part of the sociological research on the Blok_19 Pilot Project.



financing opportunities. In this endeavour, the synergy of science and professionalism, administration, and economy with the timely participation of citizens was of paramount importance. The renewal of the historical areas of the city requires effective and concrete, professionally relevant and science-based efforts lead by renowned experts.

The Institute for Physical Planning of the City of Zagreb devised the operational framework, the organisational structure and set the pace for the Programme execution by dividing it into two key stages: development of the Block_19 Pilot Project and development of the entire Historic Urban Core. Working groups have been formed and work tasks defined. These tasks will be carried out through research and the preparation of studies and expert analyses, to be integrated into a comprehensive report through an intensive cross-sectoral coordination. A financial plan was drawn up. As a 'project' within the project, an interoperable digital (GIS) database is being developed to store the data from all relevant sectors in a way that allows easy data grouping, that is, aggregation, and integration for research and analysis purposes. Additionally, spatial solutions are proposed as part of this effort.

Fig. 10: Meeting of urban planners and art historians, Institute of Art History, October 2020



Fig. 11: Presentation of guidelines for new planning paradigms of innovative urban planning approach— green urban renewal, Days of the Faculty of Architecture, April 2021



The work on the Programme evolved through simultaneous activities on several levels: detailed sectoral research at the level of the (selected) Block_19 Pilot Project conducted by the majority of the expert groups, at the level of the Historic Urban Core of the city of Zagreb (Lower Town, Upper Town and Kaptol), as well as concurrent research going beyond the boundaries of the Historic Urban Core and having much broader impact zones than a mere block/*insula* unit (mobility and transport systems, macro-economic analysis and energy-related concepts). At the same time, attention was paid to pace for implementation of possible solutions, dividing them into short-term, medium-term and long-term frameworks.

3.4 Participatory Processes

Barely a month after the devastating Zagreb earthquake that struck on 22 March 2020, the Institute for Physical Planning of the City of Zagreb prepared the proposal of the Priority Measures and Activities for Remediating the Earthquake Consequences and the Draft Content and Organisation Framework for the Preparation of the Comprehensive Renewal Programme for the Upper Town, Kaptol and the Lower Town.

The Act on the Reconstruction of Earthquake-damaged Buildings in the City of Zagreb, Krapina-Zagorje County and Zagreb County, adopted (as late as) in September 2020, set out the obligation to develop the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb. As prescribed, the Programme is being prepared by the Institute for Physical Planning of the City of Zagreb.

The Institute efforts on development of that Programme were focused on design of a matrix of programme tasks and expert groups dedicated to deliberation of a long-term process of a comprehensive renewal of the protected Historic Urban Core.

The unique characteristics of the area required an approach tailored to the elaboration of the Programme for the area of the Lower Town in relation to the area of the Upper Town and Kaptol. During the initial phase, the area of the



Lower Town and the Block_19 pilot area were examined, and in the second phase, the areas of the Upper Town and Kaptol were studied, along with general issues important for the entire scope of the protected Historic Urban Core.

In November and December 2020 (during the lockdown due to the COVID-19 pandemic), a sociological survey was conducted (communication with residents and insight into the activities in their neighbourhood, as well as surveying their needs, ideas, suggestions and proposals regarding the area in which they live and work) in the Lower Town involving a convenience sample of tenants and users within the Block_19 Pilot Project, using a mixed methodology (partly face-to-face, partly in direct contact with respondents, and partly through an online survey).

From December 2022 to February 2023, a qualitative sociological survey was conducted for the area of the Upper Town and Kaptol on the quality of life and comprehensive urban renewal and revitalisation of the Upper Town and Kaptol through three focus groups with residents of three local boards in the area (LB Upper Town, LB August Cesarec, LB Nova Ves) and through interviews with experts and stakeholders of particular importance for the urban renewal of that part of the Historic Urban Core (Tourist Board of the City of Zagreb, Zagreb Archdiocese).

During December 2020, the first results of sectoral research were presented, establishing the starting points, directions and visions, key research objectives, cross-sectoral connections, sectoral recommendations, and guidelines for improved further efforts.

The Institute presented the first research results and the first framework projections of the integrated Programme at the First Croatian Scientific Conference on Earthquake Engineering organised by the Faculty of Civil Engineering of the University of Zagreb in March 2021, thereby marking the anniversary of the

Fig. 12: Public forum within the final Programme development stage, Miroslav Krleža Institute of Lexicography, 24 January 2023





Fig. 13: Public forum within the final Programme development phase, Miroslav Krleža Institute of Lexicography, 24 January 2023

devastating earthquake. The guidelines of the new planning paradigm for an innovative urban planning approach - green urban renewal were presented at the Days of the Faculty of Architecture on 21 April 2021.

In July 2021, the Preliminary Report on the Development of the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb was prepared.

The draft Comprehensive Renewal Programme was presented in the City Assembly of the City of Zagreb on 22 March 2022 to the heads of the City's executive and representative authorities, representatives of state and city administration, representatives of the Croatian Academy of Sciences and Arts and other scientific and professional institutions, representatives of professional and non-governmental organizations, and representatives of the media. After the presentation, the draft Programme was presented for a two-month-long public consultation.

A comprehensive public consultation on the draft Programme was held in April and May 2022. During the public consultation, three thematic public presentations with discussions were held (26 April, 5 May and 10 May 2022) at the premises of the Zagreb City Forum (Tribine Grada Zagreba), Kaptol 27.

Additionally, in the second half of 2022, work on three studies covering the Upper Town and Kaptol, as well as additional studies for the integral area of the Historic Urban Core began. After the individual presentations of sectoral research and expert discussions (27, 28, and 29 September and 3 October), a cross-sectoral coordination for the second group of studies was held at the Institute for Physical Planning of the City of Zagreb (21 October 2022).

After further coordination of the expert teams' work, a public forum was organised at the Miroslav Krleža Institute of Lexicography hall on 24 January 2023 to discuss the expert studies prepared in the final phase of work on the Programme. The forum was attended by representatives of state and city administration, local self-government, scientific and professional institutions, and professional and non-governmental organizations.

On 14 February 2023, the Head of the Institute for Physical Planning of the City of Zagreb adopted a Decision to approve the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb (Class: 350-06/23-01/9, Ref. no: 251-470-01-23-1 of 14 February 2023). Following said Decision, the Programme was published on the website of the Institute for Physical Planning of the City of Zagreb, <https://www.zzpugz.hr/program-obnove/>



4

A Vision for Urban Renewal – GreenCentre 2050

The Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb, covering a wide range of topics and sectors, steers the planning activities depending on the goals and priorities in line with the Vision of Urban Renewal and Development [GreenCentre2050](#) and thoughtfully and carefully balanced regeneration, revitalization and reconstruction projects.

The historic urban core of the city of Zagreb in 2050 is the central part of the city. Through the joint effort of the city and state administration, the scientific community, academia, business community, residents and users, it has grown into:

1. **a well-maintained and safe, attractive and lively** urban space desirable to live in;
2. **a multifunctional urban space** with a balanced share and distribution of amenities built around the needs of residents, users and visitors;
3. **an urban space that ensures sociodemographic vitality, inclusiveness and consideration** by retaining old and attracting new residents and users;
4. **an urban space that has embraced the next level of modernisation and transformation** – structural transformation and adaptation of the existing construction (demolition of substandard buildings, modern infills, reconstruction to improve safety, accessibility, evacuation and quality of life), while preserving the historical identity by protecting the most important urban and architectural values and reaffirming and creating the system of accessible and connected public open spaces;
5. **an urban space which has undergone a circular and innovative renewal and transformation** and achieved the highest standards of safety, security/conservation, aesthetic and energy criteria of quality and comfort of living;
6. **a leader in energy transition, digitalisation and economic development** of the City, region and state by supporting high value-added sectors reflecting global trends and the needs of smart and green cities;
7. **an urban space that has reached climate neutrality** by decarbonising infrastructure systems, reconstructing utility infrastructure and renaturalising space by applying Nature-based

Solutions – NBS (landscaping the existing and new public parks, planting new alleys, turning “grey” infrastructure into “green”, creating green neighbourhood oases);

8. **an urban space relieved of transit car and freight rail transport**, adapted largely to pedestrians and cyclists with a modernised, decarbonised and efficient integrated public transport in which the city railway plays a vital role;
9. **an urban space with a redefined central part of the Upper Town**, based on a new vision and concept of organisation, transformation and use of space to benefit residents, users and visitors (relocation of state administration institutions outside the Upper Town and making the abandoned facilities functional to further address public and social needs);
10. **the capital’s most desirable neighbourhood to live in and an example of urban renewal**, which has put it on a par with other European capitals.



Development vision GreenCentre 2050

24/7 city attractive for its citizens,
visitors and investors
urban sustainability - green, inclusive,
adaptable and resilient city

15-minute city
DtZgApp - City as an app

Zagreb - climate neutral city by 2050
... or sooner?

renewal as a driver of economic growth
energy transition towards
renewable energy
**circular management
of buildings and space**

**block with an identity and a distinctive
character - art block / sculpture park**

programming block amenities

new modernisation - structural transformation

vital urban centre

seismically resistant existing
building stock

decarbonisation

innovative, smart and green city

city with a multifunctional network
of green infrastructure elements



5

Comprehensive Urban Renewal Goals. Measures.

As the urban development needs and challenges have been identified, and the long-term vision for urban renewal of the Historic Urban Core of the city of Zagreb – **GreenCentre 2050** created, five clear goals for comprehensive urban renewal were set, along with 54 corresponding measures planned to help achieve the goals.

Urban renewal goals

C1.

Innovative/circular perimeter renewal and structural transformation of the block/insula interiors

meeting the highest safety, conservation, aesthetic and energy standards and criteria of quality, comfort of living and quality of life

C2.

Sociodemographic vitality, social cohesion and equity

▪ (mixed social structure and age of the population ▪ building stronger social connections ▪ caring for vulnerable population groups ▪ strengthening participatory processes)

C3.

Identity, ambience and distinctive character of the city centre

▪ balanced structural, conservation, ownership and economic requirements for the renovation of buildings ▪ maintaining the residential character of the city centre ▪ balanced residential, business (especially tourist) and public purposes (including public green spaces – public parks and squares) ▪ realising the full potential and redevelopment of neglected brownfield sites ▪ backyard landscaping

C4.

Climate change resilience and climate neutrality by using Nature-based Solutions (NBS)

▪ climate change mitigation and adaptation to climate extremes – heat islands, heat waves, large amounts of precipitation in a short period, strong wind, etc.

- decarbonisation of the energy and mobility systems
- renaturalisation of space
- implementation of Nature-based Solutions and planning the green infrastructure network

C5.

Energy transition and improved circular economy in a smart and green city based on digitalisation

- enabling and encouraging the development of high value-added sectors
- enabling and encouraging the innovative and creative technologies for green and smart cities
- enabling and encouraging investments with positive impact on Croatian production and job growth
- investments in the energy sector to foster decarbonisation
- encouraging investments in climate-neutral and green projects
- digitalisation of all processes

Urban renewal measures

C1.

- C1.M1. Structural transformation and adjustment of existing construction while preserving historical identity and protecting key urban and architectural values
- C1.M2. Encouraging renewal and reconstruction according to the highest seismic resistance and fire safety standards and defining premium standards/ Net Zero Emissions (NZE)
- C1.M3. Encouraging high renewal standards by combining different potential sources of funding and setting up information centres (one stop shop)
- C1.M4. Encouraging the resolution of property right disputes with institutional assistance in finding the best possible renewal model
- C1.M5. Recruiting and organizing the private sector to encourage renewal according to the highest security and aesthetic standards, along with a proactive system of incentives and subsidies

C2.

- C2.M1. Logistics and financial facilitation of a comprehensive renewal of the existing building stock
- C2.M2. Designing a city centre according to the principles of the 15-minute city to make it attractive for people of all ages
- C2.M3. Retaining the existing and attracting new residents and users
- C2.M4. Ensuring accessibility - barrier-free architecture
- C2.M5. Setting up neighbourhood community centres to foster social connections
- C2.M6. Organising forums and info centres to strengthen participatory processes

- C2.M7. Organizing temporary replacement accommodation (when needed)
- C2.M8. Encouraging reconstruction to provide affordable housing for young people and retirement homes with apartments for senior citizens

C3.

- C3.M1. Undertaking scientific research and expert elaboration on all valuable historical buildings, blocks and *insulae*
- C3.M2. Structural transformation and adaptation of existing construction by demolition of substandard buildings, modern infills, annexing to improve safety, accessibility, evacuation and quality of life while preserving historical identity by protecting the most important urban and architectural values (new levels of modernisation)
- C3.M3. Structural remediation of traditional buildings (brick buildings with wooden floor structures)
- C3.M4. Including contemporary urban and architectural interventions (except conservation remediation)
- C3.M5. Maintaining the planned housing function to retain existing residents and attract new residents and users
- C3.M6. Maintaining the key public and social functions
- C3.M7. Architectural restoration of original valuable architectural decorations and equipment and removal of defacement of buildings
- C3.M8. Understanding recognizable character and placing a specific focus on the diversity and richness of ambience in private and public spaces (inner block and insula courtyards), public open spaces (squares and parks), offering diverse amenities and events, and mapping specific areas/environments as smaller sub-centres with distinctive character
- C3.M9. Improving amenities and design characteristics of public spaces for pedestrians and vulnerable groups (children, parents with prams, people with mobility impairments, etc.) to move around and spend time in comfort and safety, while ensuring accessibility, connectivity/ planning public spaces networks

C4.

- C4.M1. Circular renewal, reconstruction and construction reusing materials and solutions for heating, cooling, sanitary hot water and the production of electricity leading to the reduction of greenhouse gas emissions (net-zero emission)
- C4.M2. Switching to more efficient heating and cooling systems (district heating system - DHS, neighbourhood heating substations, etc.)
- C4.M3. Reconstruction and upgrading of infrastructure systems and utilities (water supply and drainage, waste and water management, telecommunication distribution infrastructure, etc.)
- C4.M4. Prioritising zero-emission vehicles (ZEV) (in the historic urban core)
- C4.M5. Limiting and discouraging transit freight traffic and car traffic through the historic urban core

- C4.M6. Introducing electrical transport systems (using renewables) operating in the historic urban core
- C4.M7. Redefining transport networks to create local, individual traffic calming zones for motor vehicles (the so-called *superblocks*)
- C4.M8. Exploring possible capacities and financial models to introduce the stationary traffic zone for people living in blocks
- C4.M9. Prioritising and improving space requirements for mobility of pedestrians, cyclists and public transport (public spaces connectivity and accessibility)
- C4.M10. Humanising streets by expanding pedestrian zones, bike lanes and green infrastructure, thus reducing the domination of cars, and providing block garage solutions for people living in stationary traffic zones
- C4.M11. Introducing the 15-minute city and creating superblocks
- C4.M12. Preserving the existing parks, creating new parks and embracing natural grounds
- C4.M13. Record keeping and preserving the existing and planting new trees (*tree canopy cover*)
- C4.M14. Increasing biodiversity (biosolar roofs, canopies, public transport stops)
- C4.M15. Water management (rain islands, green roofs, public water pumps (known locally as *Franceks*, *Franceki* in Croatian))
- C4.M16. Redefining/introducing (in planning documents) a standard of natural ground for plots and construction of green roofs and façades
- C4.M17. Using high albedo materials for outdoor surfaces (roofs, façades, cladding...)
- C4.M18. Enabling setting up of temporary shade structures in public spaces (in summer)
- C4.M19. Preparing measures and criteria for introducing green infrastructure network
- C4.M20. Preparing measures and criteria for the improvement of existing green areas and creating new ones (by zone and purpose)

C5.

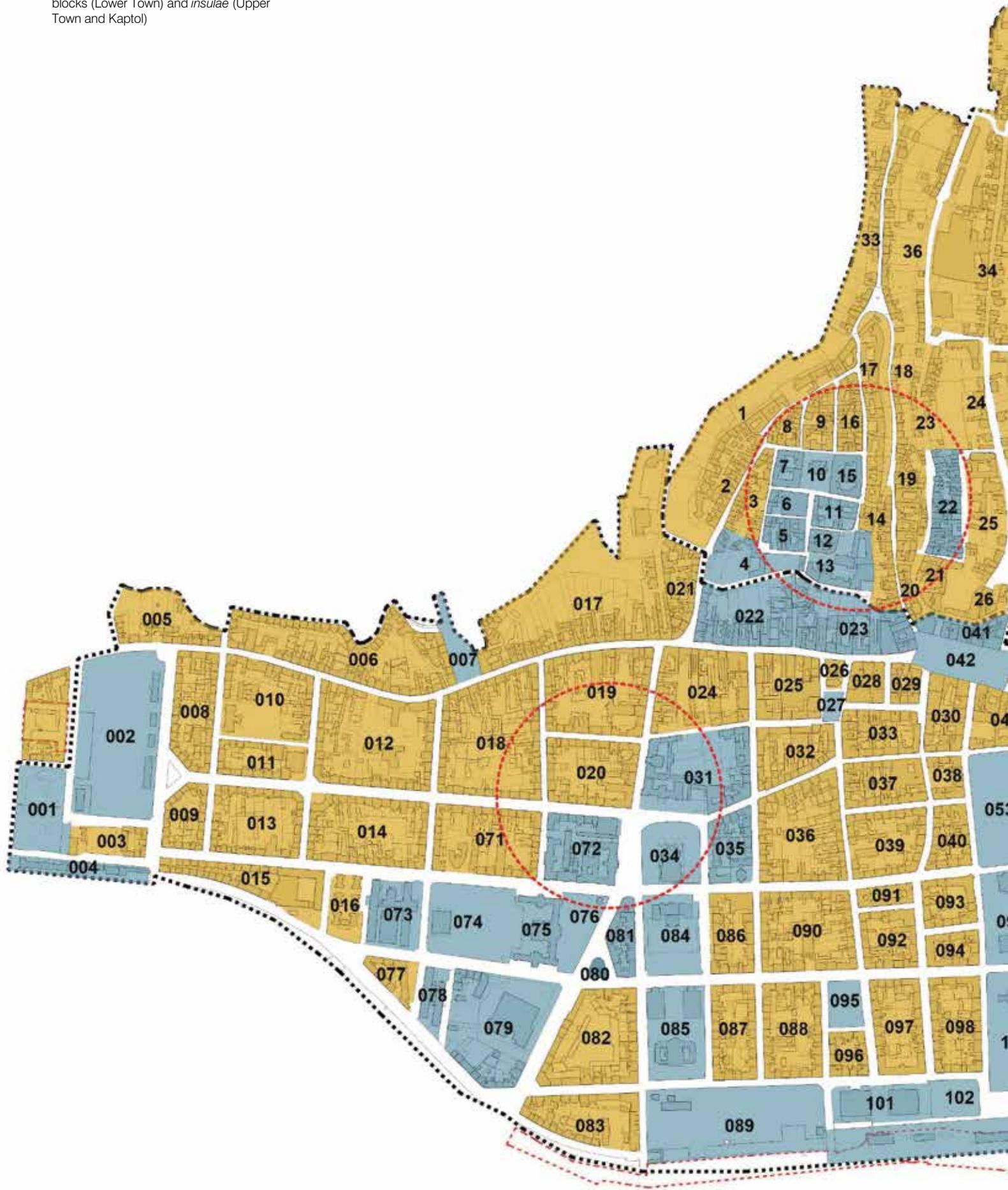
- C5.M1. Developing circular economy and high value-added economic sectors reflecting global trends and the needs of smart and green cities
- C5.M2. Fostering energy transition and energy efficiency
- C5.M3. Establishing the balance between public and private, commercial and non-commercial
- C5.M4. Connecting investments with the Croatian production growth and development of high value-added economic sectors
- C5.M5. Safeguarding traditional crafts and typical small businesses
- C5.M6. Improving utility systems (waste management, etc.)
- C5.M7. Planning and encouraging a gross value added structure with a high share of industries using the state-of-the art technologies and crea-

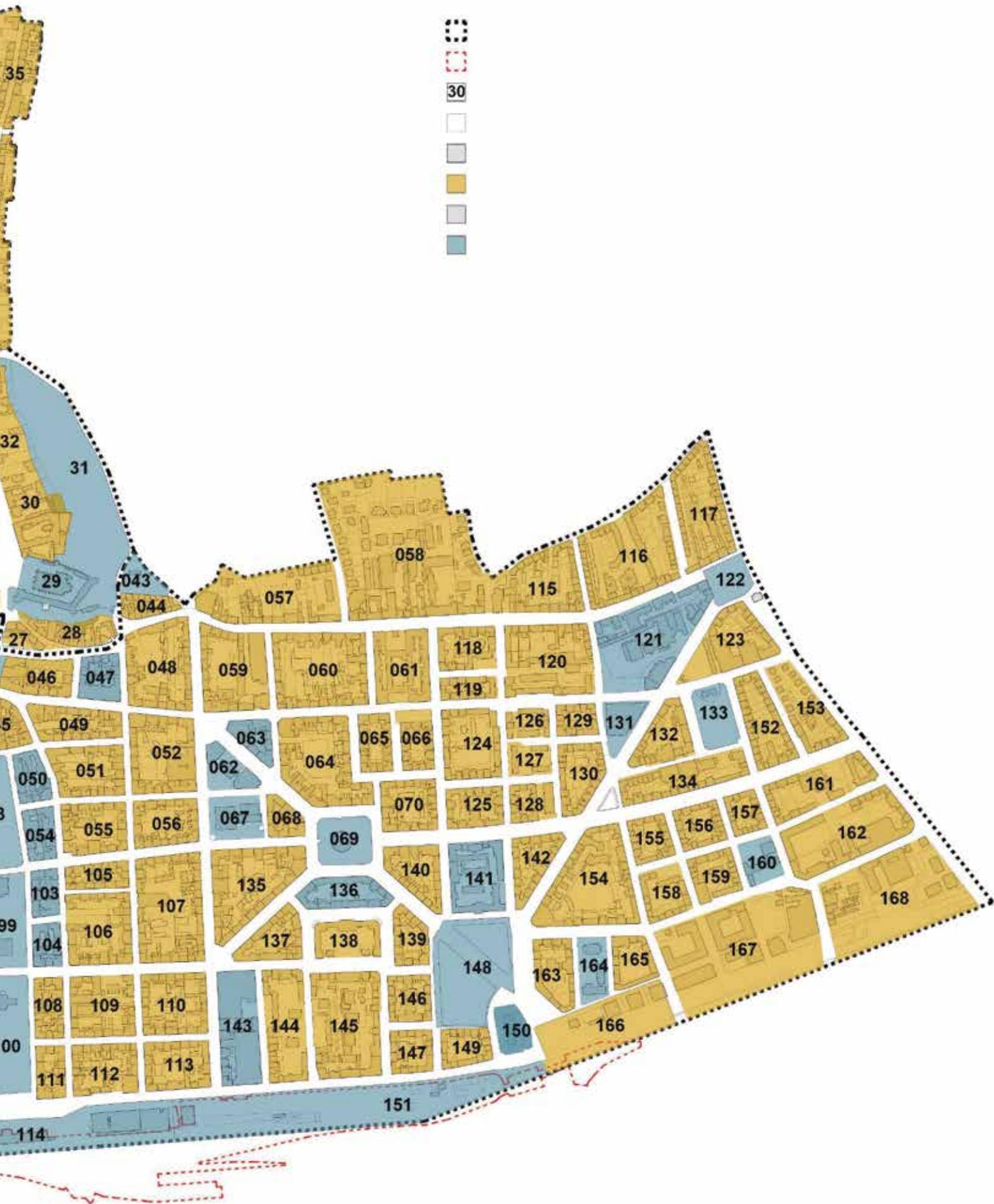


Fig. 14: Orthophoto of Block 19 with marked house identification numbers from the Catalogue of Houses

- tivity, which results in rising added-value per employee, high wages and opportunities to further sustainable development
- C5.M8. Developing specific offers for different age groups of residents and users (silver economy, student population, etc.)
 - C5.M9. Enabling and encouraging the creation of green jobs (jobs related to the energy transition, circular management, etc.), the maintenance of green courtyards, garden centres, design and maintenance of green roofs and green façades, etc.
 - C5.M10. Designing co-living spaces, providing shared residential and outdoor facilities for the residents
 - C5.M11. Developing residential property designed for the rental market rather than the homeowner market
 - C5.M12. Creating and designing flexible workspaces and offices (*co-working*), renting out extra space to other commercial tenants or resident associations

Fig. 15: Cartogram – numeration of blocks (Lower Town) and *insulae* (Upper Town and Kaptol)







6

Renewal Programme Models

Preparing the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb focused on the integration of urban and strategic planning, that is, on the improvement of the spatial and urban layer by adding economic considerations and considerations related to the feasibility of sustainable solutions, all in accordance with the new climate / energy policies, which have previously been under-represented in spatial planning. At the same time, strategic planning has gained the necessary spatial platform and framework.

In terms of the issues and content covered, the Comprehensive Renewal Programme is a leap forward in urban planning practice exercised so far. Using the thematic modelling method for the Historic Urban Core of the city of Zagreb and the interdisciplinary programming of spatial values, constraints and sustainable urban potentials, a new platform was created – **an urban programming agenda - principles, recommendations and guidelines** aimed at achieving the **developmental goals of the comprehensive urban renewal** of the Historic Urban Core and the City of Zagreb as a whole.

Following the collection of **thematic data**, conducting of fundamental **analyses**, identification of **developmental issues and needs**, as well as the establishment of **strategic goals** to be achieved, **projects, measures and activities** required for their implementation were proposed. **Prerequisites** for their realisation were also highlighted.

The components of the thematic spatial modelling include: seismic hazard and stability of the existing building stock (age and maintenance) – structural models of renewal, protection and preservation models – conservation models of renewal, affordable housing and sustainable mixed-use amenities – design models of renewal, mobility and transport system enhancement models / sustainable mobility, identity system conservation models, models for enhancing quality of life – sociological analyses, models of energy efficiency, energy transition and decarbonisation, climate change adaptation (and mitigation) models, buildings and space circular management models, quality planning and management models for the development of green infrastructure by introducing the NBS (**N**ature-**B**ased **S**olutions) system in the segment related to pluvial flood drainage, property rights models, feasibility of solutions and models of possible financing.

Through the parallel management of multi-sectoral processes via the proposed **participatory platform** involving all active stakeholders in the City planning process, a **comprehensive pattern/model** was generated which guides the establishment of **principles** and creation of **recommendations**

and guidelines aimed at achieving the **developmental goals** of the comprehensive urban renewal as well as the establishment of the criteria for prioritisation / evaluation of projects and activities (short-term and long-term) and ultimately the establishment of **performance indicators** to be used in implementation monitoring and evaluation.

The continued development of the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb, which, based on the Act on the Reconstruction of Earthquake-damaged Buildings in the City of Zagreb, Krapina-Zagorje County, Zagreb County, Sisak-Moslavina County and Karlovac County, is led, coordinated and prepared by the Institute For Physical Planning in collaboration with its associates and financed from the budget of the City of Zagreb, is the Planning Basis for the comprehensive renewal, recovery and resilience of the Historic Urban Core of the city of Zagreb and a spatial and conceptual platform that, in accordance with the EU green policies, provides frameworks for sustainable use, conditions of use and protection as well as management of space. It will also serve as the expert basis for the preparation of new generation of physical planning documents (and/or amendments to the existing ones), especially the General Urban Plan of the City of Zagreb.

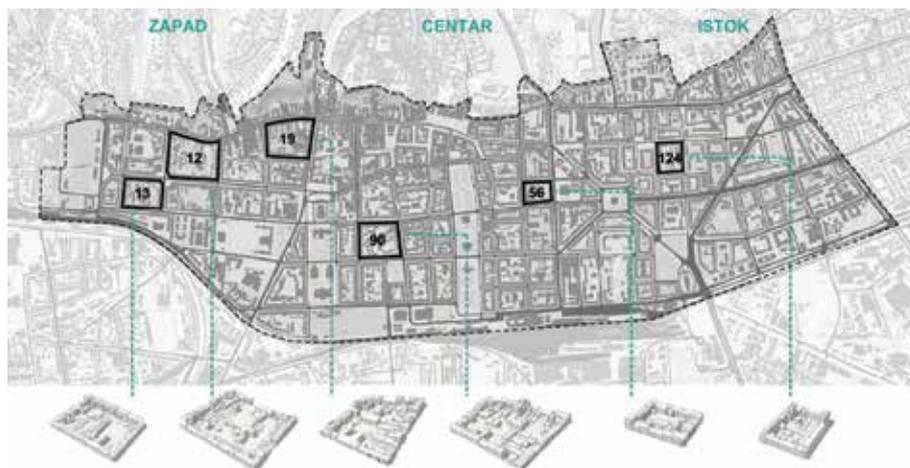
6.1 Urban Planning Models of Renewal

Lower Town area

Based on the typological classification of blocks having the same or similar characteristics, there are four proposed basic block renewal / transformation types / models for the Lower Town area:

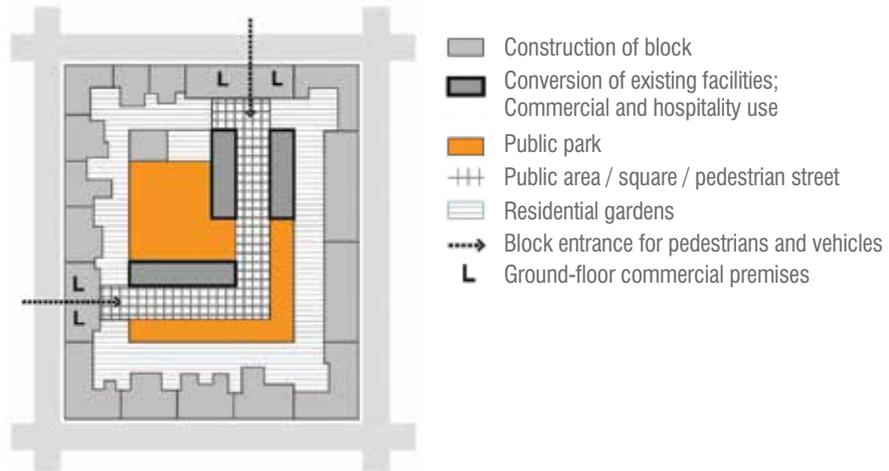
- I **Open block design – a new neighbourhood sub-centre**
- II **Open block design, highly public character – public use, square, park**
- III **Closed block design – gardens with public amenities and underground garage**
- IV **Closed block design with a pedestrian street**

(According to the Urban Renewal Models, Faculty of Architecture Institute for Urban Planning, Spatial Planning and Landscape Architecture, Zagreb, 2021 / for the purpose of the Comprehensive Renewal Programme of the Historic Urban Core of the city of Zagreb)



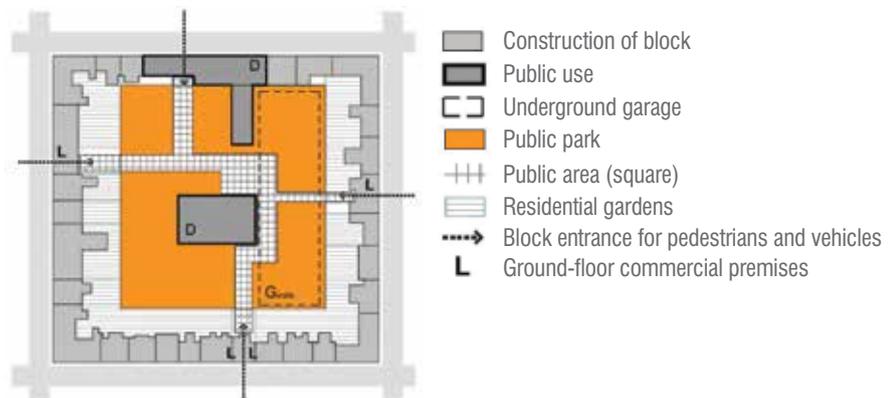
I Open block design – a new neighbourhood sub-centre

This renewal model is based on a new open public space within a block having a distinct identity that integrates accompanying amenities with the aim to decentralise the city centre, strengthen social interactions in the neighbourhood and facilitate location branding by developing urban spatial units that tell their “own story” (culture, art, design, traditional crafts and trade) that distinguishes them from each other.



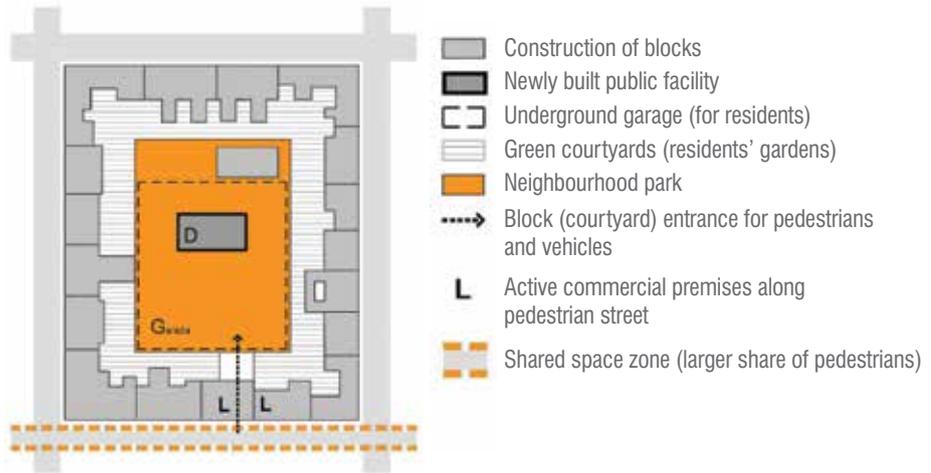
II Open block design, highly public character – public use, square, park

This renewal model is based on the creation of a new representative multi-purpose contemporary active public space within a block, which emerges through transformative processes (removal of inappropriate ancillary structures and stationary traffic) thus becoming an extension of the existing and/or the expansion of the public city amenities (theatre, galleries, faculties...). In addition to landscaped private and semi-private residential gardens, as well as the extremely extroverted public character of blocks, there is an emphasis on new street entrances with themed arrangement of ground-floor commercial premises, whose character is aligned with the profile/thematic focus of the entire block (culture, art...). The underground garage within the block addresses the parking needs of the block’s tenants.



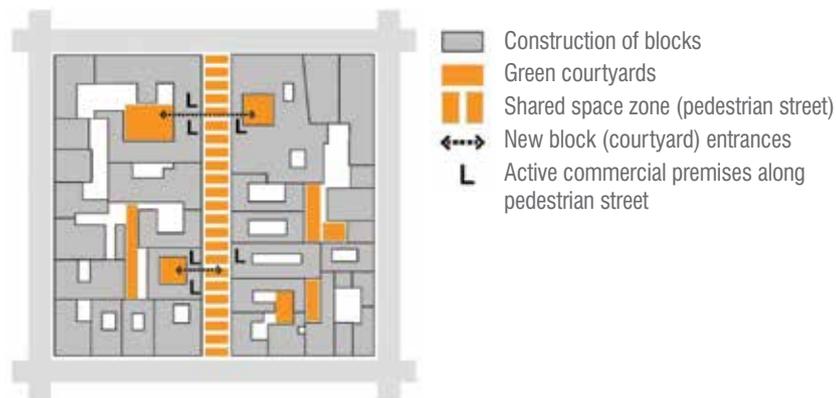
III Closed block design – garden with public amenities and underground garage

This renewal model of a block interior is based on the creation of a common open space intended for tenants, and the replacement of inappropriate facilities (workshops, car mechanics, warehouses...) with public and social-use facilities aimed at improving the life of the greater neighbourhood (nursery, small day-care retirement home...). The introverted character of the block ensures a calm and pleasant atmosphere within the block, the concept of enhanced green infrastructure extends to street areas, which are transformed to be more pedestrian-friendly and include high vegetation (shared space zone). The underground garage addresses the parking needs of the block’s tenants.



IV Closed block design with a pedestrian street

This renewal model is applicable in blocks of the highest density that cannot be structurally adjusted (due to the large number of residential and commercial buildings, which are functional and in good construction condition and having a greater deficit of green areas and outdoor spaces for tenants - children’s playgrounds, walkways, neighbourhood parks), the area for enhanced quality of life “moves” into the street, which, due to an adjusted traffic profile, increased share of greenery, urban furniture, as well as the presence of active ground-floor commercial premises, becomes a living room for tenants, a space for social interactions and a way to improve the micro-climate and environmental conditions within the blocks.



Upper Town and Kaptol area

For each of the singled out distinct areas of the Upper Town and Kaptol, a certain renewal / transformation type / model is proposed, deriving from the specific historical characteristics of the area, but also from contemporary ways of use and property rights:

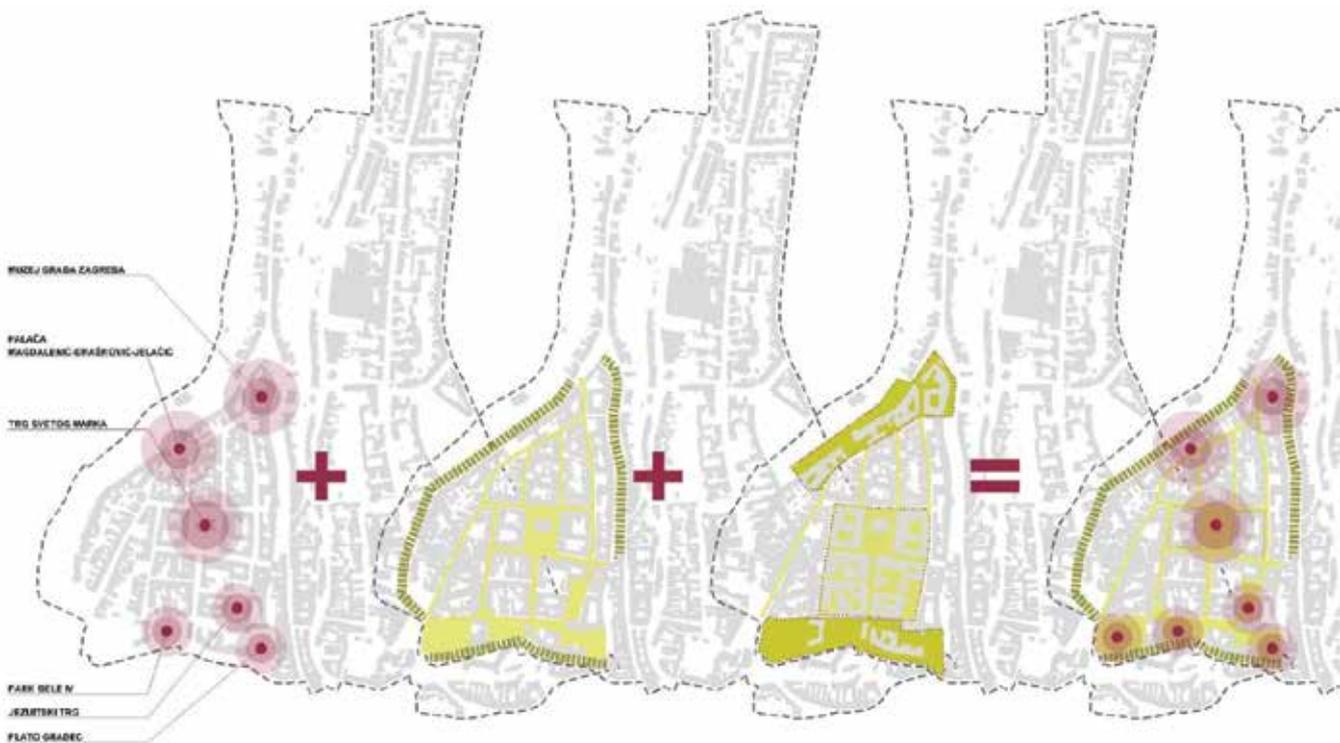
- I Structural and functional renewal of the Upper Town,
- II Structural and functional renewal of Kaptol,
- III Structural and functional renewal of the area between Tkalčićeva and Nova Ves streets

(According to the Urban Renewal Models – Upper Town and Kaptol, Faculty of Architecture Institute for Urban Planning, Spatial Planning and Landscape Architecture, Zagreb, 2022 / for the purpose of the Comprehensive Renewal Programme of the Historic Urban Core of the city of Zagreb)

I Structural and functional renewal of the Upper Town

The structural and functional renewal of the Upper Town needs to ensure a balance between residential and tourist needs, and public and administrative facilities, improve public open spaces, more efficiently establish sustainable mobility and create a network of the green infrastructure system, for the needs of both permanent tenants, but also for the sake of the citizens of Zagreb and its visitors:

- by establishing focal points of various intensities (southern section – section of the most intensive public use 24/7, central area - St. Mark's Square with surrounding buildings, north-western section),
- by establishing a complete distinct system of public open spaces,
- by setting up an improved connection with the Lower Town.



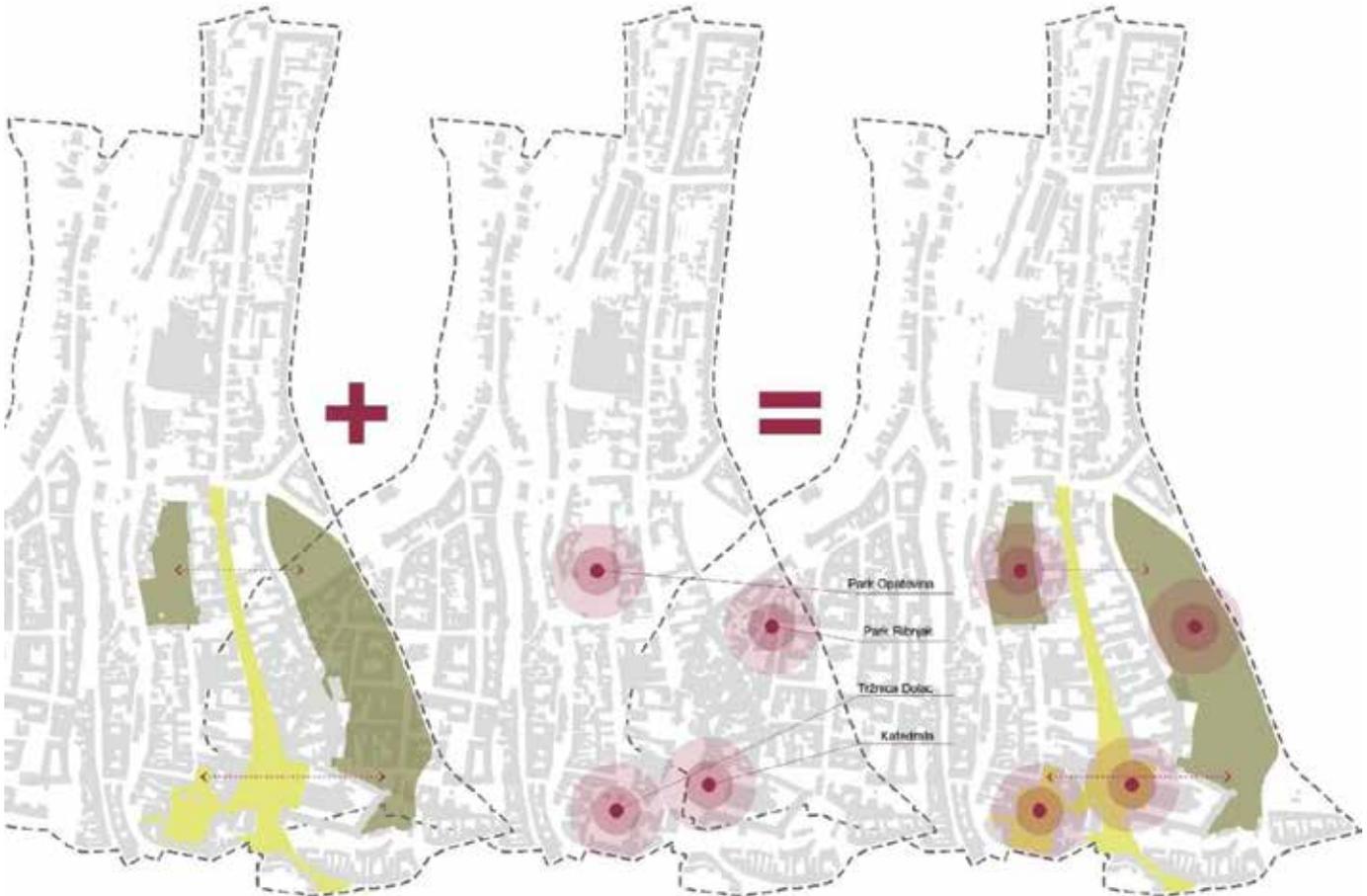
II Structural and functional renewal of Kaptol

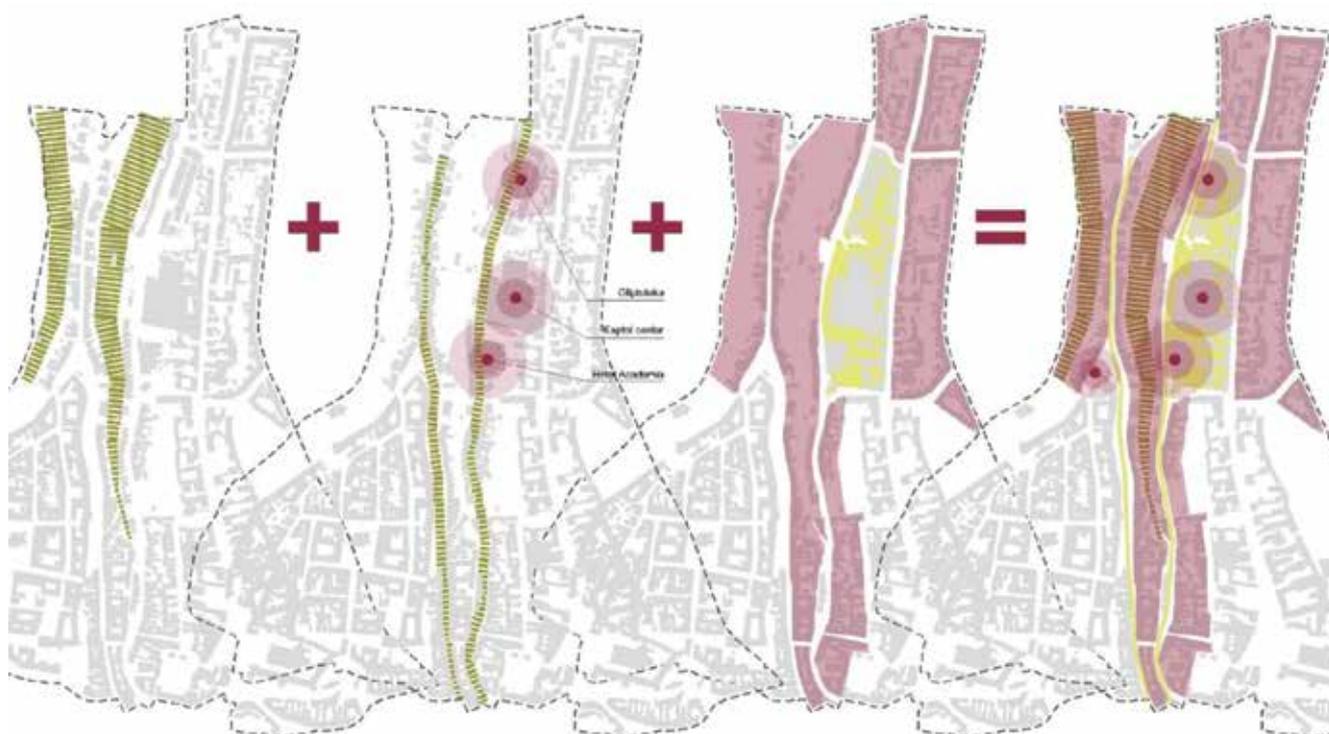
The structural and functional renewal/transformation of Kaptol, subject to the obligation to harmonise views on possible developmental scenarios between the city administration and the majority owner - the Zagreb Archdiocese, shall include:

- opening individual manor house courtyards (clearing up individual courtyards and creating areas to become public open spaces and gardens and connecting them with the area of Ribnjak Park with the functional transformation/conversion of some of the existing buildings into amenities of a more appropriate character – public amenities, culture, hospitality, public services),
- connecting park areas into a system of green infrastructure (by opening and designing new pedestrian passages through the introverted courtyards of the Kaptol manor houses and streets busy with traffic),
- Improving the functioning of the Kaptol Street in accordance with the concept of transformation of the Kaptol area (traffic, amenities, design).

III Structural and functional renewal of the area between Tkalčićeva and Nova Ves streets

During the structural and functional renewal of the area between Tkalčićeva and Nova Ves streets, which relies on the determination of design guidelines, methods of use, furnishing and targeted (stimulated) “profiling” of amenities that will maintain the liveliness/vibrancy of the area while improving and emphasising its historical character, special attention will be paid to:





- the construction of the remaining infills and their integration into the historical fabric,
- retention of all possible transverse passages towards Radićeva Street, Dolac and Nova Ves,
- encouraging diversification of amenities,
- finding the appropriate model to enable the access of delivery vehicles at periods during a day.

6.2 Conservation Models of Renewal

For the area of the Historic Urban Core of the city of Zagreb, depending on the value and quality of a building in a block / insula and the degree of damage, four conservation models of renewal have been proposed:

- **I Model of complete conservation of historical buildings**
- **II Model of partial conservation of historical buildings**
- **III Model of demolition and replacement with facsimiles**
- **IV Model of demolition and replacement with new structures**

(According to: Conservation Models of Renewal – Lower Town (Pilot project Block_19), Institute of Art History, Zagreb, 2021 and Conservation Models of Renewal – Upper Town (Block 11) and Kaptol (Opatovina), Institute of Art History, Zagreb, 2022 / for the purpose of the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb)



Fig. 16: Cultural monuments and protected zones (according to GIS, Ministry Of Culture and Media)

Legend:

- cultural monuments, protection of individual assets I
- cultural monuments, protection of individual assets II
- cultural monuments, protection of individual assets III
- protected zone: 1
- protected zone: 2
- protected zone: 3

I Model of complete conservation of historical buildings

This conservation model is applied to the most valuable historical buildings – individually protected category A cultural assets, and category B0 buildings, erected along the edges of the block.

The final decision on renewal and restoration is preceded by the preparation of a conservation study, which includes probing of façades and the main parts of the interior (entrance passages, entrance halls, staircases, lounges) as well as a detailed architectural surveying (layouts of all floors, sections, façades, details).

Buildings pertaining to this group, as a rule, are preserved in their entirety and only auxiliary interior spaces are modernised, such as sanitary facilities and other parts of commercial and residential premises. In addition to preserving the existing condition (which had often been devastated even prior to the earthquake), most of buildings of this group will require restoration of individual parts of the façade elements, relief ornaments and interior design, damaged due to the passage of time. Structural rehabilitation must be non-invasive, as is appropriate for cultural assets. Possible new interventions are reduced to a minimum.

II Model of partial conservation of historical buildings

This group comprises of B1 and B2 category buildings. During the renovation of these buildings, it is recommended to preserve and restore the street façades and roofs, as well as representative common areas of the interior (entrance halls, entrance passages, staircases). Other parts of the interior may be designed without any restrictions, depending on the intended use. In case of severe damage, preservation of the façade and the new construction of the entire building can be considered, while adhering to the layout and design of common interior spaces. Therefore, this group allows for a relatively large portion of possible newly-built structures.

III Model of demolition and replacement with facsimiles

This group is conditioned primarily by the extent of damage to the building. If the extent of damage is such that the building cannot be restored, it shall be replaced by a facsimile. However, the degree of replication (whether complete or only partial) depends on the quality of the building. Categories A and B0 require complete facsimile reconstruction, while categories B1 and B2 allow for partial facsimile reconstruction – a facsimile of the façade and possibly circulation spaces, and the rest can be designed freely.

IV Model of demolition and replacement with new structures

This group comprises of buildings of low architectural quality pertaining to categories C and D. Considering the low quality, their appearance and number of floors do not in any case affect the characteristics of the infills that will replace them, rather, the character of the infills can be determined by the overall image of the block, that is, the neighbouring buildings on the plot.

In addition to the Conservation Models of Renewal, which are applied depending on the value and quality of a building in a block / insula and the extent of damage, conservation guidelines applicable to all models are also proposed:

- 1. Reconstruction of weathered details of architectural and sculptural relief ornaments on street façades**
- 2. Raising (heightening) of historical buildings and utilisation of attics**
- 3. Annexing of historical buildings (on the courtyard side)**
- 4. Utilisation of free / freed space potential within blocks**



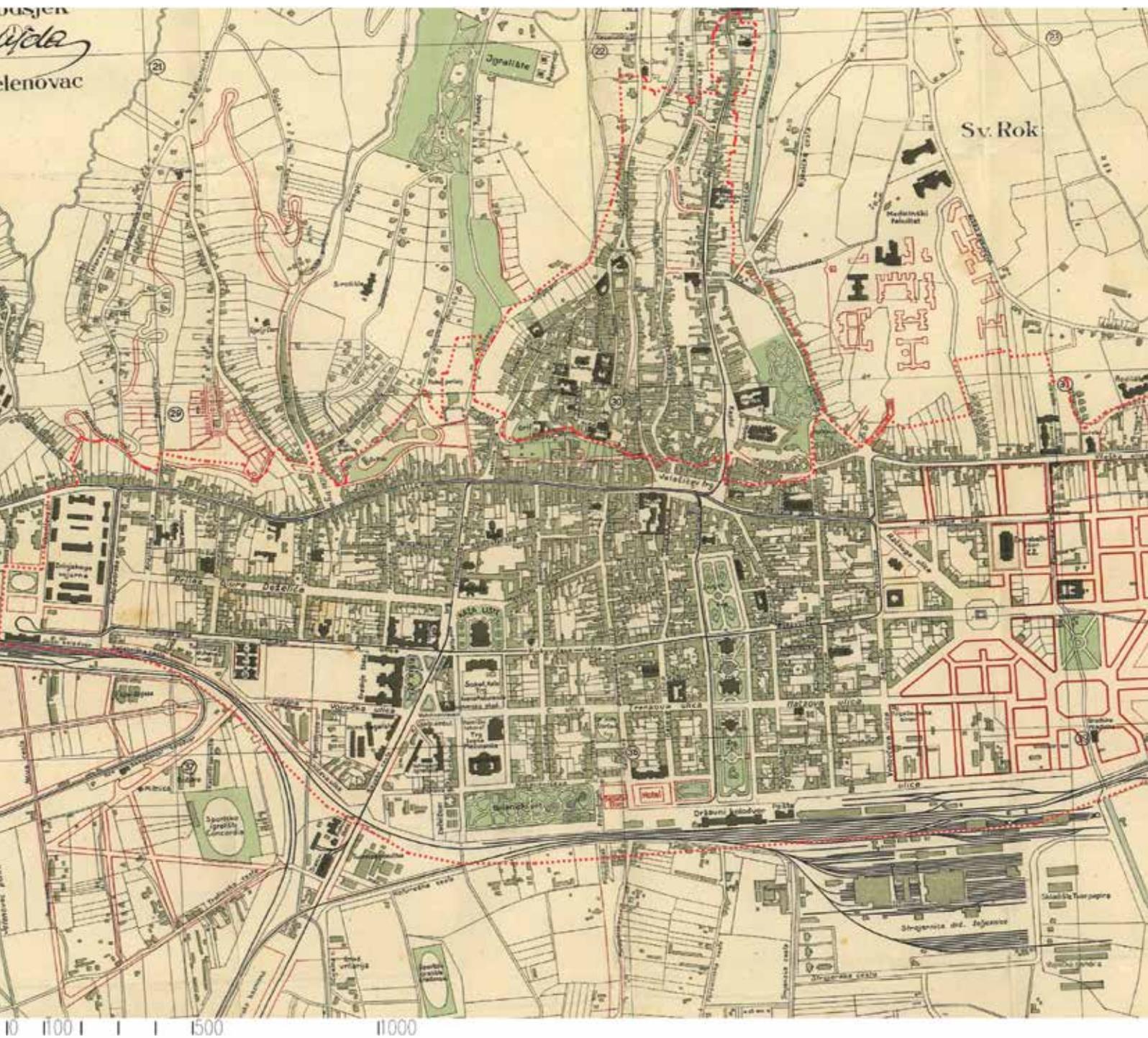


Fig. 17: Regulatory Plan 1923 (Heintel)



1. Reconstruction of weathered details on architectural and sculptural relief ornaments on street façades

Some buildings have lost their original façade characteristics in former renovations, most often during the early Modernism period, reflecting the than stylistic trends (in such cases, it falls upon a conservator's assessment whether to restore the original quality based on archival material or to evaluate the existing one). However, a far greater number of buildings have lost their external features due to their poor construction conditions (most often this refers to the removal of attics, acroteriums, and various turrets with domes or small roofs), when damaged during the earthquake, and were removed in emergency repairs.

In order to preserve the identity of the Lower Town blocks, it is particularly important to restore said architectural elements, and it is necessary to propose a legal framework to carry this out, regardless of decisions of private owners/co-owners.

2. Raising (heightening) of historic buildings and utilisation of attics

Many historical (historicism period) buildings were raised by one floor shortly after their construction (archival documentation show that the foundations were built to support the addition of another floor).

Depending on the valuation of individual buildings and their neighbouring buildings, in some cases it is possible to add floors. As a compromise solution, there is also the possibility of adding an attic section only on the courtyard side.

3. Annexing of historical buildings (on the courtyard side)

With the modern demand for apartment living, there is a need for new infrastructures and extensions, which in many cases can be achieved by annexing historical multi-storey buildings on the courtyard side. Since most historical buildings have attractive well-groomed street façades and extremely simple rear side designs, regularly having various protrusions that form an "L" or "U" floor plan, it is concluded that there are great potentials for the entire Lower Town in this respect.

4. Utilisation of free / freed space potential within blocks

With the established system of orthogonal street grids and large residential blocks, and squares and parks of the Lower Town as planned by two Regulatory Plans (1865 and 1887), the relatively large internal areas of the blocks were not regulated - originally conceived and designed as green free areas, i.e. courtyards of residential buildings, they were gradually more or less occupied by buildings of various purposes, size and quality.

The current state of Block_19 presents an opportunity to address these issues offering the greatest potential for new interventions. These interventions should focus on removing numerous low-quality buildings within the blocks, increasing greenery, and possible new quality infills.



7

Recommendations, Guidelines and Requirements

Specific recommendations, guidelines and requirements are listed below as short-term and long-term measures for eleven thematic areas, regardless of whether they relate to urban physical planning or space management:

Built structure

Protection and preservation

Amenities

Housing

Sustainable mobility

Green spaces

Nature-based Solutions/NBS

Property rights

Identity

Modernisation/Transformation

Urban security

Built structure

Renewal recommendations/Guidelines

- prepare specific risk assessments for all blocks, taking rows of buildings into account (although it is rare, post-earthquake damage in Zagreb clearly indicates an interaction)
- prepare a report on the interactions between buildings in the block by highlighting typical characteristics
- enable structural changes, especially those within the blocks/insulae (preserving the block structure/structure of the insula on the macroscale, but not necessarily at the level of individual blocks/insulae),

A key requirement for comprehensive urban renewal is strengthening the process of participation of residents and users of blocks/insulae.



- improve the unique character of each block/insula throughout the process of modernisation and post-earthquake remediation
- enable and encourage the adaptation and modernisation of the existing structures in accordance with special regulations (security, fire resistance, evacuation...)
- enable and encourage the connectivity of open public spaces (both existing and new) in order to achieve a distinctive character of undeveloped public space systems
- examine the possibility of demolishing neglected substandard structures within the blocks/insulae and replacing them with necessary functional extensions, annexes, elevators, community garage, etc., to improve quality of life in a block or group of blocks
- define the Upper Town southern façade, based on the comments received during the expert and public consultation process
- improve structurally the degraded spatial units (removal of the inappropriate 20th century structures by the Kaptol manors, removal of inappropriate and degraded structures in internal courtyards)
- enable the adaptation of the ground floors in the Upper Town to increase the public use share (whenever structure features allow)
- map and reuse as many abandoned and unused spaces and buildings in the Historic Urban Core as possible
- create a waste materials exchange on at least two locations within the Lower Town and create an application

Requirements for comprehensive urban renewal

- strengthening the participation of residents and users of blocks/insulae
- taking inventory and evaluation of data on the built structure of all blocks/insulae (building envelopes and built interior structures)
- creating a digital GIS database containing data on the built structure status according to the characteristics of construction, use, ownership, availability/accessibility, construction status, unfunctional buildings, etc.

- determining the levels of change resulting from previous illegal or uncontrolled processes in the area and producing a set of remediation recommendations (concerning design, legal matters, etc.)
- determining well-defined urban conservation requirements for potential structural changes in specific distinctive spatial sub-units (Lower Town, Upper Town, Kaptol), provided that cultural and historical values are preserved and protected
- establishing construction and design requirements for new infills, which provide state-of-the-art technical and technological solutions while preserving and improving the historical identity

Protection and preservation

Renewal recommendations/Guidelines

- review the protection limits for the Historic Urban Core of the city of Zagreb and tailor/review the associated protection measures
- determine the protected use/contemporary interpretation of specific areas in order to maintain the city centre ambience and identity (typical traditional crafts, shopping facilities, services, etc.)
- operationalise procedures for obtaining approvals, opinions and measures for renewal
- systematic/thorough understanding of the renewal challenges and sustainable management of protection efforts
- establish guidelines for new construction and modernisation/transformation of the existing structure (making city life more attractive and fostering the synergy of new and old to create a positive environment)
- enable the construction of new driveways at the block entrances (for security purposes), in accordance with the protection guidelines
- offer comprehensive renewal guidelines (complete buildings, structures and blocks), which, in addition to building renewal, also include renovation of amenities, infrastructure, energy, etc.
- upgrade the space (by introducing new technical and technological solutions in order to improve the quality of life and work in old and damaged buildings)

It is essential to harmonise the protection and preservation of cultural heritage with other principles of sustainability: social (retention of residents in the city centre), economic and environmental principles (creating conditions that foster healthier habits and better quality of life)

Requirements for comprehensive urban renewal

- accepting the argument that the Lower Town remained unfinished because its transformation process is ongoing
- harmonisation of the protection and preservation of cultural heritage with other principles of sustainability: social (retention of residents in the city centre), economic and environmental principles (creating conditions that foster healthier habits and better quality of life)
- taking inventory and evaluation of data on city- and state-owned protected cultural property eligible for comprehensive renewal (co)-funding

- identifying details on the actual and formal condition of protected buildings/complexes/blocks, and evaluation and updating protection levels
- creating a digital GIS database containing information on existing and revised conservation guidelines
- comprehending the renewal problem more broadly than a matter of an individual building - at the level of a block/insula, street and the entire area
- drafting of a conservation urban plan for the Historic Urban Core

Amenities

Renewal recommendations/Guidelines

- improve the quality, number and distribution of amenities that facilitate everyday lives of residents (kindergartens, supermarkets, recreation and sports, culture) to boost retaining of residents and attracting the new ones
- find a balance between residential and commercial purposes, defining urban areas with dominant commercial and catering facilities and quieter zones with amenities more suitable for the residents
- develop urban resource centres, prepare locations for repair café, time-sharing, co-working, co-housing...

Requirements for comprehensive urban renewal

- recording and monitoring the quality, number and distribution of amenities that facilitate everyday lives of residents (kindergartens, supermarkets, recreation and sports, culture) to boost retaining of residents and attracting the new ones
- encouraging opening of local convenience stores that stock a range of everyday commodities

Housing

Renewal recommendations/Guidelines

- improve the existing and plan/attract new functions important for everyday life and thereby increase the desirability and attractiveness of housing in the city center
- encourage the modernisation/transformation of individual residential buildings and blocks (comprehensive renewal of buildings, along with a certain level of structural transformation, primarily aiming to improve the lives of tenants, making investments to increase standard of living)

In order to retain the existing and attract new residents, it is necessary to improve the quality, number and distribution of amenities important for everyday life

- clear up substandard structures from within blocks
- design spaces for socialisation, modernisation of common premises and buildings in order to prevent/ stop depopulation in the city centre
- foster inclusivity (tailoring to the needs of residents with special needs) and participation (building a sense of belonging and pride through neighbourhood events)
- create alternative models for resolving ownership disputes to enable activities in the block/insula in order to remodel block interiors (outdoor living rooms)
- improve accessibility and design public spaces for residents, rather than just for terrace café guests, and remodel block interiors
- encourage city centre redesign according to the 15-minute city model
- remodel block interiors, whereas a group of blocks needs to be designed as a child and adult friendly space

Requirements for comprehensive urban renewal

- proposing a legal framework for the introduction of economic, social and other measures that would contribute to the long-term resident retention and enable them better housing, demographic revitalisation, socialising opportunities, etc.
- proposing a new Housing Act that would (additionally) regulate mutual relations, procedures and rules for the co-owners to give them quality and affordable housing and protect public interests
- proposing legal frameworks and measures to encourage and control the rental model of using the housing stock for the privately-owned part of this stock
- carrying out a sociodemographic analysis of the population (the latest data on residents, their attitudes and aspirations)
- introducing system and concept of legal personality of individual buildings
- revising the issued rental permits and checking new ones against strict new criteria that would improve the quality of housing of permanent residents in the buildings
- stopping further uncontrolled apartmentisation that indirectly reduces the quality of life and causes residents to leave the city centre
- monitoring and listing any conversion of residential premises to vacation rental apartments and checking whether this has been done lawfully
- blocking the process of fragmentation of the existing housing units into several smaller apartments
- setting out minimum housing standards to improve housing quality - minimum technical conditions/residential building requirements

It is necessary to stop further uncontrolled apartmentisation that indirectly reduces the quality of life and causes residents to leave the city centre

In order to improve urban public transport, it is primarily necessary to organize quality public railway transport as a backbone of the integrated transport system.

It is urgently necessary to create the Sustainable Urban Mobility Plan - SUMP for the City of Zagreb.

Sustainable mobility

Renewal recommendations/Guidelines

- improve urban public transport, primarily by improving the railway transport as the backbone of the integrated transport system
- discourage transit traffic by planning, managing and imposing traffic restrictions and speed limit controls
- reduce transit traffic flows through the Lower Town by planning and implementing local low-traffic zones (super-blocks)
- improve and adjust the concept of central car parks/garages – locating public garages at the city centre outskirts (Park & Ride)
- explore spatial and financial opportunities for building block garages in order to eliminate the practice of parking vehicles along the streets
- improve the transport system to achieve decarbonisation and adapt to climate change
- improve technology and information to develop smart solutions – SMART CITY (IOT – Internet of Things – a network infrastructure in which all kinds of physical and virtual “things” communicate and are invisibly integrated)
- implement traffic flow alternatives and models based on pilot projects (accessibility, parking, garages, supply, emergency vehicles)
- develop a mesoscopic traffic model for the city of Zagreb
- prepare a Sustainable Urban Mobility Plan (SUMP) for the City of Zagreb
- develop a plan for creating the alternative fuel stations network
- develop a plan for organising delivery and motor vehicle routes in pedestrian zones
- improve intermodal terminals (the Main Railway Station, the Zagreb West Railway Station, etc.)

Requirements for comprehensive urban renewal

- removing rail freight transport infrastructure from the city centre in order to reduce the pressure on the corridor for urban railway and passenger transport
- creating public education opportunities to gradually change the concept of mobility and transport systems by offering incentives, rather than just imposing bans
- rethinking the concept of traffic planning for historic core zones of the city by putting people first and improving their quality of life (unlike the previous concept, which prioritised road traffic)
- reconstructing the existing street network to humanise and restore pedestrian zones, as well as the integration of the NBS system
- promoting healthy lifestyles (improving pedestrian and bicycle infrastructure)

- gradually discouraging transit traffic through the Lower and Upper Town (regulations, control)
- developing pilot projects for potential traffic flow alternatives and models (accessibility, car parks, garage, supply infrastructure, emergency vehicles)
- presenting alternative traffic solutions and appropriate models to the general public and professional community and choose the best (temporary and permanent) goal-oriented solution

Green spaces

Renewal recommendations/Guidelines

- set up a system of landscape (urban) rules governing the design and maintenance of the blocks/insulae interior and establish the standards
- plan and implement the concept of green infrastructure
- develop a detailed plan for the creation of new green infrastructure in the Historic Urban Core of the city of Zagreb and align this plan with other relevant plans
- improve quality and access to green spaces within the blocks and introduce new types and methods of use
- plan and provide pedestrian passages and connections through several blocks forming a logical whole
- encourage integrated landscaping concepts, recognition and functional remodelling of green backyards across multiple blocks
- achieve an even distribution and share of green spaces in order to improve the everyday life of residents in the city's historic core
- increase the share and number of types of interconnected green spaces across the city
- create green landscape links connecting the Lower Town with a broader landscape context
- implement projects that are feasible relatively quickly and have both physical planning and funding grounds (green community oasis, mobile green information points, green-roofed bus stops, green roofs, green façades ...)
- create a street visual identity by implementing the NBS solutions, which will enable a better spatial orientation, improve the attractiveness of the street complex and encourage citizens to actively use it (recreation, leisure, socialising ...)

Requirements for comprehensive urban renewal

- educating, popularising and raising public awareness of various innovative types and ways of using green infrastructure (rain gardens, green façades and roofs, urban gardens, etc.)

- involving the public in participatory processes of deliberation on outdoor space and its planning (bottom-up activities)
- developing a green infrastructure study/strategy aimed at adapting to climate change, environmental functions, increasing the attractiveness and economic value of the area, improving socialisation and participation, contribution to improving and protecting the city's identity
- encouraging citizens to make better use of outdoor space by creating conditions for generating new amenities (recreational, leisure, residential purposes), and improving the aesthetic and environmental qualities and ambience of the space through green systems
- establishing a system of city incentive programmes for different initiatives in order to clear up and revamp the neglected internal courtyards within blocks/insulae
- encouraging connections/networking of landscaped areas with other public spaces by incorporating them into the green infrastructure system

Nature-based Solutions/NBS

Renewal recommendations/Guidelines

- use Nature-based Solutions to mitigate impact of heat islands and impose flood management (in-situ pluvial flood drainage solution, water retention and gradual discharge into the ground, more natural grounds, green roofs)
- perceive drainage in the entire river basin area
- make the best use of the natural environment
- incorporate NBS system into circular economy, especially through the hydrological cycle
- develop and network the green infrastructure system by using NBS
- encourage the use of NBS that increase climate resilience in urban areas
- integrate the green infrastructure system into physical and urban planning

Requirements for comprehensive urban renewal

- planning, maintenance and monitoring of all systems by using the GIS database
- multidisciplinary integrated approach (green infrastructure, energy efficiency, circular space and building management, seismic resilience, fire resistance)
- mathematical modelling of drainage systems and alignment with a combined sewerage system

It is imperative to use the Nature-based Solutions in order to mitigate impact of heat islands and drain pluvial floods

Necessary prerequisite for renewal is improvement of corresponding legal instruments (amending of the property right regulations) and creating a framework for systemic structural transformation and urban renewal of blocks.

Property rights

Renewal recommendations/Guidelines

- leasing common land for a fixed term (depending on voting share of co-owners) as one of the models which allows to initiate backyard makeover activities in blocks, without land reallocation and without construction works
- the activities that benefit all co-owners should be considered as regular administration tasks (a majority vote is required)
- carry out the activities that improve the quality of life and help retain the existing residents in the city's historic core immediately (regardless of legal ambiguity, unclear property rights and the need to amend legislation)
- encourage co-owners in the blocks/insulae to understand that they share a common interest and initiate the opening and revamping of the backyards, even before a systematic comprehensive renewal model is put in place

Requirements for comprehensive urban renewal

- introducing faster and simpler procedures for adjusting the actual on-site situation with land and cadastral status
- fully resolving property rights issues evolving from the social ownership, ownership transformation and denationalisation
- improving appropriate legal instruments (by amending the existing property rights legislation) and creating a framework for systematic structural transformation and urban renewal of blocks (e.g. examining of the Ownership and Other Proprietary Rights Act and the Buildings Management and Maintenance Act, etc.)
- the legislation needs to revisit co-ownership decision making and the required majority for a certain type of decisions
- undertaking activities to improve the quality of life and retain existing residents of the Upper Town and Kaptol, regardless of legal ambiguity and unclear property rights (while awaiting the law amendments)

Identity

Renewal recommendations/Guidelines

- conduct extensive research into the image and identity of the Lower Town, its specific areas and characteristics compared to other parts of the city in order to provide better conclusions and guidelines
- insist on different artefacts and ambiances unique to the living space in the Historic Urban Core and avoiding a one-size-fits-all policy
- highlight differences and branding of individual spatial units

- conduct extensive research into the image and identity of the Upper Town and Kaptol, their specific areas and characteristics compared to other parts of the city in order to provide better conclusions and guidelines

Requirements for comprehensive urban renewal

- creating a comprehensive database on the characteristics of ambience and values
- undertaking relevant analysis and critical evaluation of downtown blocks and proposing more detailed guidance on the proposed interventions
- setting clear criteria for the typological classification of blocks according to their identity
- insisting on the diversity and distinctive local character of an area that has all the historical, cultural and design predispositions to stand out as a space of significant identity compared to other city districts
- using city centre identity characteristics in destination marketing which contributes to the overall economic growth of the City

Modernisation/Transformation

Renewal recommendations/Guidelines

- enable adaptation to the necessities of modern life to keep pace with the time we live in, with new demands, standards and technological achievements, while respecting the architectural, cultural and historical heritage and improving the inherited identity values
- ensure and encourage that the state-of-the-art technical and technological solutions are applied in order to improve the quality of life and working environment in older and damaged buildings (while maintaining the ambience)
- encourage and implement development guidelines in the historic urban fabric, such as energy efficiency enhancing building retrofits, energy conservation, green building, mobility and decarbonisation leading to a smart, resilient and creative city
- create a detailed City of Zagreb heat map
- introduce a zoning system by using a heat map and identifying priority zones for expansion of the City of Zagreb District Heating System network
- identify priority areas that are economically viable and eligible for connection to the District Heating System
- identify priority areas in which connecting to existing District Heating System is not economically viable and select the heat source in accordance with the available renewable energy potentials

Requirements for comprehensive urban renewal

- accepting the argument that the Lower Town remained unfinished because its transformation process is ongoing

Raising the standard of living and introducing new technical and technological solutions are the principles which can improve the centre of Zagreb and make it a proclaimed smart, resilient and creative city.

- taking into account all evolving needs, because even the pre-earthquake condition reflected the fact that the Historic Urban Core was completely neglected
- more intensive and diverse preparation/application of projects for EU funding and funding from other available sources (with good organization, the modernization/transformation of the protected Historic Urban Core of the city of Zagreb can be financed)
- improving living standard and using new technologies are principles that can improve the situation in the city centre and make Zagreb the proclaimed smart, resilient and creative city

Urban security

Renewal recommendations/Guidelines

- risk mapping as a starting point for planning solutions
- plan urban measures for elements that significantly affect the security of premises (their characteristics, shape, size and ways in which the property is used, as well as ways in which surrounding buildings are used, and their design and character) to design secure public spaces (squares, streets, outdoor playgrounds and sports grounds, passages, public staircases, promenades, parks, green markets, etc.)
- determine seismic hazard zones (based on new insights into the post-earthquake structural resistance of buildings) and develop urban planning guidelines for the structural block transformation for a safer city and to facilitate evacuation, such as organising a block interior clearance, creating outdoor areas and walkable blocks
- improve and plan new tall vegetation, green areas and sports grounds, as scientific research has shown that they correlate strongly with lower crime rates in the neighbourhoods, foster a sense of security and reduce the risk of violent and aggressive behaviour
- improve existing and plan new spaces for socialization of residents in co-owned buildings to create stronger relations, increase informal surveillance, prevent crime and create a healthier and more active living environment
- propose urban planning measures to contribute to increasing resilience to natural disasters (earthquake, torrential flooding), technical and technological disasters (fire, infrastructure, transport, epidemiological/sanitation hazards) and war destruction and terrorism

Requirements for comprehensive urban renewal

- exploring all areas where it is possible to contribute (through physical planning and space management) to urban security at different levels (city, district, neighbourhood, building)

Risk maps need to be created as a starting point for planning solutions and propose measures which will contribute to increasing resilience to natural disasters, technical and technological disasters, and war destruction and terrorism.

8

Thematic Research

The Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb includes the following components: spatial and urban analysis, structural models of renewal, conservation models of renewal, sociological research, urban planning models of renewal of the Lower and Upper Town and Kaptol, models of improving mobility and the transport system, models of energy transition, models of adaptation to climate change and green infrastructure, design models of renewal - Block_19 Pilot Project (Scenario I and Scenario II); Upper Town and Kaptol, economic models of renewal and a business plan, circular economy platform, improvement of public utility and service systems and identity topography of the Historic Urban Core of the city of Zagreb:

	Study/research name	Study prepared by	Team leader(s)
8.0	Block_19 Pilot Project: Physical Planning Documents	Institute for Physical Planning of the City of Zagreb	Dragica Barešić, MArch Nives Mornar, MArch Jadranka Veselić Bruvo, MArch
8.1	Structural Models of Renewal (part of the comprehensive renewal of the protected Historic Urban Core of the city of Zagreb) - Lower Town	University of Zagreb, Faculty of Civil Engineering, Department of Engineering Mechanics	Assoc. prof. Josip Atalić, PhD
8.2	Conservation Models of Renewal- Block_19 Pilot Project	Institute of Art History	Katarina Horvat Levaj, PhD
8.3	Sociological Study - Block_19 Pilot Project	Institute for Social Research	Anđelina Svirčić Gotovac, PhD
8.4	Urban Planning Models of Renewal (part of the comprehensive renewal of the protected Historic Urban Core of the city of Zagreb - Lower Town)	University of Zagreb, Faculty of Architecture, Institute of Urban Planning, Spatial Planning and Landscape Architecture	Prof. Tihomir Jukić, PhD
8.5	Property Rights Models of Renewal (part of the comprehensive renewal of the protected Historic Urban Core of the city of Zagreb - Lower Town)	University of Zagreb, Faculty of Law	Prof. Igor Gliha, PhD Prof. Hano Ernst, PhD

	Study/research name	Study prepared by	Team leader(s)
8.6	Economic Models of Renewal - Economic Analysis of the City of Zagreb and Assessment of Macroeconomic Impacts of the Renewal	University of Zagreb, Faculty of Economics and Business	Assoc. prof. Tomislav Gelo, PhD Prof. Ljubo Jurčić, PhD
8.7	Adaptation to Climate Change Impacts and Green Infrastructure Usage - Block_19 Pilot Project	North-West Croatia Regional Energy Agency - REGEA	Julije Domac, PhD Miljenko Sedlar Assoc. prof. Ivana Herceg-Bulić, PhD, University of Zagreb, Faculty of Science, Department of Geophysics
8.8	Energy Renewal, Transition and Decarbonisation - Block_19 Pilot Project	University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture, Department of Energy, Power and Environmental Engineering	Prof. Neven Duić, PhD
8.9	Improving Mobility and the Transport System - Lower Town	University of Zagreb, Faculty of Civil Engineering, Department of Transportation Engineering	Željko Stepan Prof. Damir Pološki, PhD
8.10	Circular Management of Buildings - Block_19 Pilot Project	University of Zagreb, Faculty of Architecture, Institute of Building Construction and Building Physics	Assoc. prof. Zoran Veršić, PhD
8.11	Design Models of Renewal - Block_19 Pilot Project - SCENARIO II	R/INOVACIJA	Prof. Krešimir Rogina
8.12	Design Models of Renewal - Block_19 Pilot Project - SCENARIO I	Hrzić Architecture Atelier	Prof. Marijan Hrzić, PhD
8.13	Sociological Study - Upper Town and Kaptol	Institute for Social Research	Anđelina Svirčić Gotovac, PhD
8.14	Conservation Models of Renewal - Upper Town (Block 11) and Kaptol (Opatovina)	Institute of Art History	Katarina Horvat Levaj, PhD
8.15	Design Models of Renewal - Upper Town and Kaptol Scenarios	Hrzić Architecture Atelier R/INOVACIJA	Prof. Marijan Hrzić, PhD Prof. Krešimir Rogina

	Study/research name	Study prepared by	Team leader(s)
8.16	Urban Planning Models of Renewal of Blocks (part of the comprehensive renewal of the Protected Historic Urban Area of the city of Zagreb - Upper Town and Kaptol) and Urban Planning Guidelines for Renewal	University of Zagreb, Faculty of Architecture, Institute of Urban Planning, Spatial Planning and Landscape Architecture	Prof. Tihomir Jukić, PhD
8.17	Improvement of Public Utility and Service Systems (Adaptation of the Drainage System to Climate Change)	STARUM d.o.o. Loodus Punkt d.o.o.	Tatjana Uzelac, BSc CE Bruno Juričić, MArch
8.18	Economic Models of Renewal - Business Plan		Irena Đokić, PhD
8.19	Identity Topography of the Historic Urban Core of the City of Zagreb	University of Zagreb, Faculty of Architecture	Prof. Bojan Baletić, PhD

Brief summaries of all expert studies are given below. Complete materials are available on the website of the Institute for Physical Planning of the City of Zagreb (in Croatian).

<https://www.zzpugz.hr/program-obnove/>

8.0

Block_19 Pilot Project: Physical Planning Documents

Study prepared by

- Institute for Physical Planning of the City of Zagreb

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Expert team

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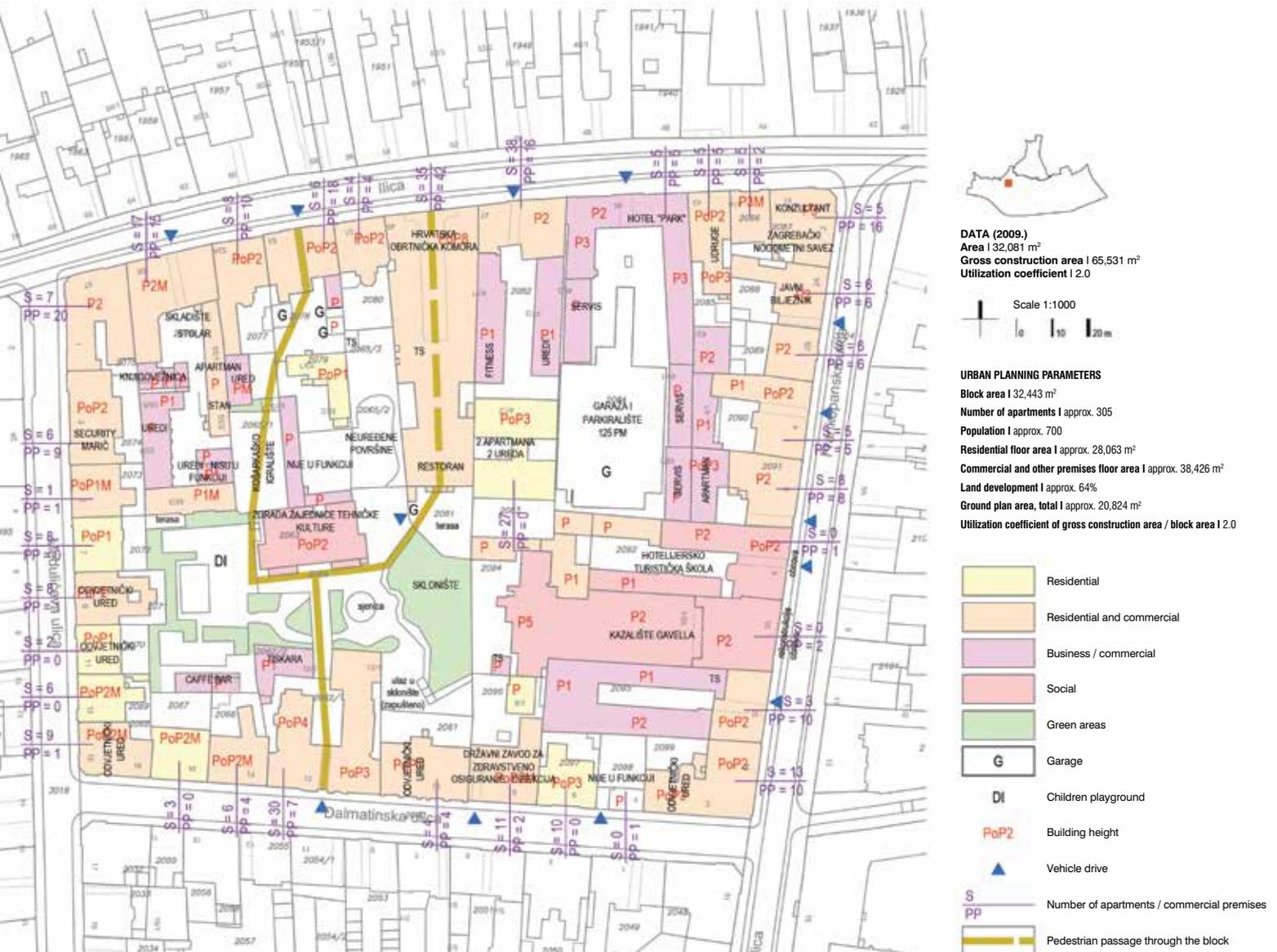


Fig. 18: Block_19 Pilot Project current state – usage and number of storeys



Terms of Reference and the role in the Programme

The development of a spatial base for the Block_19 Pilot Project is a preparatory phase for the development of the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb. It includes an analysis of the current state, an extract from the valid and archival physical planning documentation relevant to the pilot project area, an extract from the valid conservation base, photo documentation, an analysis of available data on property rights, etc. The study is a basis for expert working groups for sectoral research conducted on the Block_19 Pilot Project.

Collecting spatial data pointed to the need to create an integrated and interoperable database as a project within a project, which, in combination with field research, will simultaneously be an updated current state for the development of all types of spatial analyses, documents, plans and projects. Simultaneously, as a sub-project, analogue archival documents (physical plans and other spatial documentation) will be digitized.

8.1

Structural Models of Renewal (part of the comprehensive renewal of the protected Historic Urban Core of the city of Zagreb - Lower Town)

Study prepared by

- University of Zagreb, Faculty of Civil Engineering, Department of Engineering Mechanics

Team leader(s)

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- Ass. prof. Marta Šavor Novak, PhD

Fig. 19: Assessment of usability of buildings in Block 19 after the Zagreb earthquake



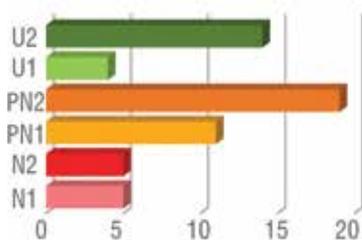


Fig. 20: Number of assessments by usability class of buildings in the Block 19 after the Zagreb earthquake – number of assessments and usability classification

Summary

Terms of Reference was very demanding because this building stock is more than 100 years old (more than twice the normal design life of structures according to current regulations), derelict (materials have lost their properties), mostly unkempt and has been repeatedly reconstructed (which is a big problem). Initially, the goals were to clearly determine the existing level of safety, define a plan to increase the level of safety, aiming at the requirements of modern regulations, use state-of-the-art knowledge and technical solutions (for example, materials) with the aim of increasing safety (but also the quality of life), define building maintenance processes through monitoring and documenting all future activities and ultimately communicate clearly with the aim of raising the level of awareness about the risk of earthquakes (for example, raising awareness about harmful effects of illegal reconstructions). The available knowledge and methodologies were used to achieve the goals, including:

- a detailed analysis of available documentation;
- a visual inspection of buildings and a classification by characteristic building categories and damage categories, using data from the rapid/preliminary inspection by volunteers;
- a preliminary engineering building resistance assessment, using analytics developed within the Study on Earth-caused Damage Remediation (2014-2021) which is based on adding weighting factors to characteristic elements/attributes of buildings;
- a detailed analysis of seven characteristic buildings, including the development of a numerical model.

The preliminary results show high vulnerability of buildings to earthquakes expected in the City of Zagreb. Based on the analyses of different complexity, different types of structural models of renewal were considered, including a wide range of approaches - from minimal interventions to the removal of a building. The analyses of buildings in a block were specific for the fact that they cannot be considered independently (which is common in design engineering practice); instead, it is the interaction of buildings (how they impact one another) that should be analysed. Such an approach opens up a new dimension of possible interventions that do not have to be focused on individual buildings but rather, by isolating characteristic parts of a block, the intervention can be aimed at the block (or part of the block) as a whole, which has proven to be more efficient. For example, connecting buildings, common panels, connecting the characteristic wall axes, which are not common solutions, but the earthquake in Zagreb showed that buildings in a block behave more favourably. An additional aspect is to try to “use” the proposed architectural concepts (infills, annexes, elevators and the like) to increase the safety of structures and residents.

Fig. 21: Usability labels
SAFE FOR USE
TEMPORARILY UNSAFE FOR USE
DANGEROUS FOR USE

green label
yellow label
red label



Conservation Models of Renewal - Block_19 Pilot Project

Study prepared by

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Fig. 22: Photogrammetric image of the façades (ortophoto) Medulićeva – Ilica streets section





Summary

The research includes architectural and photographic recording as well as archival and historical research, an analysis of the existing condition, interpretation and valorisation of buildings, as well as the proposal of conservation guidelines for individual buildings and the block as a whole.

The results of research, documentation and recording are presented and interpreted in a conservation study consisting of introductory texts and catalogues of each individual house in the block (35 of them). When the conservation study was prepared, the main goal of the research was achieved, which was to analyse and document each individual building in the block with the purpose of establishing the construction history, determine the typology, and lastly carry out the valorisation with the aim of adopting conservation guidelines. Research results have shown a high value of Block_19 within the Lower Town blocks and their architecture, formed during the second half of the 19th and the beginning of the 20th century. The block is located right next to the oldest outskirts of medieval Gradec, and that is reflected in the preserved old structure of allotment and construction.

The block's transformation, during the reconstruction after the 1880 earthquake, resulted in high-quality historicist architecture. It was enabled by powerful investors, for example Stjepan Spevec, rector of the University of Zagreb, who entrusted the construction of his house to Herman Bollé, or dr. Kosirnik, whose house was built by Gjuro Cernelutti, but also by the fact that many plots were owned by the family of architect Leo Hönigsberg, who, together with architect Julije Deutsch, founded his office in the block, designing several anthological works in it. The quality did not decline even during the Art Nouveau era, with the involvement of Vjekoslav Bastl and Lav Kalde, until the inter-war period when Aleksandar Freudenreich and Zvonimir Požgaj intervened in the block with high-rise construction (the skyscraper of the Croatian Chamber of Trades and Crafts). When we add to that the gradual shaping of the theatre and the preservation of green interior zones, numerous potentials are obvious for the comprehensive renewal of the block, as an example of the renewal of Zagreb after the 2020 earthquake.

8.3

Sociological Study - Block_19 Pilot Project

Study prepared by

- Institute for Social Research

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- Nikola Petrović, PhD
- Filip Fila, MSc Sociology

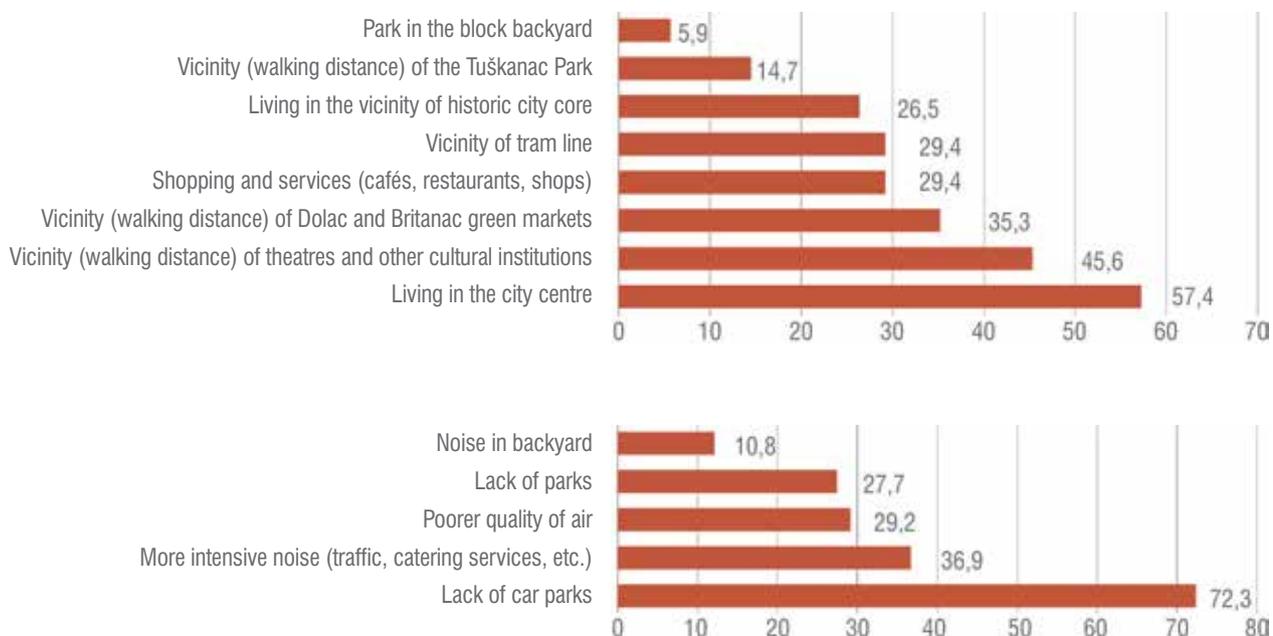


Fig. 23: Advantages and disadvantages of life in the Block_19

Summary

Sociological research is an indispensable part of urban planning. Communication with residents and getting familiar with activities in their neighbourhood as well as surveying their needs, ideas, suggestions and proposals about the space in which they live and work provide valuable information to planners and act as a barometer of the success of spatial solutions and the quality of living, working and spending spare time.

The sociological survey was conducted on a convenience sample (N=68) of tenants and users of Block_19 bounded by Ilica, Frankopanska, Dalmatinska and Medulićeva streets in November and December 2020 using a mixed methodology (face to face), partly in direct contact with the respondents, and partly with the help of an online service (Online Survey). Most of the respondents want to stay and live both in their apartments and in the city centre and have no plans of moving from the city centre. As expected, funding the reconstruction from mandatory maintenance fees was highlighted as a major problem (nearly a fifth of respondents have accumulated insufficient funds from these fees while less than a tenth of them have enough to cover the costs). Main disadvantages of living in the block are lack of parking spaces and noise from traffic and restaurants, and to a lesser extent poor air quality and lack of parks. People expressed the need for availability of crafts and services. Statements about various forms of earthquake resilience and public infrastructure improvements, especially the statement about improving bicycle infrastructure in the city centre achieved the highest average results regarding the comprehensive renewal process. Respondents largely disagree with the statement about the transformation of the centre into a commercial and tourist zone and strongly oppose the apartmentisation and touristification of the city centre. For the comprehensive renewal of the city centre, impact of the relevant professions is emphasized as the most important element that will contribute to the generally accepted, long-term preservation of the city centre.

Urban Planning Models of Renewal (part of the comprehensive renewal of the protected Historic Urban Core of the city of Zagreb - Lower Town)

Study prepared by

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Expert team

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- Ass. prof. Ana Mrđa, PhD
- Assist. Kristina Perkov, MArch

Summary

Given that individual parts and/or blocks of the historic city core are heterogeneous and have numerous distinguishing features, the urban planning study was conducted on a wider scope of the protected Historic Urban Core of the Lower Town (350 hectares, 168 blocks). Ten key spatial aspects were determined for the purposes of the research which should be taken into consideration when looking at the entire space - its features and processes as well as needs and possibilities for renewal. They are: built structure, protection and

Fig. 24: Directions of expansion of the pedestrian zone

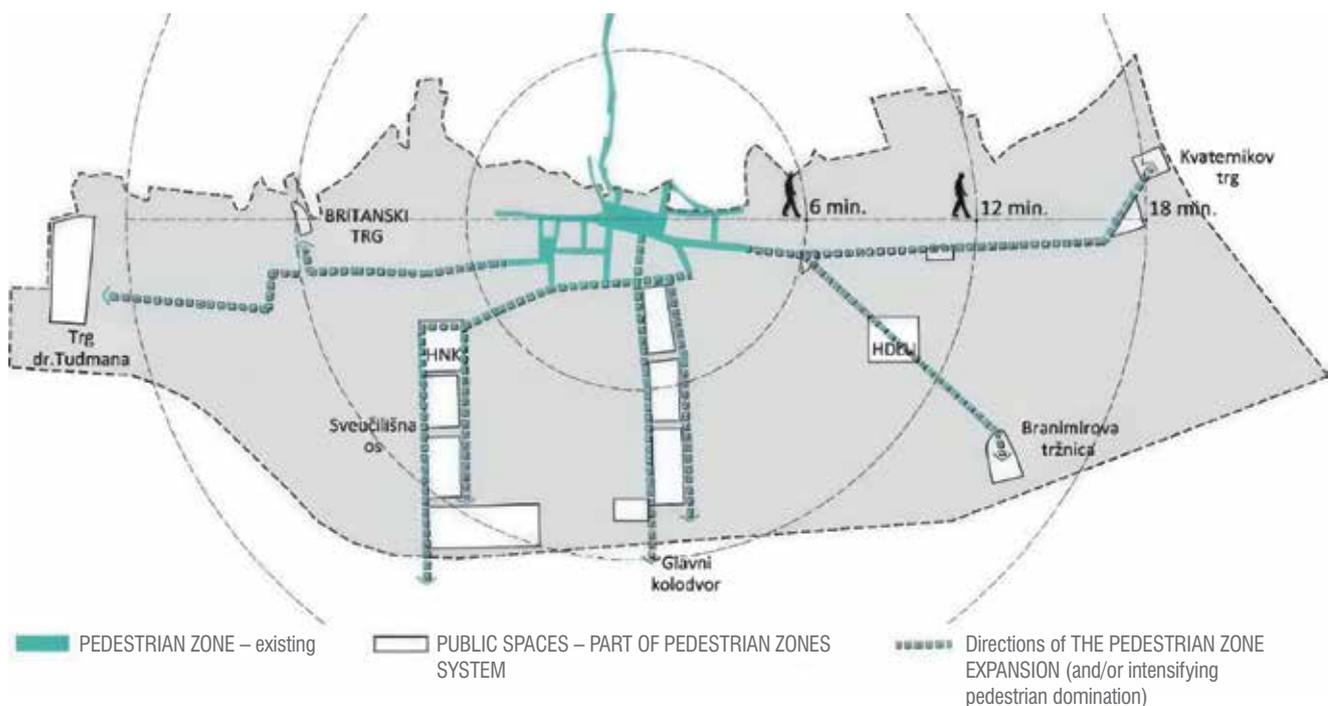
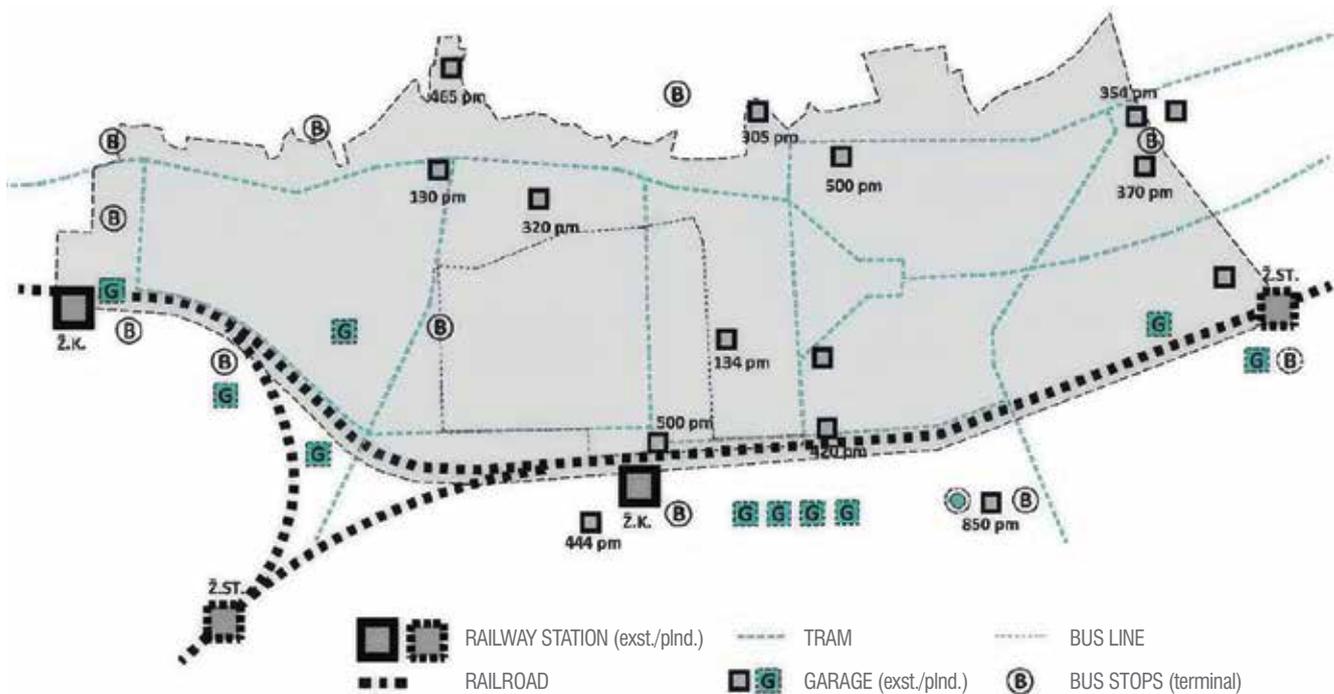




Fig. 25: Possible improvement of the neighbourhood green infrastructure

Fig. 26: Location of new public garages at the outskirts of the Lower Town by the public traffic terminals (discouraging car traffic in the city centre)



conservation, facilities and activities, housing, traffic, green areas and public spaces, property right aspects, identity and ambiances, modernization degree and urban security.

To choose an appropriate renewal model, both for Block_19 and other spatial units/blocks, it is necessary to consider integrally the conclusions regarding all established spatial aspects, since they are interdependent and form a comprehensive urban renewal model.

Within the aforementioned comprehensive renewal model the analysis of all 168 blocks in the Lower Town offered four characteristic types of block renewal, with regard to their structural and functional transformations, as well as the possibility of implementation regarding property rights, all viewed in a shorter or longer period of realization. With minor adjustments, the proposed types can be applied to most of the Lower Town blocks. Designing and establishing a comprehensive urban renewal model for the Lower Town, which must include both the organizational and the financial structure, should not bring a halt to activities that can be carried out already under the existing legal regulations and physical planning documentation.

Some of the most important goals to be achieved based on the model of urban renewal are: establishing an interdisciplinary approach and residents' participation, enabling structural changes in the block and its interior, retaining existing and attracting new residents, establishing measures to balance the ratio of housing, tourism and business facilities, improving urban public transport, discourage transit traffic through the Lower Town, improving and adapting the concept of parking/garages, implementing the green infrastructure concept, establishing a more even distribution and share of green areas, content/thematic profiling of certain city areas and implementing the necessary modernization and adaptation to modern needs.

Property Rights Models of Renewal (part of the comprehensive renewal of the protected Historic Urban Core of the city of Zagreb - Lower Town)

Study prepared by

- University of Zagreb, Faculty of Law

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Expert team

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- Prof. Marko Baretić, PhD
- Assoc. prof. Hano Ernst, PhD
- Ass. prof. Ivana Kanceljak, PhD

Summary

The starting point for the study, on the one hand, is an extremely complex factual and legal state of the ownership, conditioned by the historical development of ownership legal systems in the former Yugoslav Federation and the changes following the abandoning of social ownership, necessary for the identification and categorization of property right issues in the Historic Urban Core of the city Zagreb. On the other hand, the starting point is the existing legal framework, including the new Act on the Reconstruction of Earthquake-damaged Buildings in in the City of Zagreb, Krapina-Zagorje County, Zagreb County, Sisak-Moslavina County and Karlovac County. As an example illustrating the existing factual and legal situation, the documents

Fig. 27: Level of harmonization of plots entered into the Lower Town cadastre and land registry





Fig. 28: Level of harmony of Block_19 plots entered into the cadastre (Centre cadastral district) and land registry (City of Zagreb cadastral district)

submitted for real estate located in Block_19 were used. The existing general legislative framework only partially solves problems specific to renewal issues, while the special Act on Reconstruction does not contain the comprehensive legal framework, resulting in ambiguities and vagueness in implementation. The study, following the examination of current facts and the legal situation, aims to assess the adequacy of the existing models for solving property rights relations as a basis for renewal and offer possible amendments to regulations or practice, i.e. new models to support models of structural, urban planning, energy, infrastructure and conservation renewal which are developed by other Expert teams included in cross-sectoral cooperation during study preparation. Members of the expert legal team took part in the research, individually preparing several sections of the study and jointly collaborating on the harmonization and aggregation of common relevant issues.

The study offers conclusions about the challenges and risks of existing models, but also of possible solutions, the choice of which partly depends on the choice of models from other sectors, and the realization of which ultimately depends on the readiness and willingness of the respective branches of government for the necessary interventions and implementation. It is the basis for a clear legal basis for the implementation of the renewal model of other professional sectoral groups, and a roadmap for the inhabitants of the Historic Urban Core of the city of Zagreb for the renovation of their buildings and not leaving the city centre.

Economic Models of Renewal - Economic Analysis of the City of Zagreb and Assessment of Macroeconomic Impacts of the Renewal

Study prepared by

- University of Zagreb, Faculty of Economics and Business

Team leader(s)

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Expert team

- Prof. Ljubo Jurčić, PhD
- Antea Barišić, PhD

Summary

The study looks into the long-term potential of investment in renewal in order to move away from regarding investment in renewal merely as the cost of repairing damage and to recognize it as an opportunity for future growth and development. Renewal should be planned in accordance with state-of-the-art trends such as the Green Deal, EU energy transition, etc., and develop the City of Zagreb into a smart and green city. The aim of this research is to provide an economic analysis of the City of Zagreb and to assess the macroeconomic impacts of renewal. The economic analysis is based on the analysis of the existing macroeconomic indicators. The potential impacts of investments in renewal were estimated by applying the input-output method in Croatia's input-output charts for 2015.

The study provides a static and dynamic macroeconomic analysis of the City of Zagreb. The analysis focused on change in population trends as key determinants of the economy and the need for investments, as well as on the direction of the city's development. Next, the gross domestic product and the structure of the economy were analysed, as well as key indicators of the labour market and the expected gross trends. The analysis highlighted the economic importance of the City of Zagreb for the Republic of Croatia, as well as oppor-

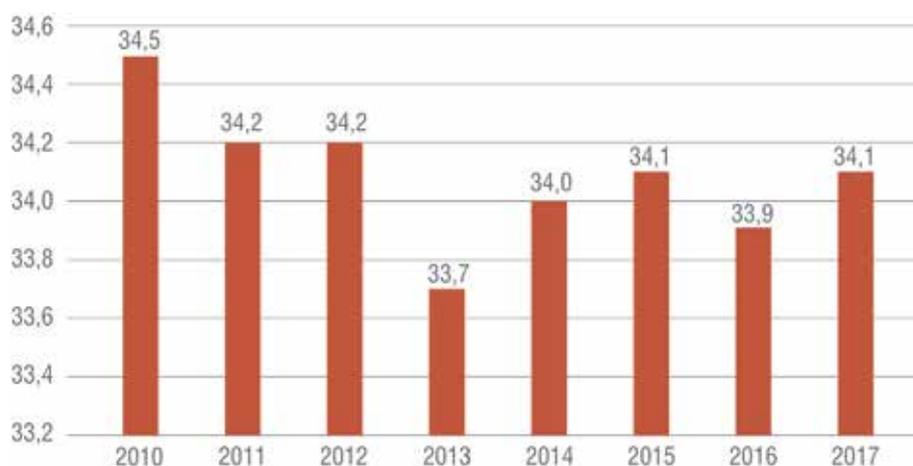
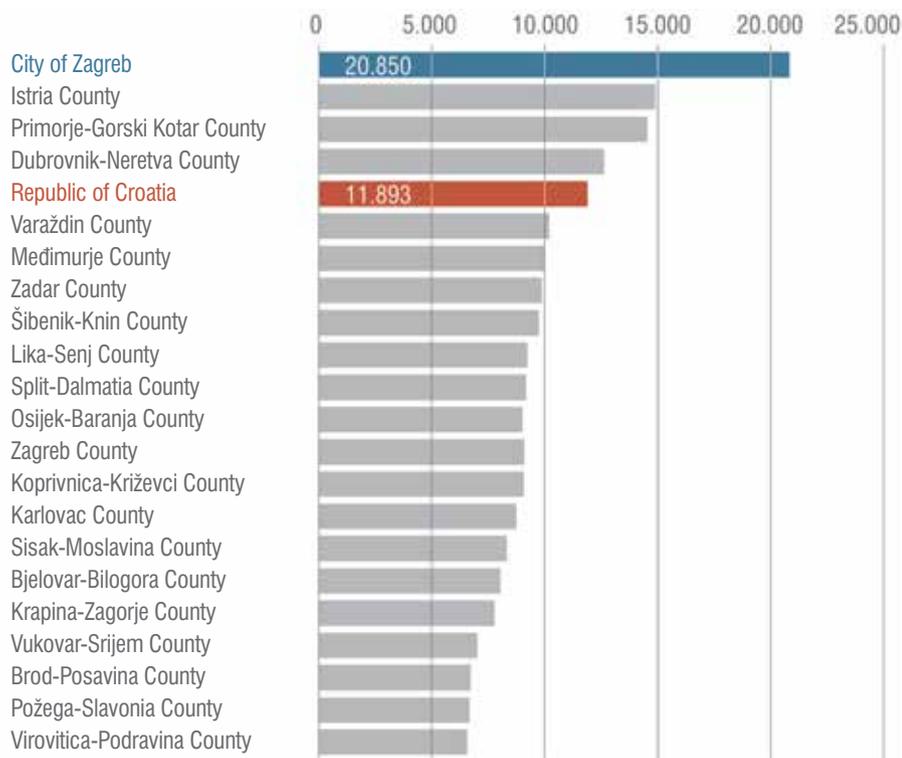


Fig. 29: The City of Zagreb GDP share in the GDP of the Republic of Croatia (2010-2017)

Fig. 30: GDP per capita by the Republic of Croatia counties in 2017 (EUR, current prices)



tunities and threats to its further development. The second part provides an assessment of macroeconomic impacts of the renewal. The approach to analysis and the applied model are explained. Further, results of the analysis in the segment of renewal impact on the gross value added and employment in the Republic of Croatia were presented.

According to the preliminary results of the input-output analysis, the renewal investment of HRK 1 billion (EUR 132.4 million) has the following estimated total direct and indirect impact: (1) around HRK 700 million (EUR 92.9 million) of gross value added; (2) around HRK 840 million (EUR 111.5 million) of gross domestic product, and (3) over 4,000 new jobs, depending on the renewal pace. The analysis assesses the impacts of investment in renewal on construction, industry and services, as well as on development opportunities for the sectors with high added value, which respond to changes in demand in the City of Zagreb, as well as in the global environment. Renewal offers an opportunity for development in the segment of renewable energy sources, energy efficiency systems, new materials and services, etc. When planning and implementing investments, possibilities to increase innovation and involve different stakeholders (state, city, university, business community, residents, civil society and social entrepreneurs) in this process should be continuously taken into consideration.

8.7

Adaptation to Climate Change Impacts and Green Infrastructure Usage - Block_19 Pilot Project

Study prepared by

- North-West Croatia Regional Energy Agency – REGEA

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- Prof. Neven Duić, PhD, FMENA

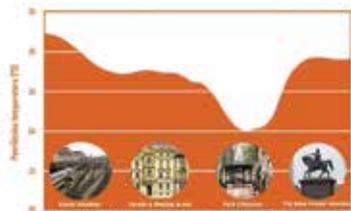


Fig. 31: Surface temperature in Zagreb during summer 2020

Fig. 32: Proposed concrete goals within the areas and concept of creating green infrastructure network in the Historic Urban Core of the City of Zagreb

Creating green infrastructure network in the Historic Urban Core of the City of Zagreb	Increase in share of green infrastructure using block identity solutions
Green infrastructure as a part of economic model – heritage and tourism	Reinforcing/creating synergetic relationships: green infrastructure + public space + buildings

Summary

The study identified main climate change threats and their impact on the urban environment, focusing particularly on the Historic Urban Core and the Block_19. It is presumed that the quality of life in the city centre can be significantly improved by applying Nature-based Solutions and green infrastructure (dispersed and networked) in combination with the social dimension. The approach to methodology development is driven by the idea of the subsequent scaling potential to larger units and networking of these units. The main results are an elaborated methodology for analysing the existing situation in the block, guidelines for increasing the share of applied green infrastructure, connecting the block’s green infrastructure segments into a network of urban, peri-urban and rural green infrastructure, identified specific measures and



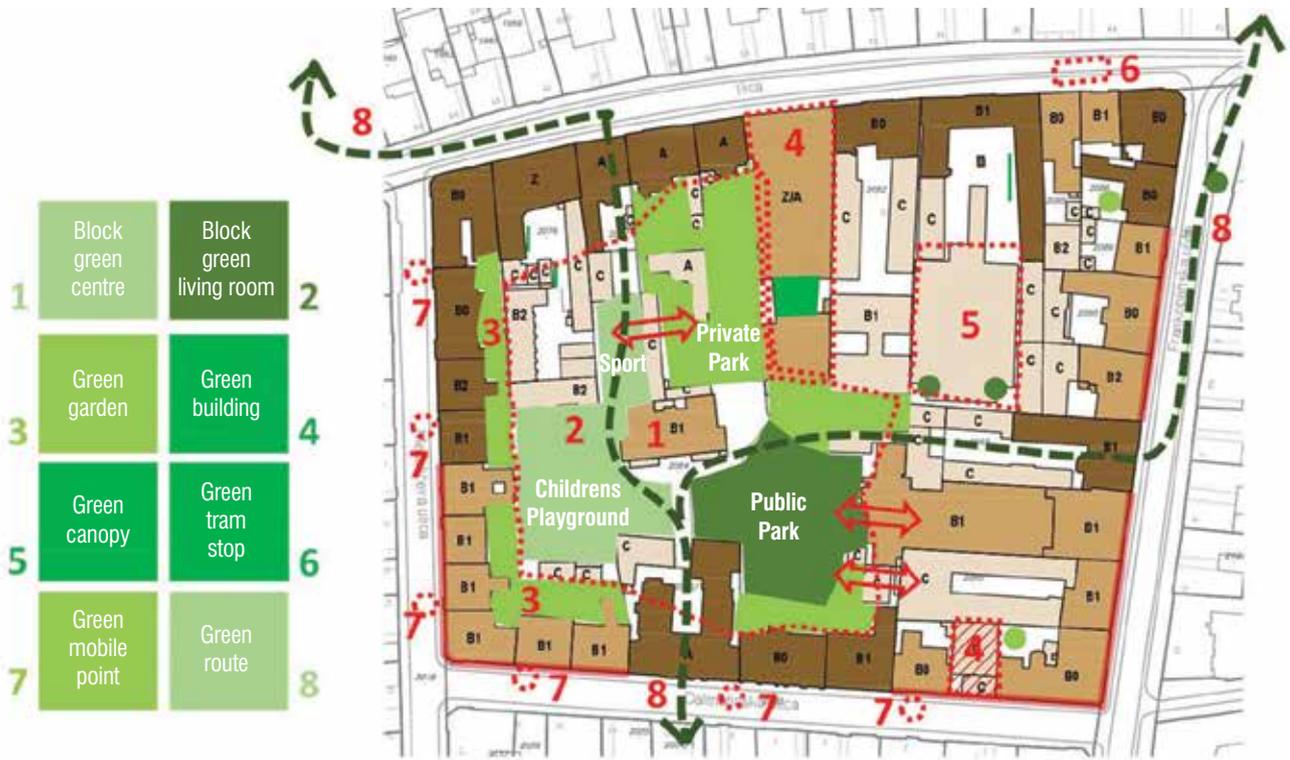


Fig. 33: Proposed green infrastructure solutions for Block-19

projects depending on the time frame and an overview of potential financial sources. Possible interventions using the Block_19 Pilot Project as an example and possible application on all blocks to increase green areas and improve the microclimate conditions are: transformation of the building in the centre of the block into the block's social green centre through the comprehensive renewal with the help of green infrastructure; transformation, expansion and integration of green areas in the central part of the block and the creation of an outdoor "living room" of the block; urban gardening as a contribution to climate change adaptation; introduction of green walls, green roofs, roof gardens and green terraces; covering the built surface or public space with a green canopy (pergola) to reduce the heat island effect; creating green infrastructure at tram stops, canopies with green roof; (temporary) replacement of a parking space with a green mobile point; creation of green pedestrian routes that connect blocks and weave a network of green infrastructure.

As regards the aspect of comprehensive renewal, it is necessary to spatially connect the green infrastructure elements inside blocks with the green infrastructure areas outside blocks. The study defines the methodology for the basic analysis of the existence of green infrastructure elements inside and outside the blocks and their connection at the block level into a higher-level network. Green infrastructure should be integrated with the results of all sectoral teams, with strong support from the economic and legal team.

Energy Renewal, Transition and Decarbonisation - Block_19 Pilot Project

Study prepared by

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Team leader(s)

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- Luka Boban, PhD, FMENA
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- Julije Domac, PhD, REGEA

Fig. 34: Location of potential connection to the existing steam line (orange), proposed expansion of the District Heating System (red), and location of additional blocks (green) for potential connections



Fig. 35: Percentage of CO₂ emission by consumption type, reference state



Summary

The energy transition towards renewable energy sources and the decarbonisation (defossilization) of the building design and construction and the mobility sectors of the City of Zagreb are the fundamental principles of a climate-neutral future.

The research is focused on the energy consumption in buildings and the existing energy infrastructure in the Historic Urban Core of the city of Zagreb. Based on a more detailed elaboration of the Block_19 Pilot Project, the heating sector was identified as the one responsible for approximately 75% of CO₂ emissions due to the low energy class and the use of individual natural gas boilers, which puts the heating sector decarbonisation in the focus of transition processes. At the same time, the heating sector accounts for a large share of energy consumption. For the Historic Urban Core of the city of Zagreb it is also important to look at the cooling options in order to remove air conditioning units from roofs and façades. Scenario analysis showed a relatively low potential of available renewable energy sources which cannot fully cover the energy needs of the entire block. The final proposed technical solution comprises energy renewal of buildings, connection to the District Heating System of the City of Zagreb, installation of photovoltaic panels on building roofs in accordance with conservation conditions, and installation of water-to-water or ground-to-water heat pumps, depending on the yield of the aquifer for covering the heat load of several buildings within the Block_19. It was emphasized that the heat pump can be used for heating and cooling, depending on external conditions or energy needs in the building.

In accordance with the technical solution for the pilot project, energy transition was proposed for the Historic Urban Core of the city of Zagreb so that in 2050 it will not use individual gas boilers but technologies based on co-generation (simultaneous production of electricity and heat), renewable energy sources and heat pumps. The biggest challenge is the expansion of the existing major hot-water lines as it requires systematic planning and coordination of all participants. Energy renewal of buildings should run in parallel with the expansion of the District Heating System to reduce the heat load of the building and release additional heat capacities of the heating network. Cooling needs will be covered by heat pumps or by developing a district cooling system.

Improving Mobility and the Transport System - Lower Town

Study prepared by

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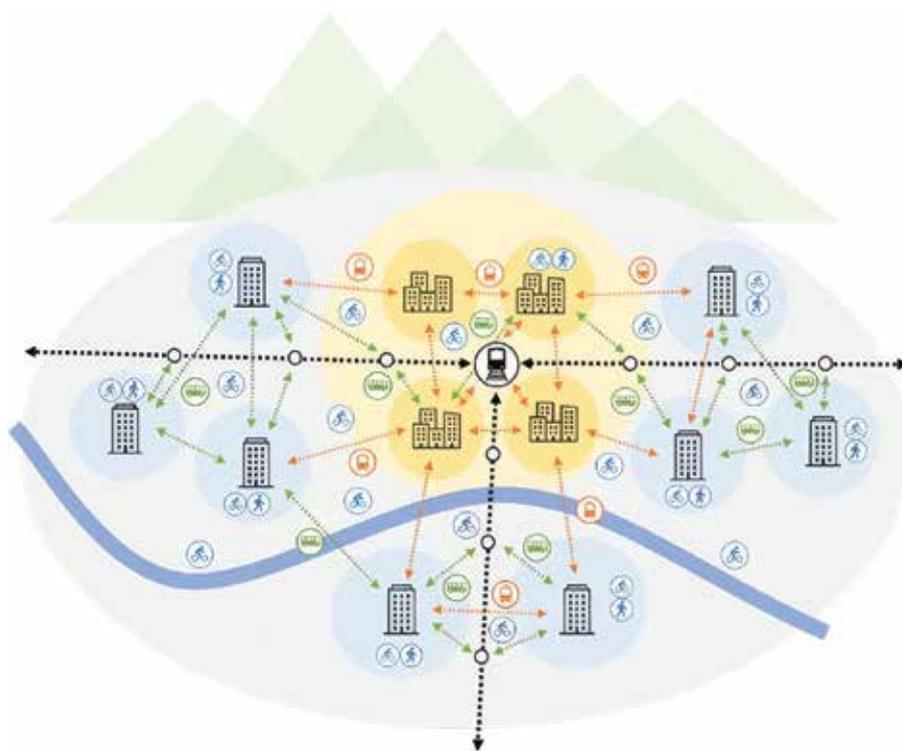


Fig. 36: Vision of future development of the City of Zagreb transport system towards the 15-minute city

Fig. 37: Vision of Dalmatinska street design



Summary

The issue of mobility and the transport system goes beyond the boundaries of the Historic Urban Core of the city of Zagreb, thus a regional approach in accordance with the most advanced EU practices is necessary. The main challenges in the mobility and transport system of the city centre are the improvement of pedestrian and cycling standards and infrastructure, transit traffic, stationary traffic and freight rail traffic.

The vision of improving the mobility and transport system in the Historic Urban Core of the city of Zagreb includes the reshaping of the transport system through its reconstruction and the restoration of the city centre identity with the residents' active participation in the renewal and development. The basic vision in the planning of the transport system of the city of Zagreb is to establish the so-called *15-minute city*.

The mobility and transport system improvement program defined five development goals applicable to the entire transport system and to each transport sector separately: economic sustainability of the transport system, environmental sustainability of the transport system, safety of the transport system, transport accessibility and urban mobility.

The result of the Mobility and Transport System Improvement Program for the achievement of set goals is a list of 27 measures for all transport sectors covering the field of organization, management and infrastructure, which must be implemented immediately.

The *15-minute city* vision and the urban railway as the backbone of the public transport system are key research milestones that should be elaborated and integrated with all other sectors and incorporated into planning documents. Sectoral recommendations and directions for the city centre are as follows: redefine the transport network with the aim of forming zones of moderate individual motor vehicle traffic (super blocks), convert the existing areas for stationary individual motor vehicle traffic into pedestrian and bicycle corridors and green areas along with a solution for stationary traffic for residents, connect pedestrian routes within the blocks and research capacities to accommodate residents' stationary traffic in the block.

Circular Management of Buildings - Block_19 Pilot Project

Study prepared by

- University of Zagreb, Faculty of Architecture, Institute of Building Construction and Building Physics

Team leader(s)

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Expert team

- Ass. prof. Lea Pelivan, MArch
- Stanka Ostojčić, MArch

Summary

Circular management of buildings and space as one of the sustainable urban development principles has only recently appeared in the form of strategic directions, hence its application is only just starting. Introduction of the principle of circular management of buildings in the renovation programming addresses the challenge of managing a large quantity of construction waste and analyses the impact of buildings on the environment and the improvement of the quality of life. Bearing in mind the need for renovating the existing building stock of the Historic Urban Core, but also of the entire City of Zagreb, the principle of circular management of buildings and space should be related to the physical planning documentation as soon as possible.

In circular economy, resources retain their value because they are used efficiently and continuously, the relationship between primary and secondary resources is optimized, the quantity of waste is radically reduced, energy consumption and use of the material are rationalized, waste generation is prevented, recycling is encouraged and the use of hazardous chemicals is reduced, consequently leading to the development of new materials and technologies. The main goals of circular management of space and buildings are increasing the building lifespan, increasing energy efficiency, use of renewable



Fig. 38: Comparison of construction waste quantities in the entire City of Zagreb in 2017 and after the Lower Town renewal

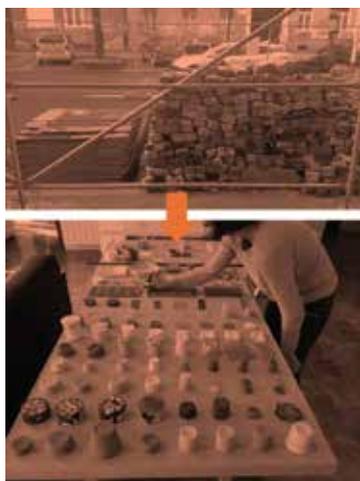


Fig. 39: Construction material and products recycling possibilities (research: koFAKTORlab)



energy sources and reducing the quantity of construction waste. When renovating the building becomes economically unjustified, the building reaches the end of its life and is dismantled and demolished.

Buildings registered in the Register of Cultural Property of the Republic of Croatia are an exception. These buildings are subject to the methods of protection and restoration of the architectural heritage which ensure a permanent process of retaining the building in space. For the materials and products left after the dismantling and demolition of the building, new possibilities of use should be identified, either in the form of primary or secondary use or as raw materials for new materials and products. Achieving this goal requires building materials and products to be used or installed in ways which will enable their reuse with as little energy consumption as possible. In doing so, it is also important to establish a waste exchange for materials and products with the purpose of ensuring control over their use and reuse. Simultaneously with establishing a waste exchange, innovations in the field of recovery of building materials, i.e. waste should be developed.

Research has shown that a significant portion of materials and products retain their technical properties after dismantling and can be reused for the same or similar purpose (primary use). Materials or products that have partially “lost” their technical properties can be used for another purpose (secondary use) or, in case of a significant loss of properties, the material or product can be used as raw material for new products (recycling).

8.11 Design Models of Renewal – Block_19 Pilot Project – SCENARIO II

Study prepared by
— R/INOVACIJA

Team leader(s)
— Prof. Krešimir Rogina

Expert team
— Prof. Krešimir Rogina, MArch
— Bernarda Ivančan, MArch

Summary

Scenario II of design model of renewal is a result of a theoretical consideration of the city at the beginning of the 4th Industrial Revolution, with a design outlook towards 2050 and beyond. It follows the specific nature of development by looking 30 years back in an attempt to understand what comes next, 30 years in the future. By asking what could change, whom we are addressing and how, it attempts to envision scenarios and narratives for the revitalisation of Block_19 for the coming era.

Fig. 40: Block_19 layers: Three unique hubs and horizontal skyscraper

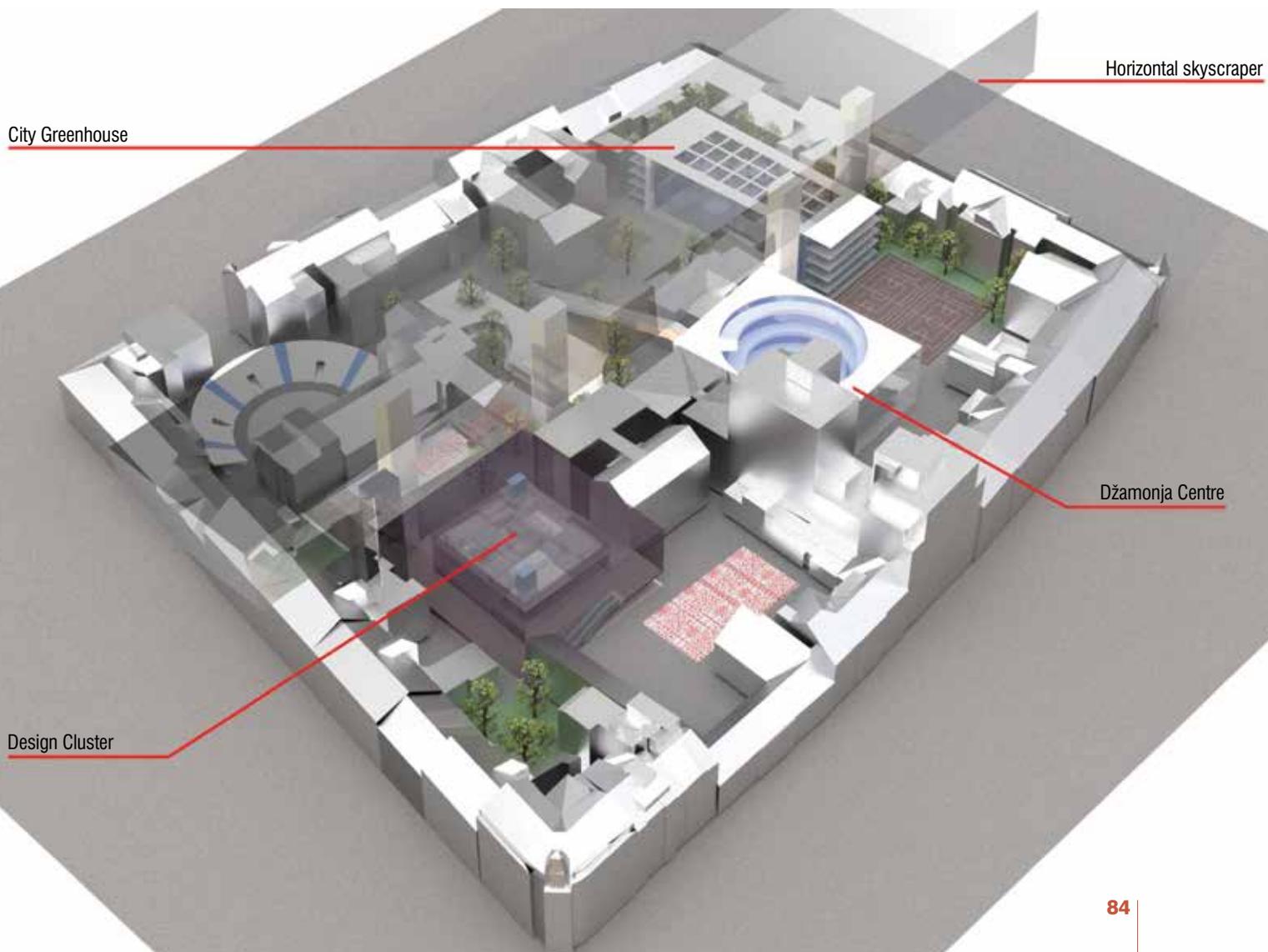
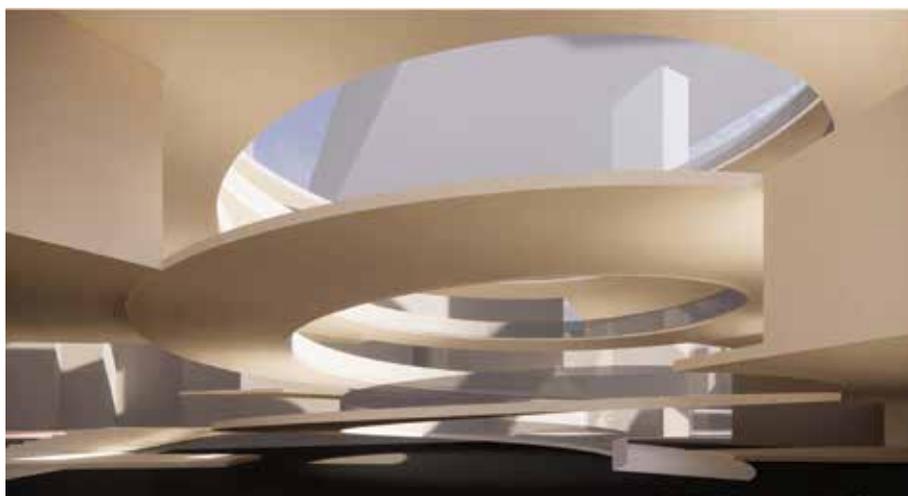




Fig. 41: Block_19 layers: City as an application



The study is based on the idea that Zagreb is a city of lost urbanity, unclear identity, and exhausted resources. The concept postulates that, in the same manner in which we generate hardware, we should aim to fabricate its software and interweave the Historic Urban Core of the city of Zagreb with an application. The use of a unique App to personify the historic core would initiate the process of making the city space public, open, and accessible, contrary to the expected privatisation. The centre would corpusculate into smaller, more dynamic units of space, reemerging into new spatial forms. The study focuses on exploring the city software, whose revitalisation, generating, shaping, and rearranging should be carried out as carefully as the renewal and expansion of the physical structure. From its definition to the vision of its new identity, i.e. the re-branding of the Zagreb Historic Urban Core, Block_19 has been discussed in detail through a number of prominent topics. Possibilities for implementing a unique urban software are analysed by chapters: through large infrastructure 24/7 and the urban city, its multisensory experience and entry into the micro- and nano-scale, to pressing issues of housing and transport, energy and waste, going even beyond, to spatial behaviourism, flora and fauna, behaviour of particles, transparency and colour, atmosphere of draft, light/shadow, water, etc.

Just as any other software has spatial and physical implications, this one would also be indicated and induced through three unique hubs and a horizontal skyscraper. Revealing, clearing up, and opening would aspire to become its main characteristics, and authenticity and nativeness, identity and originality of the location would be realised with a boundless field of possibilities and non-stop service through personalisation and customisation, identification and appropriation, as well as all-present eventfulness, which would inaugurate structures and constellations that would be impossible to experience anywhere else. Outside, it is shaped as three abstract, almost invisible crystals, and inside, there are three colossal urban areas, of which there are relatively few in Zagreb. The central one, Džamonja Centre, as the main generator for the reinvention of Block_19 and the entire historic downtown core, is a creative epicentre, with the work of the world-famous Croatian artist being only the cause and inspiration. Not less important is the Design Cluster in the east, with vital features of the School of Design, surrounded with orbiting similar elements, dedicated to features interacting with award-winning Croatian design.

Design Models of Renewal - Block_19 Pilot Project - SCENARIO I

Study prepared by

- Hržić Architecture Atelier

Team leader(s)

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Expert team

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Summary

In this study, Block_19 is envisioned as an **ARTISTIC CITY BLOCK / SCULPTURE PARK** with an existing (earthquake-proofed and reinforced) construction on the rim. At the same time, substandard and damaged buildings are removed from the interior part of the block, forming a park where a public pavilion is planned to be built, intended for cultural, social, and artistic purposes. Planned construction includes: **Džamonja Centre** in the north-western part of the block, integrated, where appropriate, with the existing building of the Croatian Association of Technical Culture; **Cultural Centre** in the north-eastern part of the block, which extends to the existing building of Hotel Park; **School of Design** in the southern part of the block, planned to be

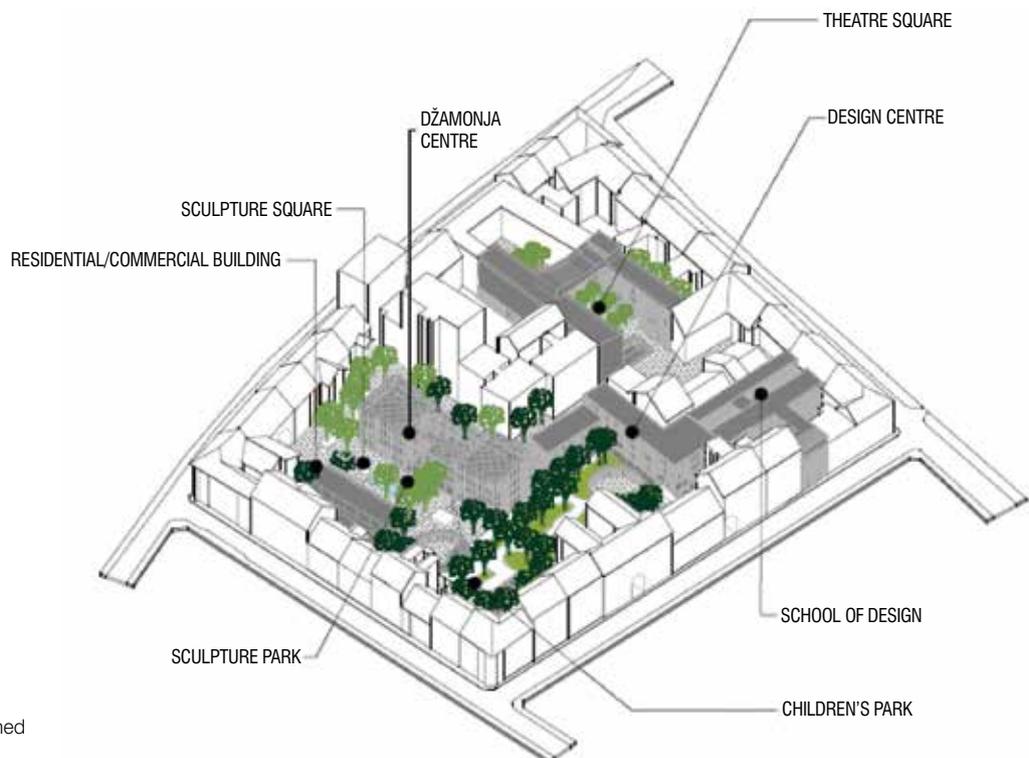


Fig. 42: Block_19 SCENARIO I: Planned construction - block axonometry



Fig. 43: Block_19 SCENARIO I: Axonometry of individual buildings and spatial representations (Džamonja Centre, School of Design, Cultural Centre, Design Centre)

built in the empty lot in Dalmatinska Street; and **Design Centre**, with a park surrounding all of them, allowing for passage and staying in the block from Ilica, Frankopanska, and Dalmatinska streets. Underground floors with commercial facilities and garage parking areas are planned to be built under the park. All planned amenities within the block are to be interconnected at floor levels -1 and -2. This way, the ground floor level will remain a park, while the underground floors, with the exception of the extension of the cultural facilities, will also offer commercial facilities and parking areas.

Džamonja Centre / Sculpture Park is a permanent and open exhibition and educational institution, consisting of the Džamonja Foundation permanent exhibition and its art collection, as well as venues for scientific and professional conferences concerning Croatian visual arts and related topics. Sculpture Park is a part of the complex, incorporated into the existing greenery. It creates a dialogue through nature with the building of the Croatian Association of Technical Culture, where it is possible to envision the intended use connected to the Džamonja Centre at a later stage of the realisation.

Fig. 44: Block_19 SCENARIO I: Spatial representation – Sculpture Park with the Design Centre building at the back



With its programme, **Cultural Centre / Theatre Park and Square** contributes to the revitalisation of the block and houses a large three-part theatre hall, smaller dance and multimedia halls, dance and music studios, classrooms, a number of connected office spaces, and public ground floors with commercial facilities. An open stage for summer shows is planned at the roof of the building. The park and square surrounding the Cultural Centre create an area for cultural and social events. Within its programme, the Theatre Park has an amphitheatre stage under the canopy. A place for generating new social events, the Theatre Square is located in the atrium of the Cultural Centre.

School of Design and Design Centre connect the empty lot in Dalmatinska Street with the adjacent one in Frankopanska Street. The new dimensions meet the requirements of the School of Design, and the intended use contributes to the “artistic” nature of the block. Design Centre is a newly-planned infill in the block, which shapes its interior façade. During the second stage of construction, the interior of Design Centre will house elements from the building of the Croatian Association of Technical Culture, leaving the room in the existing building for extending Džamonja Centre.

8.13

Sociological Study – Upper Town and Kaptol

Study prepared by

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Summary

The qualitative research targeted residents of three local councils from the historic area of Zagreb: the Upper Town, August Cesarec, and Nova Ves. Three focus groups and four interviews were held during the two stages of research (from December 2022 to February 2023). Besides the local tenants, two interviews were held with experts and actors of special importance for the urban renewal of this part of the city – one with the representative of the Zagreb Tourist Board and one with the representative of the Zagreb Archdiocese.

The main research questions (protocol) have been divided into two thematic areas: (1) Quality of life in the Upper Town and Kaptol, and (2) Complete urban renewal and revitalisation of the Upper Town and Kaptol. Through substantive analysis and data coding, five main categories of responses have been obtained, as follows: (a) *post-earthquake reconstruction and the departure of residents*; (b) *quality of everyday life*; (c) *traffic and transport solutions*; (d) *connection with the area and the sense of belonging to this part of the city*; (e) *short- and long-term revitalisation*. Most tenants pointed out that the buildings are inhabited mostly by senior citizens who did not want to participate in

Fig. 45: "Terrorism prevention measures" at the St. Mark's Square



the renewal beyond the required minimum because they already have loans and do not want to increase the mandatory maintenance fees. With regard to the existing public and primary infrastructure, the tenants of the Upper Town complained that they only have a pharmacy (in Kamenita Street), as the last grocery shop (in Ćirilometodska Street) recently closed down, so they are forced to go to the Lower Town for basic necessities. The situation was no better for tenants of Nova Ves, since all shopping is tied to the Kaptol Centre shopping mall. The greatest dissatisfaction is focused on car traffic, which is sometimes very dangerous for pedestrians in the Upper Town because of fast driving. With current traffic regulation, traffic violations are common because people try to reduce traffic circulation. The tenants also complain about the lack of parking space, which was appropriated during the construction of Ban Centre or the new pedestrian zone in old Vlaška Street. They also point out to the so-called night-time street racing and reckless driving of young drivers from the northern part towards the centre (along Kaptol Centre and Medvedgradska Street), who, apart from making a lot of noise, endanger the lives of all residents. Regarding the economy, the tenants propose tax exemptions be provided by the City for the lease of empty premises so that they are more easily occupied with various services rather than being unused. The tenants are mostly satisfied with green areas but believe that some are neglected, such as the park on Opatovina or the Vranyczany Plateau. Even though some green areas are close to existing parks, e.g. forest park Jurjevska, they are not sufficiently cultivated nor used. The tenants believe there are too few public playgrounds and that more should be invested in these and kindergartens. They are mostly bothered by the so-called *terrorism prevention measure* introduced by the government, which placed a protective railing along St. Mark's Square, preventing people from passing from north to south, which is still in place even after written complaints. The Upper Town residents want the Government and the Croatian Parliament relocated to the city's outskirts. They agree that the city should be the driver of a number of activities, especially in culture and social life, and encourage public institutions to be more open to including the local community in their activities.

Conservation Models of Renewal – Upper Town (Block 11) and Kaptol (Opatovina)

Study prepared by

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Fig. 46: Tituš Brezovački Grammar School, former Jesuit St. Joseph's seminary / royal boarding school – ground floor arch

Summary

The Institute of Art History covered two areas within the scope of the comprehensive renewal of the Historic Urban Core of the city of Zagreb, as a pilot project for the reconstruction of the Upper Town and Kaptol. In the Upper Town, this is Block 11, delineated by St Mark's Square, Kamenita, Habdelićeva, Vitezovićeve, and Ćirilometodska streets. In Kaptol, the pilot project covers Opatovina. These are two different areas. Palaces and houses of nobles and citizens, as well as a public building, former Jesuit

Fig. 47: Opatovina - orthophoto



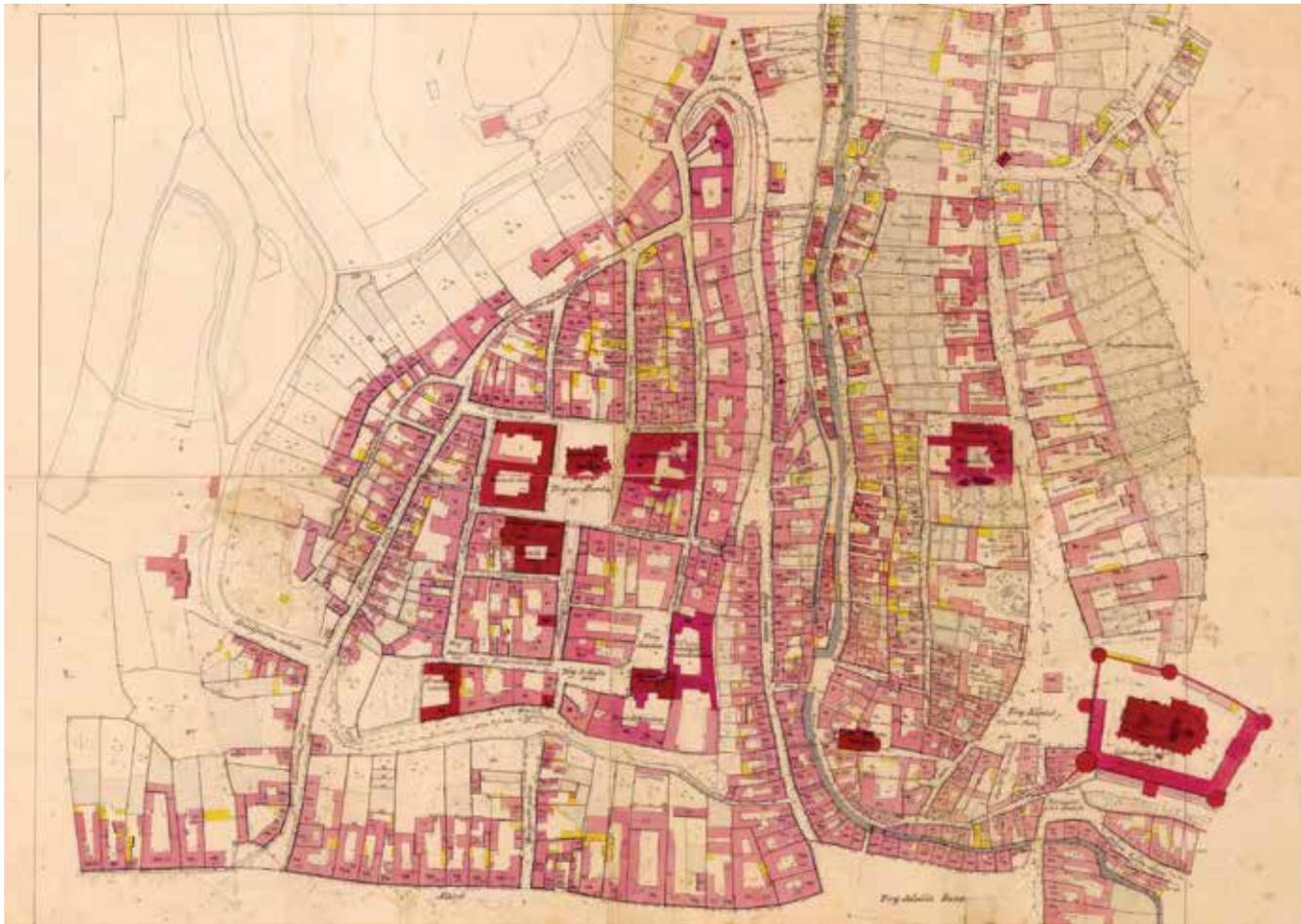


Fig. 48: Zagreb, 1864 cadastral map, Croatian State Archives, Detail with the Upper Town / Gradec / Kaptol

seminary / boarding school for nobles, today the Tituš Brezovački Grammar School, were all erected in the Upper Town block, situated at the very heart of the planned medieval town. The buildings date back between the 17th and the 19th century. However, in their structure, they contain traces of earlier historic layers. The position, orientation, and shape of today's plots all point to traces of medieval allotment of land. Considering the chronology of the owners, who belonged to the town elites, there are valuable examples of baroque and classicism architecture. For the reconstruction of these, separate conservation studies should be prepared.

In Opatovina, houses were built in the 15th century based on a planned project, when the back parts of the plots were separated from the manor houses to form a street, which follows the line of the walls. The intention was to regulate the area for settlers obligated to defend Kaptol. Most of the houses (17th – 20th century) have more modest architectural features but comprise a recognisable historic ambience. In view of their currently predominant use as catering facilities, the houses are exposed to inappropriate interventions. The conservation model for the renewal shows the spatial development of the selected areas, valorisation, and the draft conservation guidelines. Each individual house has been analysed, also accompanied with guidelines, archival materials have been collected, and photographic documentation, along with the ground floor layout, has been prepared.



Fig. 49: Grlečić-Jelačić Mansion, interior of the first floor with classicist wall paintings

8.15

Design Models of Renewal - Upper Town and Kaptol Scenarios

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Fig. 50: Analysis of the possibility of connecting Bela IV Park and Grič Park



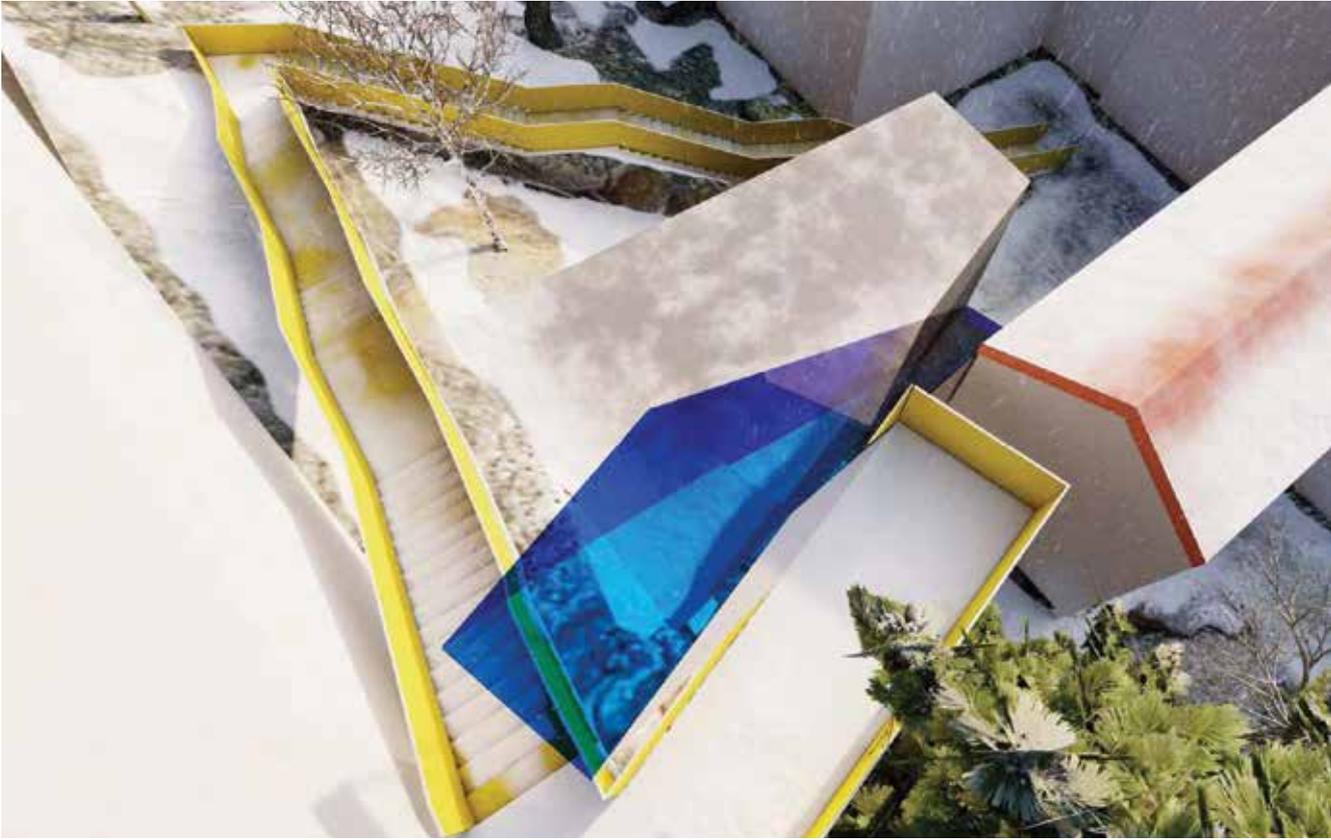


Fig. 51: Spatial representation – connection between the Upper Town and Radićeva Street

Summary

The urban area involved is already built, defined, and protected, so the emphasis is on the greenery, preserving the public space, parks, courtyards, i.e. voids, as well as a better connection between the Upper Town and the city of Zagreb, accessibility and propulsion within the area.

The main idea of the study is to protect often, even presently, endangered public space – especially public spaces in the Upper Town, such as parks, squares, streets, etc. One of the objectives of the study is to prevent further devastation.

When preserving the undeveloped and public space of the Upper Town, it is very important to preserve the city's sightlines, with particular attention given to the outskirts.

The study's objective was to research the possibility of an alternative solution for transit traffic, new public garages, and public transport, as well as to design the urban parterre. Various parking solutions for tenants were explored. However, the proposed solution is to completely relocate parking for business premises and institutions. To make this possible, it is important to establish an efficient and environmentally friendly public transport system, such as electric minibuses and new funiculars or lifts.

New connections would increase the availability of environment, as well as spatial propulsion and flow, and strengthen the incorporation of this oldest historical matrix in the city life flows, preventing the potential for Disneyfication of this highly valuable space, which should instead retain its maximum divergence of its amenities.

Fig. 52: A viewpoint at the Southern Tower site – Grič Park



8.16

Urban Planning Models of Renewal of Blocks (part of the comprehensive renewal of the Protected Historic Urban Area of the city of Zagreb - Upper Town and Kaptol) and Urban Planning Guidelines for Renewal

Study prepared by

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Team leader(s)

- Prof. Tihomir Jukić, PhD

Expert team

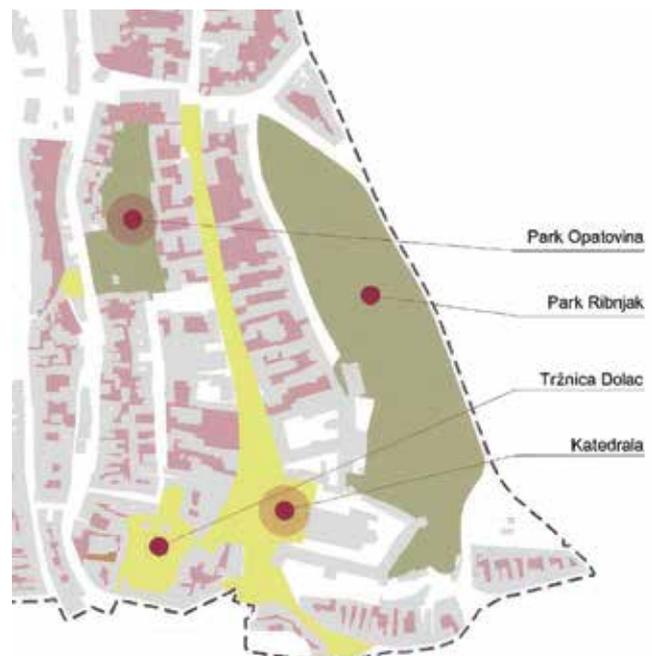
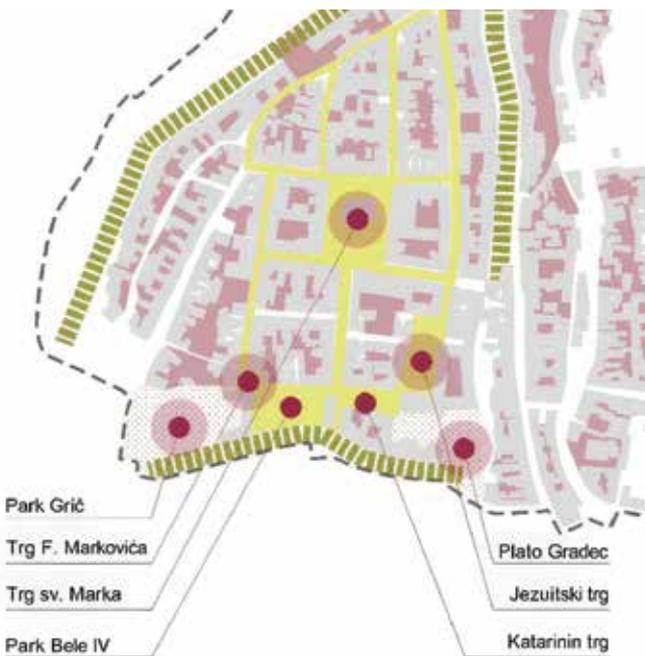
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Summary

Urban renewal understands a comprehensive modernisation of the oldest part of the city through a set of planned measures for solving the historic centre's economic, social, cultural, spatial, and environmental problems after decades of neglect. The systematically thought-out and long-term process aims to transform the historic urban core into a safe, cultivated, attractive and lively city space, and an attractive place to live. The Upper Town and Kaptol should become a multi-functional city area, with a balanced share and distribution of amenities servicing everyday needs of the residents and tourists. The historic identity must be preserved by acknowledging the protection of the valuable constructed tissue and improved by reaffirming and (re)designing the system of open public spaces (squares, parks, courtyards). It is necessary to establish

Fig. 53: (left) Public areas system concept for the Upper Town

Fig. 54: (right) Public areas system concept for Kaptol



good accessibility and connection/network by ensuring alternative pedestrian connections (passages through backyards, escalators, lifts), discouraging transit traffic and inappropriate stationary traffic, upgrading the system of public city transport, and tailored parking/garage use model.

Research results are formulated as guidelines (for short- and long-term renewal) for each of the three defined and recognisable areas.

Proposal for **the Upper Town** includes: ensuring varying intensity of use for individual sections/ambiences, graded substantive and temporal use; better connection with the Lower Town, favouring the dominance of pedestrians; networking of squares, and comprehensive planning and design; balancing amenities for tourists with those for residents; in a long-term – relocation of some administrative functions (Croatian Government, administration, and institutions), and an increase of the share of amenities ensuring the quality of everyday life (shops, services, public and social facilities, etc.), and the attractiveness of the public use of space.

Proposal for **Kaptol** includes: arranging and coordinating further activities with the City and the Archdiocese (principal owner); opening of backyards of some manor houses for public use; higher quality pedestrian (cross-)links (Tkalčićeva/Opatovina – Kaptol – Ribnjak Park).

Proposal for **Tkalčićeva – Nova Ves** includes: avoiding commercialisation and unification of hospitality facilities; insisting on a higher quality renewal and use of space by preventing the construction of closed terraces, with particular attention given to the construction of the remaining infills and their incorporation into the historic tissue, retaining of transverse passages to Radićeva Street, Dolac and Nova Ves, encouraging the diversification of amenities and finding a suitable model for the entry of delivery vehicles.



Fig. 55: Property-rights aspects – prevalent ownership: a) Upper Town – Republic of Croatia and City of Zagreb; b) Central interspace (Tkalčićeva – Nova Ves) – private ownership; Kaptol - Catholic church and Zagreb Archdiocese

8.17

Improvement of Public Utility and Service Systems (Adaptation of the Drainage System to Climate Change)

Study prepared by

- STARUM d.o.o.
- Loodus Punkt d.o.o.

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Expert team

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Summary

The starting point for the study conducted within the Comprehensive Renewal Programme for the Historic Urban Core of the city of Zagreb is the exploration of the possibility for introducing green infrastructure through Nature-based Solutions for pluvial flooding drainage and the proposal of guidelines for preparing physical plans.

The research (study) refers to measures of adaptation to climate change by upgrading public utility and service systems in the Upper Town, Kaptol, and the Lower Town, taking into consideration all factors for the high-quality introduction of green infrastructure as an element of physical planning for pluvial flooding drainage. One of the modes is an integral approach, i.e. Nature-based Solutions (NBS) and Water Sensitive Urban Design (WSUD) measures for achieving the listed objectives. It is crucial that Nature-based Solutions (NBS) and Water Sensitive Urban Design (WSUD) measures point out the

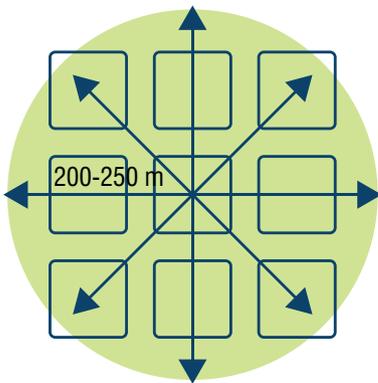


Fig. 56: Implementation plan scheme – opening the inner space in one of 3-4 blocks to public and ensuring green spaces for the residents (at 200-250 m distance from their homes)

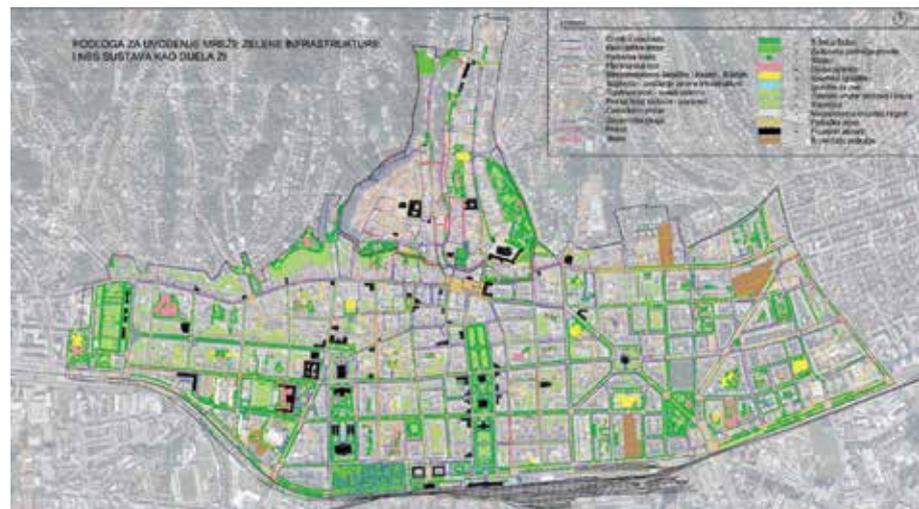


Fig. 57: Base document for introduction of a green infrastructure network and NBS system as a part of the green infrastructure

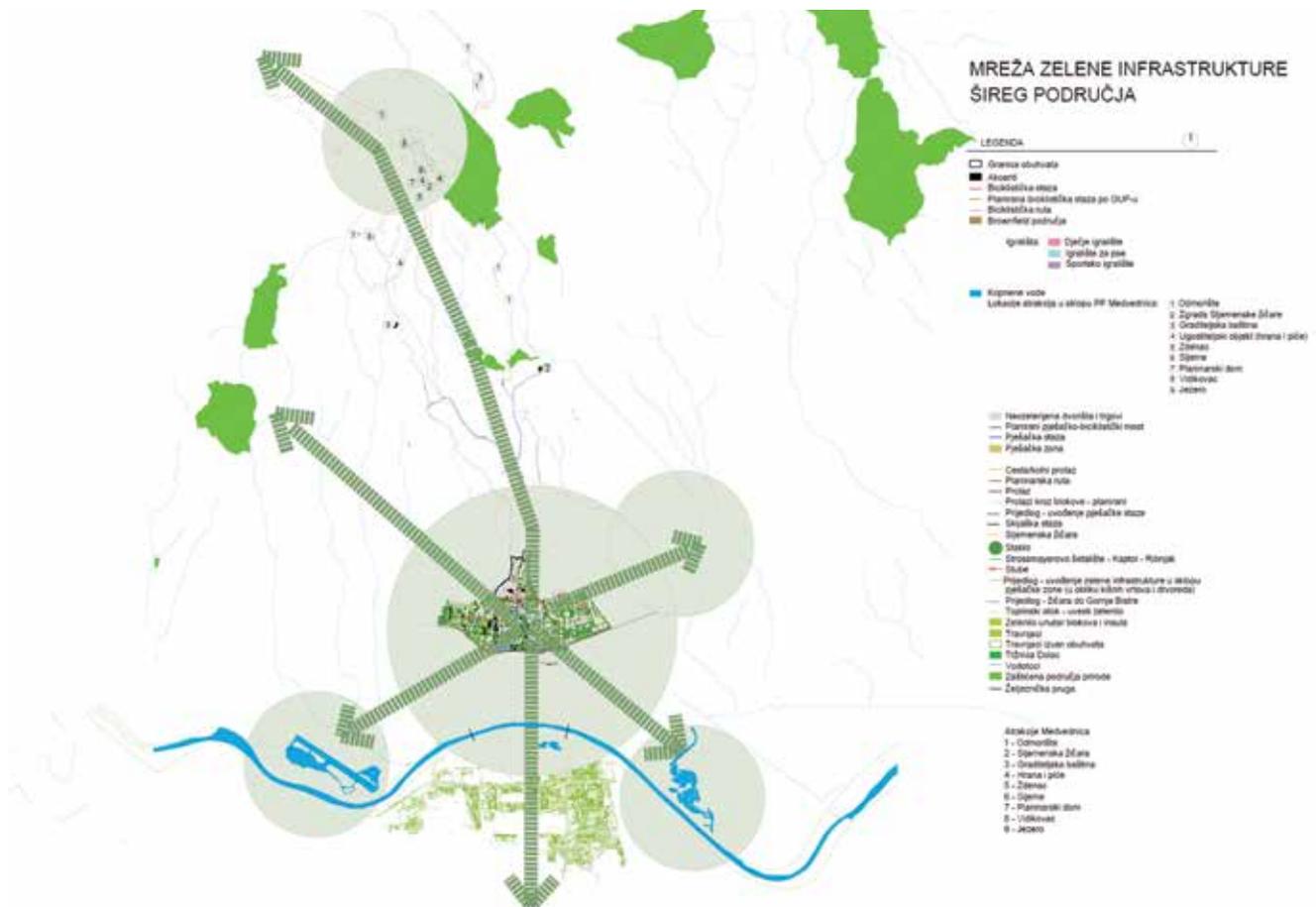


Fig. 58: Green infrastructure network for the greater City of Zagreb

importance of the retention and management of waters in the river basin and sub-basins in urban areas with integrated assessment of drainage for the entire river basin.

For the purpose of the research, it was necessary to process all existing data on natural and anthropogenic situation in the area of the intervention, as well as all GIS data and data sets required for the analysis. All existing green areas within blocks, *insulae*, squares, and streets that may serve as places for rain-water recipient have also been mapped. A calculation has been made with the Santa Barbara method for a 24-hour shower, with a recurrence period of 100 years, for all blocks, *insulae*, and streets, and the quantity of water infiltrating the underground within 24 – 30 hours if the infiltration is 10^{-7} or lower. The surplus water must be retained and gradually drained underground after rainfall.

It was determined for each block, *insula*, and street whether it is sufficient to keep the water on the ground and retain it, with a recommendation to jointly address water run-off from buildings and landscape solutions (which allow innovations in design and typology), where surplus water can be evapotransported or retained. The analysis showed that a 10% run-off reduction and the introduction of additional greenery could solve the pluvial flooding drainage with Nature-based Solutions, which could reduce the pressure on the existing combined drainage system, be adapted to climate change and reduce heat islands in the city, and which could also become a part of the green infrastructure network.

Economic Models of Renewal - Business Plan

Study prepared by

— Irena Đokić, PhD

Summary

Preparing the Comprehensive Renewal Programme is the first important step towards a systematic renewal of the Lower and Upper Town and Kaptol. For successful implementation of the Comprehensive Renewal Programme, it is necessary to prepare an Action Plan, define actors and co-actors in the implementation of planned measures/projects/activities, and identify models for renewal management and funding, as well as find possible sources of funding (in addition to the city budget), which could be used for renewal (co)funding, which is the main objective of this study. The draft Action Plan includes measures, projects, and activities that need to be implemented in the short-term, medium-term, and long-term to implement the Comprehensive Renewal Programme.

For that purpose, the study preparation consists of several steps/parts:

- examination of the existing documentation (expert studies/reports) required for the Programme and other documentation relevant for implementation of these terms of reference;
- preparing a brief statement on the approach to the renewal of Block_19;
- preparing a draft Action Plan based on measures/projects/activities proposed in the draft Programme and amending it with measures/projects/activities relevant for implementation of the Programme;
- identifying sources of funding for measures/projects/activities;
- identifying actors/co-actors in the implementation of measures/projects/activities defined in the Action Plan;
- preparing a draft conceptual model for managing and organising the implementation of the Programme;
- proposing project funding options and identifying the possibility of funding by group of measures/projects/activities;
- preparing conclusions and recommendations for the implementation of the Programme.

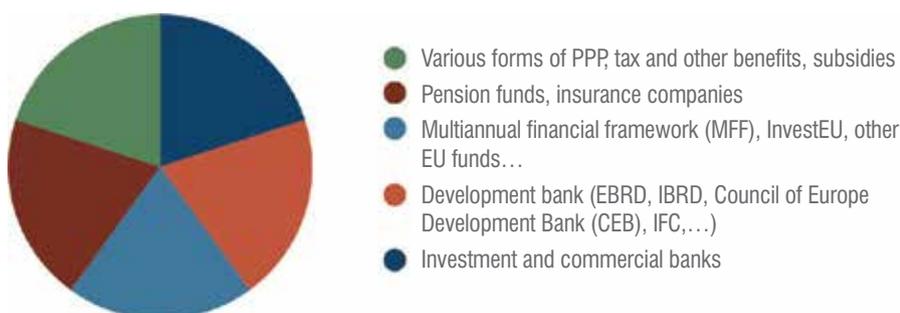


Fig. 59: Funding opportunities for comprehensive renewal of the Historic Urban Core of the City of Zagreb

The study also covers elements that are the backbone for understanding of strategic planning and the preparation of strategic planning documents, as well as compliance of the Comprehensive Renewal Programme with strategic planning documents of higher order. Experience and lessons learned from other cities after disasters have been covered in the section referring to examples of renewal in other cities, and they could help understand the need for a holistic approach to renewal and careful planning of this complicated process.

The first conclusions suggest the need for changing the legislative and institutional framework, which, at this moment, significantly slows down the renewal process on all levels. The problem of ownership of multi-apartment and mixed-use buildings and limited financial resources impede the start of the renewal process, so after the earthquake, renewal was mainly focused on the renewal of public buildings. The historic core of the central part of the city represents the city's identifying value, reflected in protected city blocks and individual buildings. Even before the earthquake, these buildings and structures were more-or-less damaged, dilapidated and weathered, and the earthquake further weakened their stability and structure. One of the biggest challenges is to preserve the cultural heritage in accordance with the conservation profession requirements while putting it to use in an economically and financially viable way. The need for investments in preserving and protecting the cultural heritage, primarily for safety reasons, greatly exceeds available funds and other resources for the renewal, calling for a reassessment of the current approach to protecting and preserving the protected buildings and prioritisation.



8.19

Identity Topography of the Historic Urban Core of the City of Zagreb



Fig. 60: Red Crosses Project, AB Ilić

Fig. 61: Comparison of damaged buildings (acc. to the register of the Institute for Physical Planning GIS June 2020) and those undergoing renewal (public and socially-owned buildings, and privately-owned buildings)

Study prepared by

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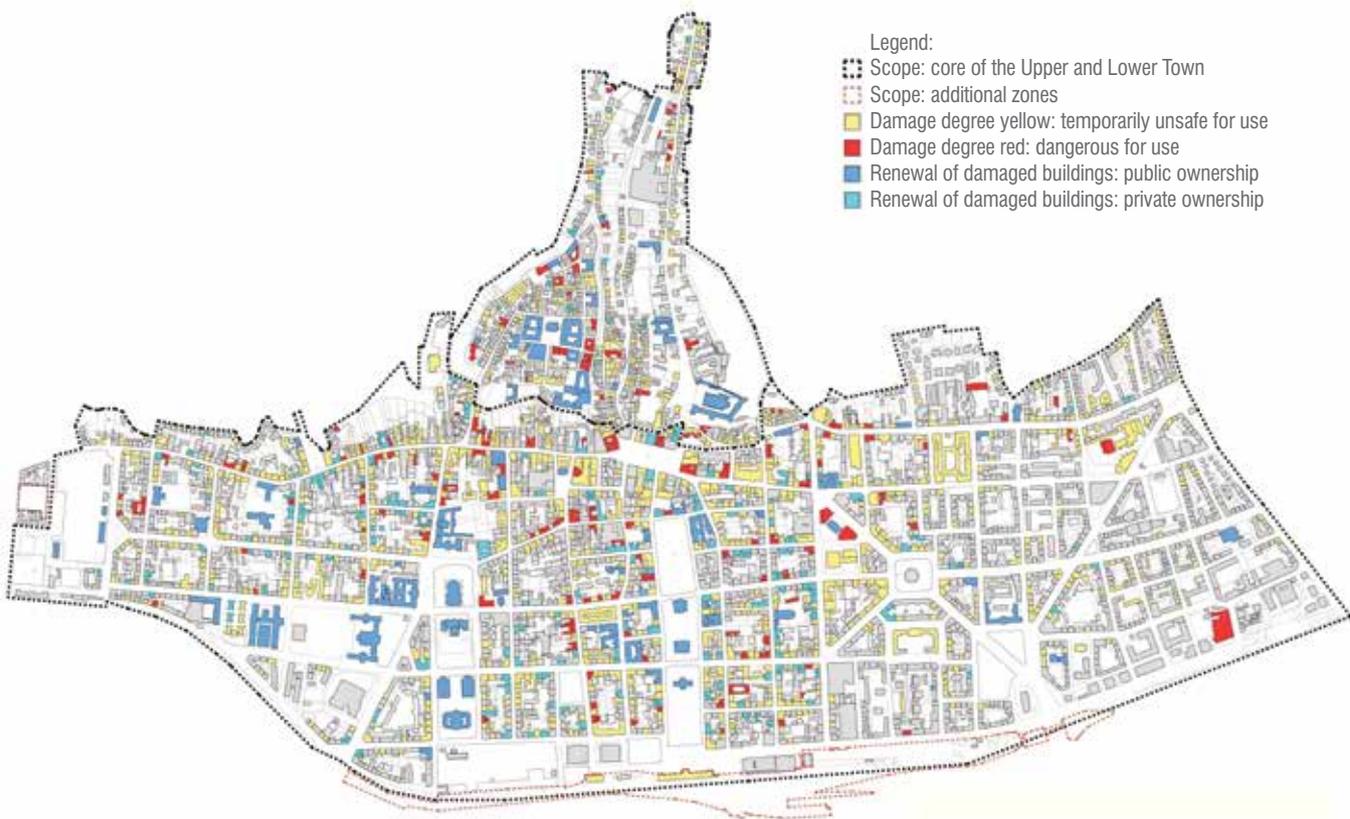
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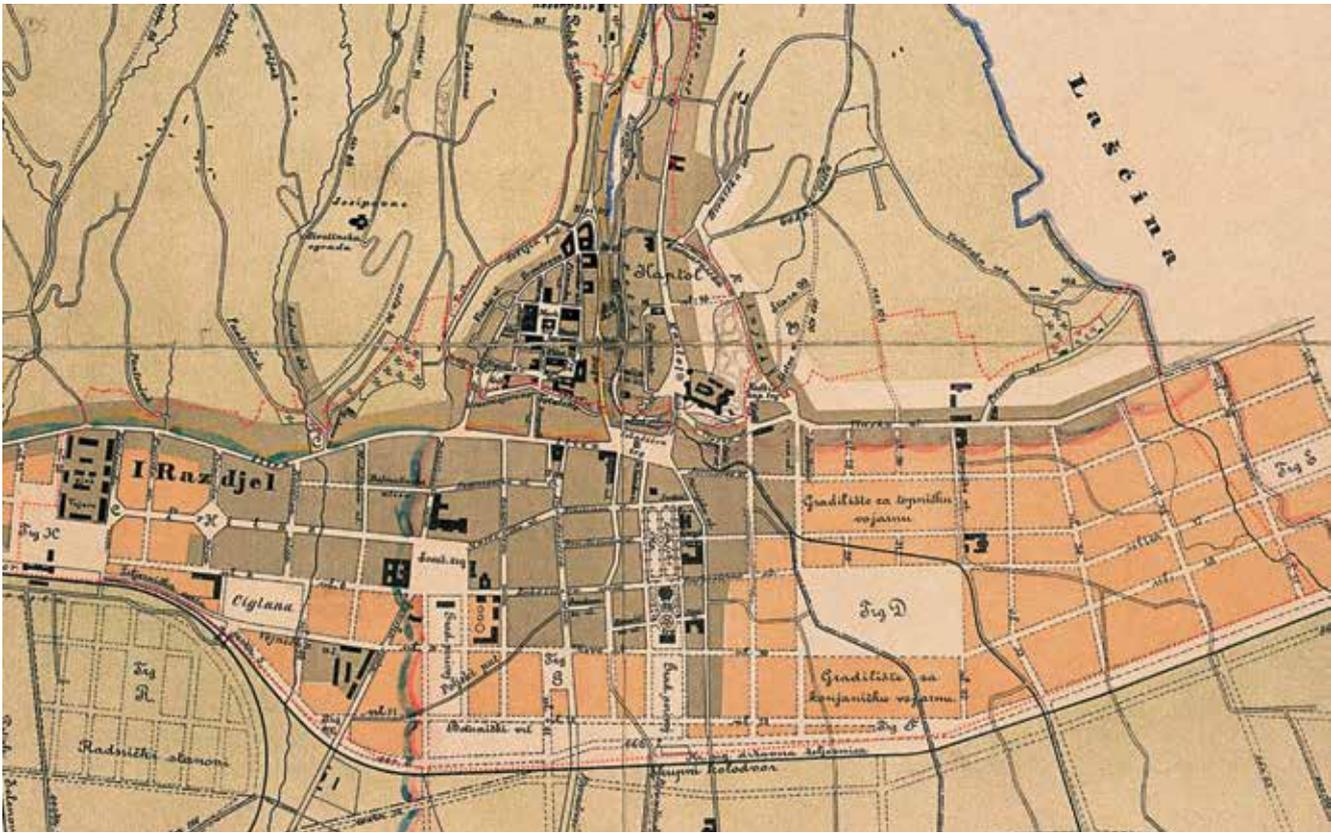


Fig. 62: Second Regulatory Plan from 1887 (copy from 1889, published in large number of copies as The City of Zagreb Plan, 1889, Regulatory Plan). It envisages a considerable expansion of the city and its division into zones – the first zone being the Lower Town with its expansion towards east and west, with the existing or newly planned more intensive construction of blocks

Summary

The Historic Urban Core of the city of Zagreb is in a state of crisis. The state of neglect of some of the buildings, negative demographic trends, traffic congestion, graffiti, touristification, and the aftermath of recent earthquakes require a proposal of a comprehensive plan for the comprehensive renewal of the Historic Urban Core on which the political administration, competent professionals and residents will all agree. The changes in the state and current processes should be effectively managed to improve the area and retain its residents. This requires time, a framework, and a methodology for discussion. Such a discussion on development requires precise background documents that can be referred to and the preparation of comparative analyses.

The Identity Topography project aims to recognise areas, processes and aspirations in the Historic Urban Core and prepare precise documents on various topics, which will serve as the basis for identifying the extent of the problems and their classification, and for identifying problems that require a more detailed discussion and taking a stand, in order to define the renewal and development guidelines. The study structure is open for future contributions. Six study chapters focus the discussion on the following questions: What is the tradition and experience in the city planning of the City of Zagreb? What is the current state of the Historic Urban Core, especially after the earthquake? Is the Historic Urban Core urbanistically complete? What have been the results of urban planning and architectural activities in the historic core in the last 20 years? What is the identity of the Historic Urban Core, and how does it change through its use? How can the residents be encouraged to identify with residential neighbourhoods to a greater extent, and how can the neighbourhoods be promoted at the City level? How can the elements of public spaces be connected into meaningful wholes, contributing to their identity and symbolic value?



Fig. 63: Corner of Đorđićeva and Petrinjska streets; a symbol of Zagreb earthquake distress

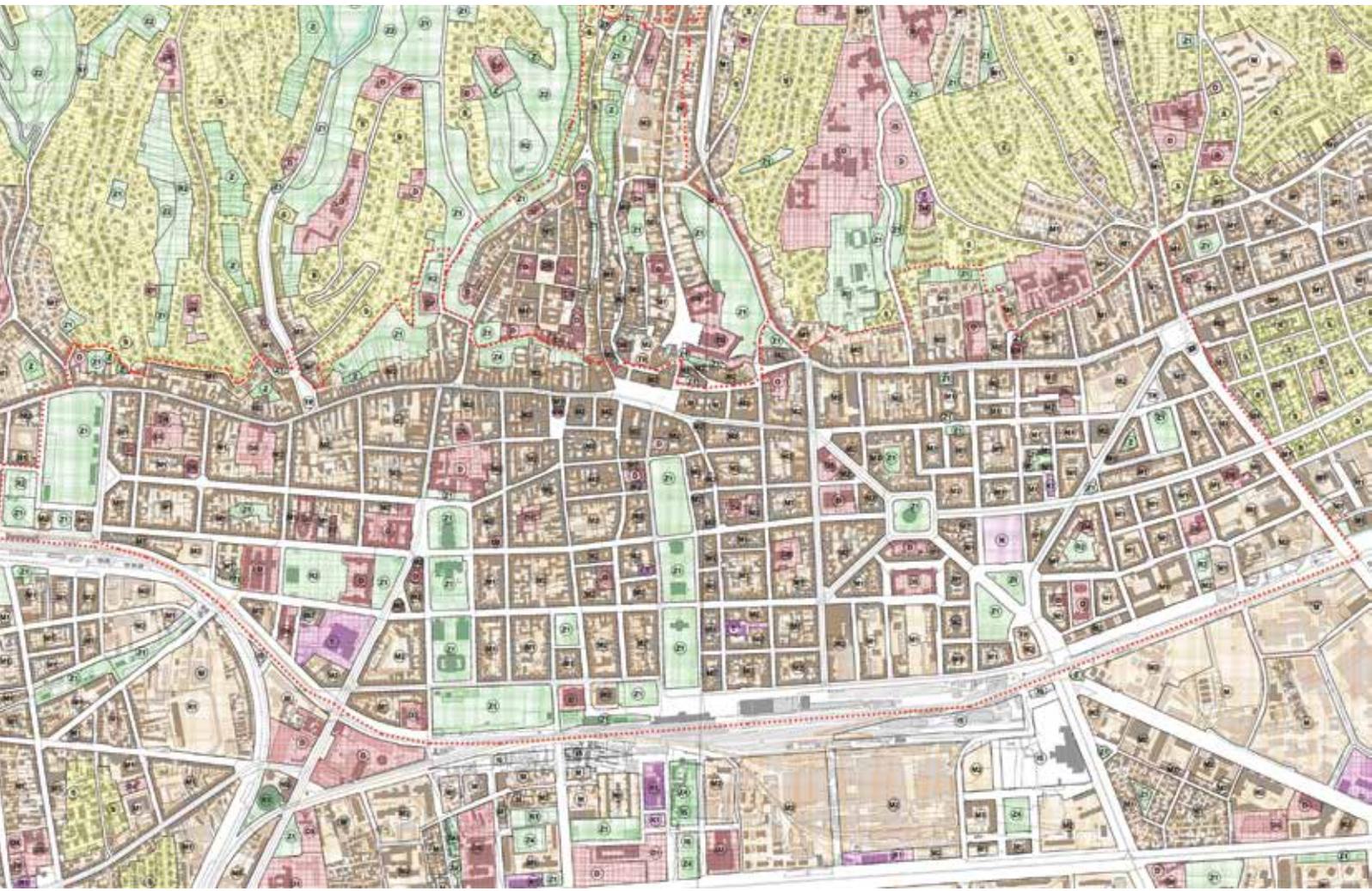


Fig. 64: General Urban Plan for the City of Zagreb, 2016. Land use plan (with Historic Urban Core of the City of Zagreb scope boundaries)

List of Figures. Sources.

Fig. 1: Cartogram – Analysis of the scope used in Comprehensive Urban Renewal Programme development; *Institute for Physical Planning of the City of Zagreb, July 2020*

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Fig. 3: Cartogram – Conservation Basis: Historic Urban Core of the City of Zagreb; *Immovable Cultural Assets, General Urban Plan of the City of Zagreb (acc. to the Conservation Basis of the City Institute for the Conservation of Cultural and Natural Heritage, 2008)*

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