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EDITORIAL

Dear readers,

In this issue of *Spatium* we continue with publishing a number of miscellaneous papers, covering some specific aspects of ecological planning, protection of cultural heritage, brown-field control and management, management of urban sprawl, participatory urban planning and management, housing and other architectural construction, architectural history, and so on, from various countries, viz.: Republika Srpska, Philippines, Serbia, Ukraine and Russia. Also, some contributions relate to broader geographical spaces. Few papers from Serbia reflect the findings of current international and national scientific research projects.

Miodrag Vujošević
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IDENTIFICATION AND ECOLOGICAL ASPECTS OF LARGE-SCALE BROWNFIELDS IN THE REPUBLIC OF SRPSKA

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Large-scale brownfield sites are the most apparent brownfield category in the Republic of Srpska, and they are the most valuable asset when it comes to explaining this spatial phenomenon. Transition and armed conflict in Bosnia and Herzegovina have caused, among other things, brownfield formation; a decline in industrial employment alongside a reduction in the size of the armed forced have further increased the number and total area of brownfields in Bosnia and Herzegovina and the Republic of Srpska. Their ecological characteristics, as in other transitional countries, are largely responsible for the definition of brownfields, but they are not the most significant barrier to the revitalization of large-scale brownfield sites. The present paper will provide the methodology of large-scale brownfield identification as well as an accompanying distribution map of these sites in the Republic of Srpska.

***Key words*: large-scale brownfields, identification, ecological characteristics, revitalization, the Republic of Srpska.**

INTRODUCTION

Spatial and urban development result in various geospatial phenomena. Brownfields are one of the most noteworthy of these phenomena, and they have recently been the focus of various multidisciplinary studies in the transitional countries of Eastern and Southeastern Europe (Đukić *et al.*, 2014), as well as globally (Bijelić, 2014; Hollander *et al*, 2009). These locations are a significant part of the built-up areas in many settlements. They not only have a negative economic and ecological effect on their surroundings, but also have a negative social, psychological, and aesthetic impact.

There are many definitions of brownfield sites. Generally speaking, there are North American and European approaches to conceptually defining brownfield sites. American and Canadian authors define brownfields as abandoned or underused contaminated sites (Bartsch and Collaton, 1997; Dennison, 1998; Russ, 1999; Yount, 2003; Sigman, 2010), whereas the majority of European authors use more complex definitions of a multidisciplinary character without emphasizing only the potential contamination of these sites (Alker *et al.,* 2000; Grimski and Ferber, 2001; Grimski *et al.,* 2002; Oliver *et al.,* 2005).

Revitalization of brownfields in Serbia – a guide for decision makers and professionals is a typical example of a publication with a complex and multidisciplinary definition; here brownfields are defined as areas and facilities in urbanized zones which have lost their original use or become underused, often presenting, or it is assumed that they present, an ecological hazard, and they have dilapidated manufacturing and other facilities (Danilović *et al.*, 2008).

At the global level, brownfields have different causes; that is, their origin varies depending on the country and continent. Taking into account their specific economic features, North American and Western European authors associate brownfields with changes in economic structure arising from the transition from industrial to post-industrial society (a shift from a production-oriented to service-oriented economy). In support of this view, the largest concentration of brownfields is in post-industrial areas, where the boom in industrial production in the last two centuries has been followed by a decline or even shutdown in economic activities, i.e. deindustrialization (Hollander *et al* 2009; Adams *et al.*, 2010; Van Dyck, 2010; Li, 2011; Ting Tang and Nathanail, 2012). Today's Western European and North American brownfields owe their origin to the period of continuous economic decline and deindustrialization of the 1970s and 1980s, followed by a period of economic deregulation and liberalization in the 1980s and 1990s (Van

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Dyck, 2010). The process of brownfield formation itself, in the narrower sense of the meaning, is a vicious circle of decline in which owners are unable to sell contaminated properties and choose to simply abandon them, leaving such locations as places susceptible to various forms of social pathology, and finally resulting in the devaluation of neighboring properties (Bartsch and Collaton, 1997).

This attempt to explain the causes of brownfield formation evidently lacks a more detailed and in-depth analysis which is not only characteristic for North American and European authors, but also for authors from Eastern and Southeastern Europe (post-socialist countries). The emphasis in post-socialist countries is not only on the changes in economic structure, but also on the fact that these countries have experienced a transition from a socialist to a capitalist socio-economic system, each with its own economic specificities. The brownfields of Eastern Europe first appeared in the 1990s immediately after the collapse of communism and the transition from a planned economy to a market economy, accompanied by globalization trends (Frantal *et al.*, 2013; Kunc *et al.*, 2014).

Large-scale brownfields stand out in terms of their relative size within a geospace. Their size varies in respect to their spatial context. This paper identifies large-scale brownfields in the Republic of Srpska and Bosnia and Herzegovina as those with an area covering over 4 ha. The main hypothesis is that the ecological characteristics of large-scale brownfield sites are not the most significant barrier to their revitalization, i.e. restoring their capacities. Although Bosnia and Herzegovina, prior to 1992, was abundant with basic industry (Marić, 1991; MVTEO and UNDP BiH, 2002) and military facilities (Čekić, 2004), the analysis of large-scale brownfields from the ecological standpoint should lead to a conclusion that the ecological characteristics of these sites do not represent any major obstacle to their reactivation.

AREA OF INTEREST

The area of interest of this paper is large-scale brownfields in the Republic of Srpska, an entity (federal-confederal unit) in Bosnia and Herzegovina.

The Republic of Srpska (RS) covers mainly the northern and eastern part of Bosnia and Herzegovina. Its total area is 24,666 km^2 or 48.17 % of the total area of Bosnia and Herzegovina. This entity is located between 45°16′ and 42°33′ north longitude, and between 16°11′ and 19°37′ east latitude (MPUGE and NUZRS, 2015). There are 64 units of local governance (ULG) in the RS – 57 municipalities and 7 towns (N.B. the town of Istočno Sarajevo is a single local governance unit comprising made up of 6 municipalities). The RS has no regional level of government in its administrative division.

MATERIAL AND METHODS

There are no universal criteria for brownfield identification, which is due to the different perceptions of the nature of brownfield sites themselves. Methodologies for brownfield identification are primarily based on the use of various public registers and databases, which lack accurately defined and objectivized (quantified) criteria. In the process of brownfield identification, a very important role is played by spatial planning documents and the geographic information systems through which numerous spatial registers operate.

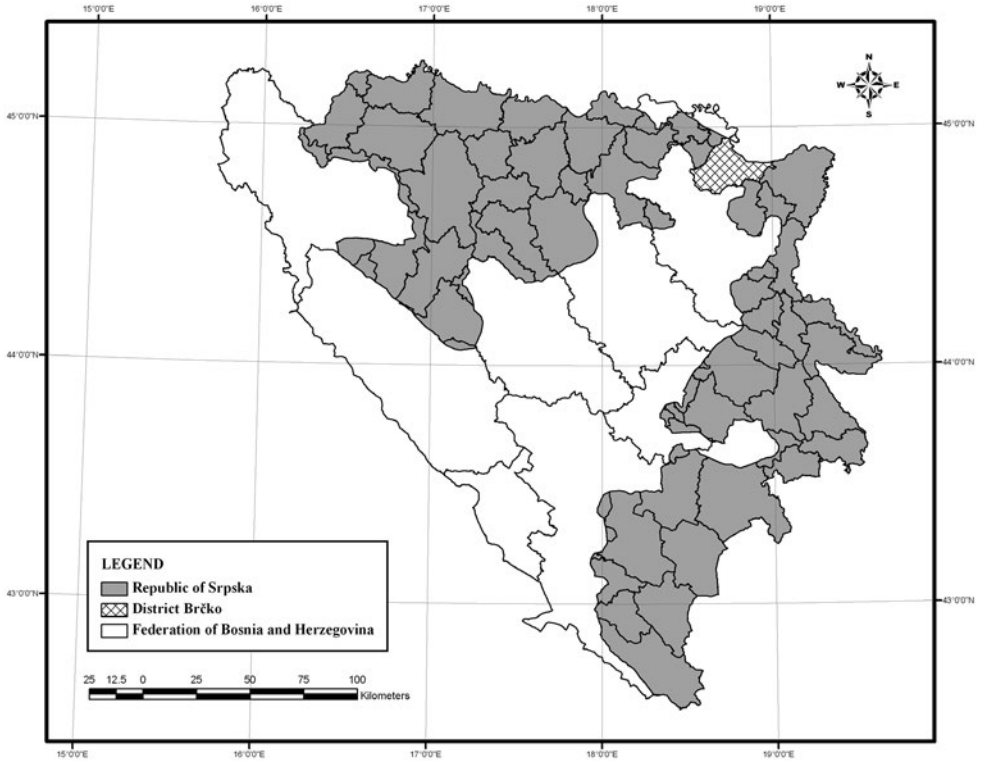

Figure 1. Position of the Republic of Srpska in Bosnia and Herzegovina (Source: authors)

Regrettably, legislation at the entity and canton levels in Bosnia and Herzegovina does not address the issue of brownfield sites. Moreover, the majority of existing spatial plans in cantons and entities fail to see the challenges and potential of brownfield sites in terms of their spatial development, which, in the end, results in the lack of proper identification. The changes and amendments to the Spatial Plan of the Republic of Srpska (until 2025) can be seen as a positive exception to this state of affairs.

Because of the diversity of brownfield identification criteria, there is a need to tailor the criteria to various types of such locations. For example, military brownfields require a different set of identification criteria from the most common criteria used for industrial and commercial brownfields. This leads to the conclusion that a specificity principle needs to be applied when creating a proper set of identification criteria. The second principle is that of integrity or homogeneity. This principle assumes that a location needs to be treated as a whole and not partially.

Identification criteria must be based on the key features of these sites; that is, they need to be abandoned and inactive (or underused). The first feature can be determined by the capacity utilization degree of the location, and the second one (for inactive or underused locations) can be established by means of job density. This second indicator is applicable for industrial brownfields, i.e. commercial brownfields, but it is difficult to apply it to military and (municipal) utility brownfields. For military and utility brownfield sites, it is very difficult to determine the exact indicators of inactivity or underuse. The activity level at such locations can only be determined by accessing the location records or through fieldwork (i.e., field inspection).

After the criteria and indicators for brownfield identification in the Republic of Srpska have been established, it is necessary to define certain boundaries that frame the concept of brownfield identification. Based on European (primarily Czech) experience, the degree of the location's capacity utilization should be below 30%; that is, more than 70% of the location should not be in use (Bergatt Jackson and Votoček, 2010). In terms of job density, the matter is rather complicated. International authors do not even define this indicator, which leaves the matter unaddressed in terms of establishing the necessary quantitative limits. The analysis of strategic spatial planning documents (mainly spatial plans for local communities) in the Republic of Srpska and elsewhere in Bosnia and Herzegovina conducted in the last thirty years indicates that the average job density in industry (industrial zones and industrial plants) prior to 1992 ranges from fifty to sixty employees per hectare, whereas the numbers for the last ten years show fourteen employees per hectare, mostly due to the economic transition. If the limit for the underuse of locations in terms of their job density is set at 10% of the value prior to 1992 (optimal job density by definition), a calculated value of six employees per hectare is found to be the lower limit for brownfields in the Republic of Srpska. To categorize a location as a commercial (industrial) brownfield site, it is essential to have these two indicators below the lower limits, and also to respect the principle of homogeneity.

Municipal (utility) and military brownfields need to be in line with the specificity principle; that is, apart from the exact indicator of location use, they also need to be field investigated in terms of proper registers, inventory access, and remote detection. In the case of military brownfields, the State Property Inventory, created by the Office of the High Representative in Bosnia and Herzegovina in 2009, is relevant in terms of site identification (Office of the High Representative, 2009). This inventory lists the military property once owned by the Federal Secretariat of National Defense (the former Yugoslav Defense Ministry) and the Territorial Defense of Bosnia and Herzegovina. Apart from this inventory, other sources of information on military property (i.e., potential military brownfields) include data obtained from the Bosnia and Herzegovina Ministry of Defense pertaining to non-perspective military locations. These data were acquired from the authorities upon personal request in August 2011. By comparing these two sources of data, it was found that a significant number of sites recorded in the State Property Inventory made by the Office of the High Representative in Bosnia and Herzegovina were not listed in "the inventory list of military locations in the Republic of Srpska, which are neither under operation by the Ministry of Defense nor the armed forces" (MO BiH, 2011).

A study was conducted for this article on December 31, 2013, which resulted in the identification of brownfields in the Republic of Srpska with an area exceeding four hectares (large-scale brownfields). Various sources were used for their identification, but they can all be classified in the following categories:

- Local development strategies;
- Strategic spatial planning documents at the municipality level (local communities);
- The Local Economic Development Portal of the Republic of Srpska Agency for Development of Small and Medium-Sized Enterprises (RARS-MSP, 2008);
- Inventories (the Bosnia and Herzegovina State Property Inventory);
- Graphic sources: satellite images (Google Earth, Bing Maps, Yahoo Maps), aerophotogrammetric (aerial) images, geodetic maps, 1:25,000 topographic maps published by the Military Geographic Institute in Belgrade, 1:50,000 topographic maps published by the Defense Mapping Agency of the United States;
- Interviews conducted with local government (municipality) officials in charge of the departments of economic affairs and/or spatial planning.

The ecological characteristics of large-scale brownfields together with their other specifics (property and legal, economic and socio-psychological traits) determine the entirety of this phenomenon, and stand in close relation to the quality of the environment in a certain area. Unfortunately, due to the lack of an environmental monitoring system, it is impossible to give an exact assessment of the condition of the environment in the Republic of Srpska. This situation causes the use of qualitative assessments (MPUGE and NUZRS, 2015), mainly based on economic activity levels prior to 1992.

RESULTS AND DISCUSSION

In the former Yugoslavia, the common factors of brownfield formation, such as changes in the economic structure and the transition from socialist self-management to a capitalist system, also include two additional significant factors: armed conflict and economic sanctions imposed by the UN against the former Federal Republic of Yugoslavia (Serbia and Montenegro) and the Republic of Srpska during the 1990s. This was particularly evident in Bosnia and Herzegovina (and its entity the Republic of Srpska) and Serbia, whereas Croatia and Macedonia suffered indirect economic effects resulting from the sanctions imposed against the Federal Republic of Yugoslavia.

Using criteria from the previous chapter, forty-nine large-scale brownfield sites have been identified in the Republic of Srpska. Their total area is 601.86 ha (0.24 ‰ of the area of the Republic of Srpska). It should be noted that some 90% of these locations were never identified as such by other sources. The largest proportion of these sites has been distinguished in the mesoregion of Istočno Sarajevo (Eastern Sarajevo), i.e. 38.78 % of the total number, or 19 large-scale brownfield sites. Figure 2 shows the distribution map of all of the large-scale brownfields identified in the Republic of Srpska.

There are no relevant ecological data about this category of brownfields in the Republic of Srpska. The ecological documentation needed for an environmental permit at these sites is almost non-existent due to a relatively insignificant number of active companies at large-scale brownfields. However, the sites themselves, even if the toxic emissions are disregarded, present a source of environmental degradation in other ways. Namely, there are a number of production plants with considerable reserves of toxic substances once used during production processes. Also, it is still possible to see examples of residual pollution as an effect of toxic material emission over previous years, resulting in pollution of the soil, groundwater and surrounding facilities. The soil and groundwater are highlighted here as the most vulnerable categories.

The complexity of brownfield characteristics is best illustrated when the technical (ecological) criteria are outlined in order to prioritize the brownfields for remediation. Such an approach was first developed by the state of Colorado (USA). It includes the following criteria:

- Toxicity of contaminants (human/ecological),
- Site characteristics (waste stability, volume, concentration, and mobility),
- Human exposure,
- Ecological exposure (Colorado Department of Public Health and Environment, 2015).

The first two criteria are internal, whereas human and ecological exposure are the two criteria with external character, since they are related to the surrounding population and environment (endangered or threatened species or managed habitats, and wilderness areas).

The Czech author, Jirži Tylčer, focuses mainly on the internal criteria, and provides a general classification of brownfields in relation to their contamination potential:

- Category 1 – low risk of significant contamination (no limits for future reuse of site),
- Category 2 – medium level risk of significant contamination (the contamination sites are limited

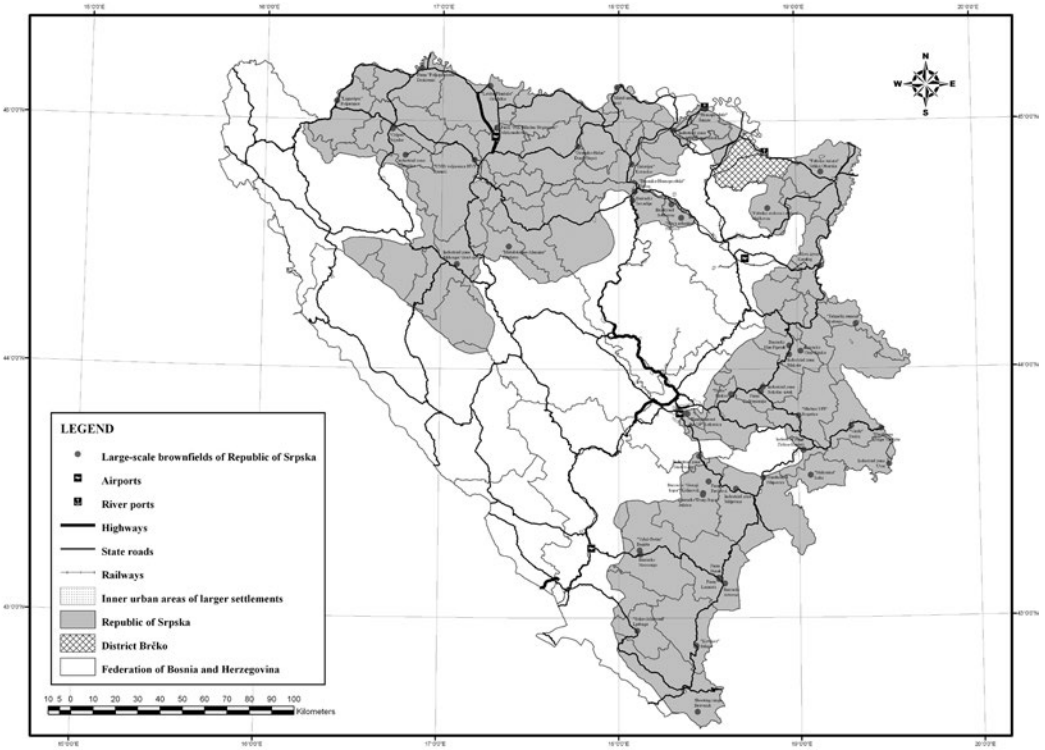

Figure 2. Distribution map of large-scale brownfields identified in the Republic of Srpska (Source: authors)

to the soil surface; not extensive remediation; no limitations to future reuse of site),

- Category 3 – high risk of significant contamination (the contamination sites are limited to the soil surface, substantial remediation required; existing limitation to future reuse of site),
- Category 4 – high risk of large-scale contamination (large area remediation required; numerous limitations to future reuse of site) (Tylčer, 2008).

This categorization arises from the type of activity (the main production process) once occurring at the specific site. Similarly, a more simplified classification arranges brownfield sites into: no contamination potential sites, potentially contaminated sites and sites with a high level of potential contamination (Filipović, 2014).

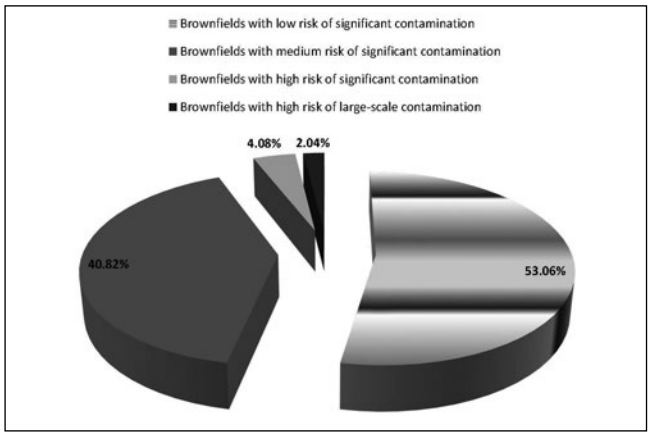

Figure 3. Structure of large-scale brownfields in the Republic of Srpska by level of pollution (Source: authors)

CONCLUSION

Residual contamination is not significantly present at the location of large-scale brownfield sites in the Republic of Srpska, which is supported by their structure in terms of the level of contamination. The distribution of these sites is dominantly characterized by the low and medium risk level of significant contamination; they make up 93.88 % of the total number of large-scale brownfield sites in the Republic of Srpska. This is all due to the nature of the production sites once in place at these locations. The following examples can be seen as exceptions: the paper and cellulose plant in Prijedor, and the asbestos production plant in Petrovo, categorised as brownfields with a high risk of significant contamination, as well as the military facility in Han Pijesak categorised as the only brownfield site with a high level risk of large-scale contamination due to its subsequent contamination with depleted uranium (UNEP, 2003).

The research results clearly indicate that the ecological characteristics of large-scale brownfields in the Republic of Srpska are not the most significant obstacle to their potential revitalization, i.e. their future reuse for the same or a different purpose. The ecological burden of these sites is considerably different from those in Western Europe and North America, where brownfields and contamination sites are often considered to be the same phenomenon. The key barriers to the reactivation of the large-scale brownfield sites in the Republic of Srpska are, therefore, to be looked for elsewhere – namely, in terms of their spatial, proprietary and legal, economic and socio-psychological traits.

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URBAN SPRAWL: EXTENT AND ENVIRONMENTAL IMPACT IN BAGUIO CITY, PHILIPPINES

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Urban sprawl has emerged as a striking characteristic of recent global urban development. Land use policies advocating urban expansion for residential use to the detriment of a critical environment as in the case of Baguio City, Philippines, have shaped and reinforced the urban sprawl phenomenon. Urban sprawl is characterized by discontinuous, fragmented/leapfrog development, with random population densities. There are generally few studies regarding the environmental impact of urban sprawl and it is along this vein that this study was undertaken. The purpose of the study is to gauge how extensive urban sprawl has grown in Baguio City via Shannon's entropy model and to explore its impact on the city's environment. The result of the study revealed that urban sprawl prevails over the city's physical development. The proximity of the entropy value to the maximum reference value, indicate a highly dispersed urban development attributed to the continuous increase in population, coupled with the physical constraint of topography and its limited land area. The most critical issue challenging the local government of Baguio City and its people is the creation of a Long Term Development Plan that should strike a balance between local ambitions, demographic facts, and the environmental sustainability.

***Key words*: urban sprawl, urban growth, shannon entropy, environmental impact.**

INTRODUCTION

In the last few decades, there has been a wide and growing global interest in the field of urban sprawl as an elemental characteristic defining urban growth and development. The world population has been largely concentrating in urban areas. Since the 1950s, global urban population has nearly doubled twice, from 732 million to 2.8 billion. Urban populations already totalled more than 3.2 billion in 2006 (United Nations, 2006). Although alarms and challenges have already been raised in Europe (European Environment Agency, 2006), according to the United Nations, virtually all this growth has and will continue to take place in developing countries. Runaway urban growth and development have resulted in unbridled environmental degradation in the urban domain. Urban sprawl or the free-developing and non-coordinated growth of cities beyond their peripheries is not limited to any particular social, economic group, culture, or any place. It is primarily the consequence of population growth which is neither planned nor managed. This urban growth is propelled from the bottom and is influenced by a gestalt of forces mainly, but not exclusively, economic, but nonetheless having impacts that are difficult to explain (Besussi, 2003).

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The need for large scale and intermittent urban expansion will definitely result in the encroachment of the surrounding natural environment or open land parcels such as agricultural fields, forest lands and even wet lands. The transformation of these areas into non-reversible built-up areas may have important negative costs on the urban ecosystem, including the city's water system, biodiversity, and climate (Xu *et al.*, 2000).

Baguio City in the Cordillera Administrative Region in northern Philippines dramatically reflects the urban sprawl phenomenon. Complexity defines the management of Baguio's environmental and natural resources, mainly because of considerable issues, including its current designation as a town site reservation (a status which had its origins in the American colonial period), the plethora of various and often antagonistic ancestral land claims over large areas of the city, and the city's undulating to moderately steep topography. However, in spite of the presence of rigorous data painstakingly gathered through remote sensing and GIS in exploring the trends and patterns of urban growth and development, there are generally few studies in terms of the environmental impacts of urban sprawl.

It is along this vein that this study was undertaken. It aims to gauge the limits of urban sprawl using Shannon's entropy

model and integrating remote sensing and GIS in the analysis. This paper discusses the concept of urban sprawl and how this phenomenon occurred in Baguio City. Qualitative evaluation of data was also conducted to determine the environmental impact of urban sprawl in the city.

CONCEPTUAL OVERVIEW OF URBAN SPRAWL

Urban sprawl is a development observed after World War II. It was largely a consequence of the demand for improved housing conditions, a demand that arose out of the Great Depression, low family formation and low home construction rates. Urban sprawl was pushed strongly by leaps in technology as well as by business and marketing strategies that led to changes in demography from consumption rates to personal choices. There was also an increased importance of privacy and control over private affairs. Transportation preferences factored flexibility exemplified in the private automobile and the subsequent establishment of interstates and freeways (Schultink *et al*., 2005).

The term "urban sprawl" does not possess a standard definition. Ewing (1994) defines it in terms of "accessibility between related uses." He writes that poor accessibility arises from an inability to focus development or to functionally combine land uses. Urban sprawl has also been employed to refer to various urban forms, including contiguous growth in the suburbia, linear patterns of strip development, and leapfrog or scattered development. These forms have normally been related to patterns of modern centers where agglomeration grows out from malls, peripheral cities, and new towns and communities.

Burchell and Mukhjerji (2005) link sprawl to low density occupation as well as to leapfrog development characterized by unlimited expanses. In this wise, expansion occurs importantly in residential or non-residential forms in relatively idle environments. Everywhere, this development is of low density, leapfrogging, as it were, over the development of another area. While urban sprawl is a phenomenon common to both developed and developing countries, particular causes and specific attributes vary significantly. In developed countries, for instance, urban sprawl may arise from consumer tastes and preferences to innovative techniques of capital accumulation through real estate development. The European Environmental Agency, acknowledging this lack of consensual definition, simply defines sprawl as "'the physical pattern of low-density expansion of large urban areas, under market conditions, mainly into the surrounding agricultural areas" (European Environment Agency – Swiss Federal Office for the Environment, 2016).

Research on urban sprawl has been concentrated largely on mega cities and highly advanced metropolises (Hamidi and Ewing, 2014; Hennig *et al*., 2015). However, middle sized and smaller urban areas may experience the highest rates of urban sprawl. A case in point is Ajmer, a medium sized city located in the state of Rajasthan in India, where population growth has tripled, together with an increase of the urban zone from 1997 to 2002 (Jat *et al*., 2003).

Sudhira *et al.* (2003) elsewhere in India reported an expansion of the population by 54% in the last three decades of the 20th century, with a corresponding expansion of urban areas by a remarkable 146%, that is, slightly less than thrice the population growth rate. More recently, similar and parallel trends have been studied and analyzed in China (Su *et al*., 2010; Liu *et al.,* 2014) and Malaysia (Boori, *et al.* 2015) in Asia and Ghana in Africa (Cobbinah and Amoako, 2012).

The relationship between green areas in the urban fringe and the consequent reduction of agricultural land in China was also discussed by Su *et al*. (2010) who further emphasized the importance of government programs to ecological conservations and controlled urban expansion. Research on urban sprawl, however, remains relatively sparse in developing countries.

Thus, more studies on the emergence and unfolding of this process in particular areas, particularly in the South East Asian region, are necessary to understand trends, causes and consequences that should widen our perspectives of urban growth in areas where urban sprawl is more intense (Muniz *et al.,* 2007). In the Philippines, for example, while planners are concerned with the rational allocation of land uses within fast-growing municipalities and cities, scant attention or none at all is given to the phenomenon of urban sprawl in official planning documents such as the Municipal Comprehensive Land Use Plan.

The impact of sprawl-induced land use conversions is an increasingly significant concern both in urban and rural places. People do not really fully understand these impacts which may range from exhaustion of ground water resources by private deep wells, nitrate and phosphate contamination of ground water by private septic systems and contaminated runoff caused by pesticides and fertilizers to contamination sourced from industrial and commercial establishments and toxic substances from poorly designed landfills (Mohammadi *et al*., 2012).

URBAN SPRAWL PHENOMENON IN BAGUIO CITY

The Locus of the Study

The study finds ground in Baguio City, which is located in Benguet, the southernmost province of the Cordillera Administrative Region in the Philippines. It is bounded by the following municipalities, namely, La Trinidad in the north, Itogon in the east and Tuba in the southwest. Baguio City is the Philippine's "Summer Capital" with an average temperature of 19.7°C, generally lower by 8-10°C than those of the low land areas. The city is a plateau with an altitude of 1,417 meters above sea level. Its total land area of 5,749 hectares is characterized mainly by undulating to moderately steep slopes with grades of 19-50 percent (see Figure 1).

Baguio's transformation from "Kafagway" (the city's pre-colonial appellation) into the country's "summer capital" started in the late 19th century, when the Americans penetrated the Cordillera and established Baguio City as a Colonial Hill Station (Reed, 1999). The American colonial regime would eventually lead to the dispossession of the pre-colonial indigenous landowners of their lands for the purpose of requisitioning a military reservation (Cleto, 2012). Under the commission of then the United States Secretary of War William H. Taft on October 3rd, 1905,

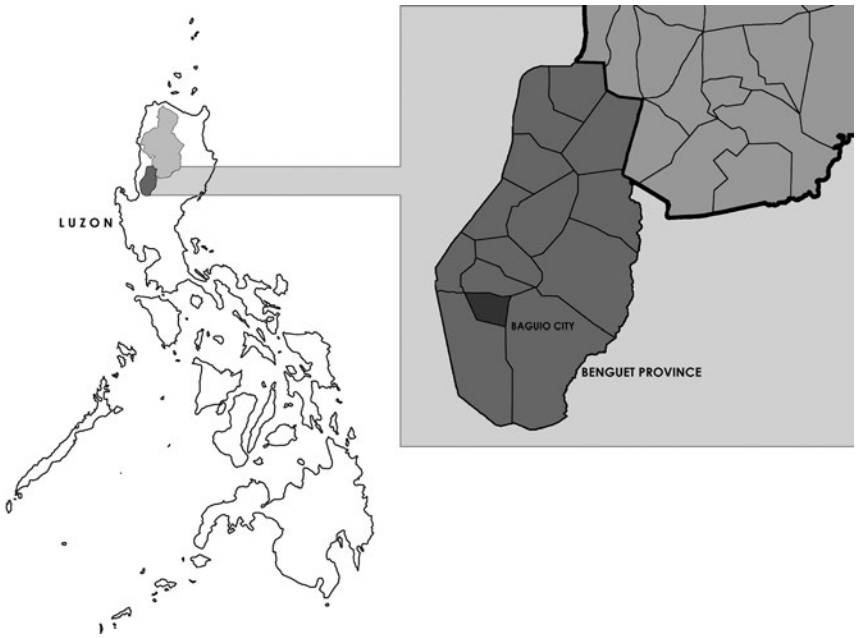

Figure 1. Location of the Study Area in the Province of Benguet, Philippines (Source: CLUP 2014-2023)

the American planner and architect Daniel H. Burnham formulated the comprehensive urban design of the future city (Boquiren, 1994).

It is interesting to note that Burnham strongly opposed to a dense settlement in Baguio, pushed for the regulation of the city's expansion, and promoted stringent laws for the purpose of preserving the natural environment. Burnham initially envisioned Baguio as a city of just 25,000 people. Unfortunately, Burnham's initial design, meant as the blueprint for the city's main thrust of development, was formulated without a formal survey (ibid.). At the brink of World War II, Baguio had grown into a centre of transportation, a medical and educational hub, and the administrative headquarters of highland industrial and commercial activities (such as mining, lumbering, tourism and vegetable production).

From the early 1900s onwards, Baguio City's urban population grew rapidly. In 2010, the City had an estimated population of 318,676 with a high population growth rate of 2.36% from 2007 to 2010. The city's population is expected to reach 344,070 by 2020 and may double in thirty (30) years (CLUP 2014-2023).

Methods and Procedures

The environmental and policy challenges posed by urban sprawl necessitate effective and integrated plans to be able to solve them. To be able to address the challenges however, there is a need for accurate and integrated tools to measure the phenomenon of urban sprawl. This research will therefore utilize qualitative and quantitative measures for a robust understanding of urban sprawl in Baguio City.

The quantitative tools used were the remote sensing, specifically the Geographic Resources Analysis Support System Geographic Information System (GRASS GIS) and the Quantum Geographic Information System (QGIS), as these two can be interfaced allowing morphological (physical and locational) classification of space. The second quantitative tool is the Shannon Entropy, also known as Shannon's diversity index, Shannon-Weaver or Shannon-Wiener Index. The qualitative tool used is the Galster *et al.* (2001) which uses configuration and density as criteria in classifying the sprawl typology.

Data-gathering proceeded on several levels. First, data on land uses in the City of Baguio at three points in historical time, i.e. 2002, 2010, and 2013 were primarily sourced from the City Comprehensive Development Plan (2014-2023). These were then independently validated by land use data from the Environmental Urban Planning Research Laboratory of Saint Louis University, School of Engineering and Architecture in Baguio City. Land uses were initially dichotomized into built-up and un-built areas. The built-up area was then re-classified into four policy areas (i.e. production, protection, settlement, and infrastructure), resulting in a cumulative and simplified categorization of land uses to which the Shannon's entropy model was applied. Shannon's entropy was thereafter computed for the years 2002, 2010 and 2013 and the results were analyzed as measures of urban sprawl at these particular points in historical time and for their cumulative impact on the city.

These measures of urban sprawl were complemented by imagery analysis. We utilized satellite images from Digital Globe 8 – band, taken in 2012. Grass GIS was used for remote sensing, while QGIS software was used for data display and analysis. Furthermore, available thematic maps prepared by the local government in reference to their Comprehensive Land Use Plan (CLUP) were employed in the analysis of the morphology of urban sprawl and its impact on the city's physical environment. The Galster Physical Patterns Defining Sprawl – a common tool used to provide a better apprehension of the physical attributes and typology of the prevailing urban morphology related to the urban sprawl phenomenon – provided the parameters in the characterization and classification of the urban form of the city.

RESULTS AND DISCUSSIONS

Measuring urban sprawl by Shannon's Entropy Model

As mentioned earlier, the quantitative data for the study was based from the total built up and un-built areas from years 2002 to 2013, which correspond to the four policy areas within any given political/administrative unit or territory. For the purpose of this study, the various land uses in the city have been classified in these policy areas. Areas for living included settlements or the residential land use; areas for making a living covered production areas, which included commercial, industrial, private and public institutions and the special economic zone; the areas to connect and support the settlements and production areas meant the physical infrastructure of the city, including utilities, airports, roads and bridges and the life support systems encompassed protected areas, including agricultural lands, forest and water reserves, creeks and rivers and others (Serote, 2004).

Protected areas are those that are not built over, but are left in their pristine conditions as they accomplish their purposes maximally, i.e. as a source of food, clean air, safe water and also as receptor of wastes generated in the settlements, infrastructure and production areas. The first three policy areas comprise the overall built up area. This re-categorization, thus, further reduces the territory into two broad policy areas: the built form and the un-built environment. The major focus of this study is on the measurement of urban sprawl. It employed Shannon's Entropy Model to gauge the extent of spatial concentration or dispersion of a geographical variable (xi) among n zones. The general structure of this model is reproduced as follows:

$$H = -\sum_{i=1}^{n}$$

Where H represents the value of Shannon's entropy, Pi represents the proportion of the variable in the ith zone and n is the total number of zones. Entropy value ranges from 0 to Ln (n) = maximum entropy and shows the urban sprawl physical growth. Here, if the value approaches zero, the distribution is very compact and if the value approaches Ln (n), the distribution is dispersed. The classified land use for both periods was divided into two categories; built-up and non-built up areas.

The result shows that for the years 2002, 2010, and 2013 the entropy values were registered at 1.7874, 1.4639, and 1.6577 respectively. This is indicative of a highly dispersed urban development which may be attributed to the continued increase in population, coupled with the physical constraints of the topography and limited land area. Shannon Equitability during the year 2013 indicates a more evenly dispersed rate of urban sprawl as compared to the year 2010 where it was closer to 1 (See Table 1).

This is due to the reduction of construction activities, especially in infrastructure sector, caused by the economic inflation problems experienced by the country in the year 2010.The actual magnitude of increase in development from 2002 to 2010 is 11.28% which is considered extensive, considering the limited land area compounded with topographical constraints of the city.

Table 1. Calculating Shannon's Entropy for Baguio City, years 2002, 2010 and 2013

LAND USE	EXISTING AREA (Has.)		
	2002	**2010**	**2013**
Residential	1,760.96	3,405.01	3,239.92
Commercial	201.35	282.77	317.13
Institutional	410.02	416.27	213.05
Park	48.83	70.68	81.32
Forest/Water Reserves	521.23	521.23	240.37
Special Economic Zone	288.1	288.1	301.86
Open/Vacant Forested Areas	1,951.80	566.21	591.84
Industrial	130.39	42.86	57.89
Airport	1.72	27.89	32.16
Cemetery	20.13	12.79	13.87
Abattoir	5.6	4.43	2.7
Utilities	0	15.74	8.54
Bureau of Animal Industry	0	95.02	104.35
Bureau of Plant Industry	0	0	8.98
Creeks/Roads	309.71	0	210.16
Reservation Area	0	0	323.55
Sewerage Treatment Plant	0	0	1.31
Agrarian Reserves	96.57	0	0
Dumping Site	2.59	0	0
TOTAL	**5,749**	**5,749**	**5,749**
Shannon's Entropy (H)	1.7874	1.4639	1.6577
LN(N)	2.6391	2.5649	2.8332
Shannon's Equitability (EH)	0.6773	0.5707	0.5851
Numbers Equivalent (Nq)	5.9739	4.3228	5.2472

From the geocoded data, it may be inferred that the urban area grew in all directions with more built-up developments towards the northern and north eastern part of the city; this is mainly due to the expansion of commercial areas originating from the centre of the city, coupled with real estate developments in all directions of the city.

Classification and influencing factors of urban sprawl in Baguio City

Different urban morphologies may be described with the use of a typology based on two continuous dimensions, which are made discrete here for explanatory purposes: settlement density (high and low) and physical configuration, ranging from contiguous and compact to scattered. Adopting the physical patterns defining sprawl (Muniz *et al.,* 2007), the general urban form of Baguio City is classified into two types: scattered and leapfrogging development which can be gleaned from the irregular settlement density and physical arrangements, extending from contiguous and compact to scattered and discontinuous developments. It can be posited that sprawl as a pattern or a process can be differentiated from the causes that lead to the emergence of such a pattern or from the effects of such patterns (see Figure 2).

This proposition undoubtedly states that the analysis of patterns and processes should be distinctively separated from the analysis of causes and consequences. Nonetheless, some studies (Schultink *et al.,* 2005) submit that the consequences of development bring forth a specific urban

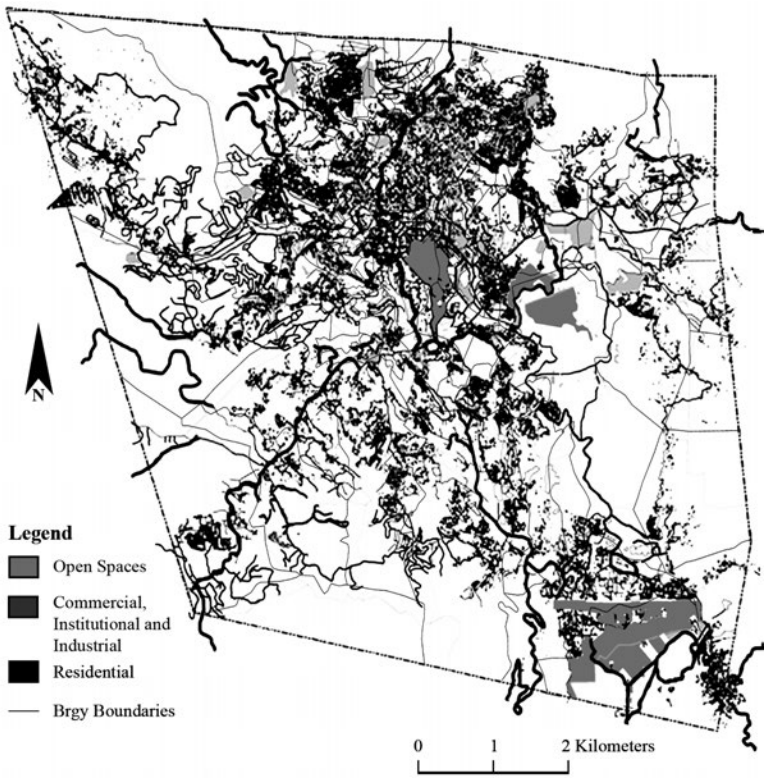

Figure 2. Baguio City Built-up Map, 2015
(Source: CLUP 2014-2023)

pattern as undesirable, not the patterns themselves (Galster *et al.,* 2001). Therefore, whether a pattern is positive or negative should be analyzed based on the factors that bring about such a pattern. Anent to this, the author deems it necessary to enumerate the influencing factors that cause urban sprawl in Baguio City. These factors are enumerated as follows: Rapid Population Growth, Slow Economic Productivity, Land Speculation, Land Use Conversion, Legal Disputes, Physical Geography, Lack of Affordable Housing, Transportation System and Failure to Enforce Planning Policies.

Cumulative environmental impact of urban sprawl in Baguio City

Although the problems associated with urban sprawl are far from being conclusive, the preponderance of evidence is nonetheless compelling. In the case of Baguio City, the decreasing area of prime open lands has long been identified as a negative consequence of urban sprawl even as the 2014-2023 Comprehensive Land Use Plan (CLUP) recommended increasing residential land usage to correspond to the shrinkage in the city's open areas. An assessment of the space covered by urban green spaces and even forest reservations in the city is difficult due to the variations in land use categories used in the said CLUP, which lists "Forest/Water Reserves" and "Open Areas" as land use categories (see Figure 3).

This is highly an evidence of a speculative and arbitrary nature on how open areas are reserved for urban expansion rather than for environmental protection. Currently, the city is mostly composed of residential lands, which take up 61% of its total land area. The second largest land use is for "Vacant Forested Area" at 12.38 %, followed by Commercial Land Use at 2.57 %. Meanwhile Forest/Watershed Reserves comprise 2.54 % of the city's lands.

Aside from the negative collaterals on open spaces and forest areas, urban sprawl and the pressure of continued population increase have moreover exerted a severe strain on the City's water resources (Su *et al.,* 2010). Several watershed reservations and four major waterways are situated in or pass through Baguio City. Although the Cordillera Region generally has a relatively high ground water storage capacity , the water requirements of the highly-urbanized Baguio coupled by its shrinking forest cover have apparently outstripped its water resources leading to water shortages in the city (CEPMO, 2010). To date, the dwindling water supply is at the top of the environmental problem of the city.

The pollution of the City's tributaries continues to be significant and waste generated by the city passes through the northern flanks of La Trinidad municipality where the highly polluted Balili River also passes through. Sources of pollution for the city's water ways include informal settlements along the water ways considering that most of the overflow from septic tanks and other waste products go directly to this river without a treatment system in place.

Currently, waste management easily qualifies as the biggest environmental problem in the city. The local government has been reported to collect 284 tons of garbage per day. The top source of waste is coming from residential areas at 43%, followed by food establishments at 22%. RA 9003, however, requires a certain level of segregation at source in spite of the fact that CEPMO (2010) admits that garbage

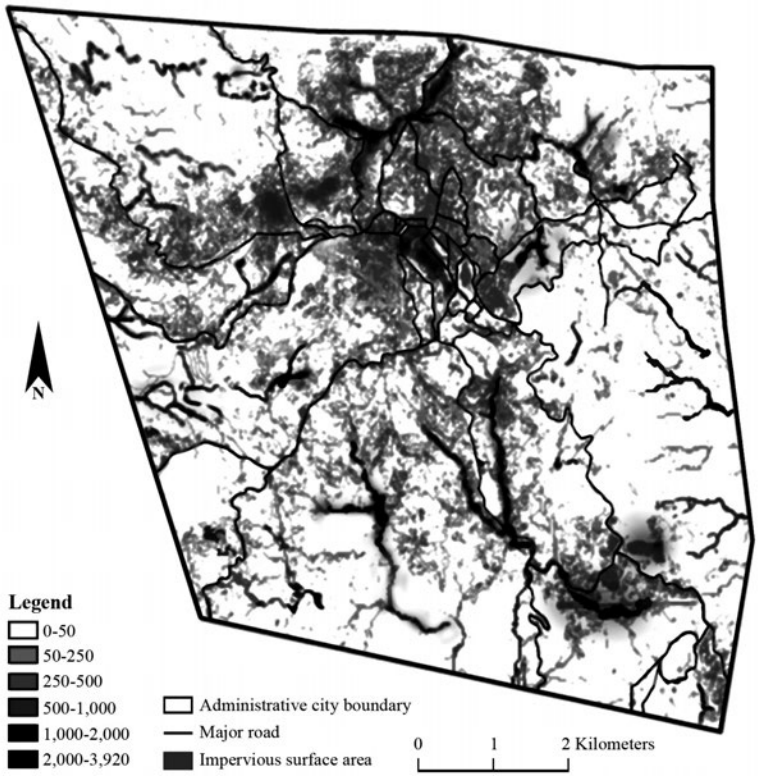

Figure 3. Flow Accumulation Model
(Source: CEPMO, 2010)

collection remains mixed. There is no existing sanitary land fill for Baguio City, most of the city's wastes are transported to Capas, Tarlac sanitary landfill, which is about 3 hours away from Baguio City. The management of the city's liquid waste is given to the Baguio City Sewage Treatment Plant (BSTP) which serves only 66 barangays or districts; the rest of the 63 barangays depend on individual septic tanks and natural canals contributing to a large degree on the aspect of water pollution.

In terms of transportation issues, the radial road network of Baguio City results in all traffic converging at the Central Business District of the city. The increasing dependence on private rather than public utility vehicles has promoted traffic congestion both in and around the city. As of 2007, the total of registered private and public transportation vehicles were recorded at 31,472. This is undesirably high, considering the small land area of Baguio City. With the high dependence on motorized form of transportation, the air quality in the city is deteriorating. According to the Community Environment, Parks and Management Office (CEPMO, 2010), the transportation sector remains the primary contributor to the carbon dioxide emissions problem, contributing 62% to total emissions. This is followed by residential areas at 22%, commercial areas at 10% and industrial areas at 6%.

In general terms, Baguio's fragile environment, as disadvantaged by the urban sprawl phenomenon, increases the population's vulnerability to the deleterious effects of climate change. CEPMO recently declared that Baguio City was now among the World Bank's Top Seven Risk-Prone Cities in Asia. The existing physical configurations of Baguio City in terms of its impervious surface ratio with its total land area are obviously beyond the expected dimension of a sustainable environmental quality.

CONCLUSION

The result of the study reveals that urban sprawl prevailed over the city's growth and development scenario. In quantitative terms, the proximity of the entropy value to the maximum reference value indicates a highly dispersed urban development attributed to the continued increase in population, coupled with the physical constraints of its topography and limited land area.

The planning pattern, where more and more lands are projected for residential use as reflected in both 2010-2020 and the 2014-2023 Comprehensive Land Use Plans (CLUPs) of Baguio City, is an evidence of an apparent paradoxical planned-uncontrolled urban growth caused mainly by the increasing population and the complexity of land management issues, chief of which includes the city's legal mandate as a town site reservation, the unresolved conflicts in ancestral land claims, squatting activities and real estate developments. Land use conversion by legal circumventions predominate the land use and environmental management aspects of the city, reinforcing the urban sprawl phenomenon to the detriment of the city's environmental sustainability.

Aggravated by the human foot print, Baguio City is currently stripped of a significant portion of the pine forest that had since served to resupply and replenish Baguio's aquifers. As a consequence, inadequacy now characterizes the city's groundwater supply, while excessive surface run off has annually flooded the lowest places of the city. Extensive development and construction in the city have also led to

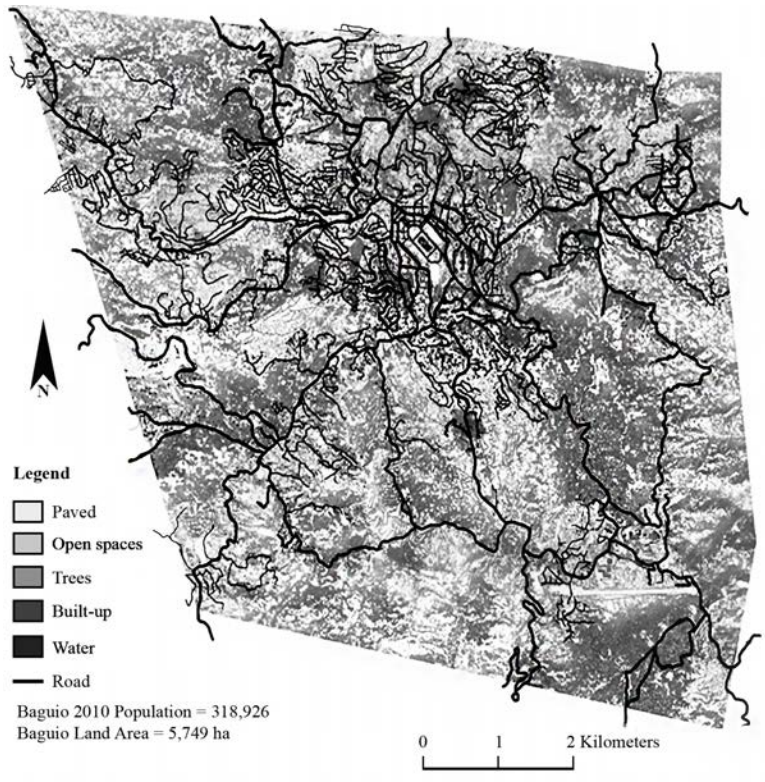

Figure 4. Baguio Environmental Footprint 2013
(Source: EUPRL, Saint Louis University, School of Engineering and Architecture)

the conversion of once thickly-forested slopes and hitherto highly absorptive substrates to impervious surfaces that define a poorly planned urbanization, resulting to a polluted environment (see Figure 4).

In relation to these findings, it is evident that the most critical issue challenging the local government of Baguio City and its people is the identification of the city's unique competences by designing a "climate smart" long term development plan which clearly specifies its regional role. If planning is to remove the city from the precipice of this environment and climate recipes, all efforts should be coordinated in the pursuit of a multi-year plan through a transparent participatory process. If Baguio City envisions itself to maintain environmentally competitive and sustainable, it must concentrate on striking a balance among local ambitions, demographic realities and the emergent challenges of the environmental impact of urban sprawl as well as climate change.

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PARTICIPATORY URBAN TRANSFORMATIONS IN SAVAMALA, BELGRADE - CAPACITIES AND LIMITATIONS

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This paper analyses the implications of participatory urban design in Belgrade, namely of the series of recent unsolicited activities that has contributed to setting up a specific micro environment in the neighbourhood of Savamala. Its main aim is to promote bottom-up urban development, surpass current profit-oriented trends, and benefit from socio-spatial contradictions as opportunities for creativity and participation.
The Savamala neighbourhood is among the most important landmarks in Belgrade. Endowed with rich historical heritage and extraordinary spatial potential, Savamala is now a traffic bottleneck with intense pollution, urban noise and socio-spatial conflicts. In order to set up an engine for urban development, several streams of participatory activities have been launched by NGOs and IOs, such as: online campaigns and networking, informal research activities, pop-up events and instant actions for societal progress and bottom-up economic activities. The Actor-network theory (ANT) methodological approach demystifies the circumstances of participation and the role of various actors in building pathways of urban transformations in Savamala, while the Multi-agent system (MAS) proposes the framework for tracing their behaviour at the neighbourhood level.
A complex post-socialist framework presents a challenge for these participatory activities to provide opportunities for urban transformations, based on social interest rather than on real estate speculations. In the lack of official strategies and institutionalised support, the MAS-ANT method involves estimating whether an economy of social exchange could contribute to improving the quality of life and functionality of urban systems.

***Key words*: post-socialist cities, social participation, urban development, multi-agent system (MAS), actor-network theory (ANT).**

INTRODUCTION

This article attempts to analyse the often blurred and twisted structure and puzzling development prospects of neglected urban neighbourhoods in post-socialist cities. In the case of the Savamala neighbourhood in Belgrade, the study is grounded upon the recent boom in bottom-up spatial interventions and small-scale cultural projects. These activities have gradually grown into a kind of informal platform for active participation and the management of urban conflicts. Therefore, they put forth an alternative strategy in order to overcome the rigid administrative procedure of urban development and transform the negative side effects of imitating and lagging behind the conventional urbanisation model and unsuitable urban patterns, as well as the gloomy outcomes of accelerating globalisation into a development impetus suited to these societies. These circumstances make the Savamala neighbourhood a suitable environment for examining the efficiency of bottom-up urban transformations.

In order to make transformations contextually appropriate and resistant to biased power relations and individual interests that thrive in transitional economies, it is important to continually keep track of the wider social repercussions and assess the risk of a range of "inter-states", which are intersections of the timeline of development and the indicators of swift and biased socio-spatial transitions in post-socialist neighbourhoods. The flexibility and the trial and error iterations of such urban transformations represent a catalyst for change and a means of seizing opportunities inside an urban environment, and converting these into development tools. Thus, such inclusive socio-spatial interventions strengthen horizontal practices and initiatives, unlike the leading urban public institutions, which tend to support vertical urban development decision-making.

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The first part of this paper provides an overview of the spatial and historical circumstances in Serbia and their manifestation in Savamala. This will be followed by presenting the MAS-ANT (Multi-agent system and Actor-network theory) methodology[2], an innovative methodological hybrid that has been applied to the context of Savamala. Its alternative urban development model is based on the combination of a participatory approach and the principles of the creative economy in order to transform existing urban conflicts, clandestine social potential and spatial capacities into urban development opportunities. Urban conflicts thrive on discriminatory power dynamics, clashes of cultural differences and a series of confrontations of opposing viewpoints within a city, and they tend to progress from a personal level to a socio-urban dimension. Social potential and spatial capacities, in our interpretations are contextual resources that enable horizons of possibilities by making use of the available social, human and spatial capital (Grönlund, 2007). Finally, the aim of this paper is to indicate possibilities for urban transformation, modification and/or change through an iterative process of small-scale bottom-up interventions. The resulting urban state of Savamala will eventually induce economic, political, cultural and spatial transformations and explicate the initial step in formulating urban development prospects appropriate for post-socialist cities.

CONTEXTUAL ANALYSIS

The development of cities is a contextual category, global and local. Nowadays, it is also a political, economic and spatial category. Therefore, the multilateral nature of urban development in the contemporary world is not only strongly based on global movements of capital, markets, goods and trends, but it is also responsive to local socio-spatial capacities and limitations. Such a complex and perpetual process could only be partially tamed and projected by regulatory practices and organisational solutions in the specific urban environment**.** On the other hand, socially beneficial urban development starts out from the experiences of all the urban actors and stakeholders and depends on direct individual experience, as well as on the sense of well-being. Therefore, mobilising the population to form an integral part of decision-making processes activates dormant creativity, and builds up an experimental education field and communication strategies for studying local cases that participants can relate to. The Savamala creative cluster is an example of how such a process of collective urban interventions is coordinated and articulated from the ground up.

The Savamala neighbourhood is situated in the central urban zone of the city of Belgrade, on the southern bank of the Sava River. It is a unique area in Serbia with plausible collision between traditional and modern and past and present; it is rich in tradition, history and heritage. But world wars, authoritarian rule and the current economic crisis have left their marks. Savamala is now a traffic bottleneck with intense pollution and urban noise. For decades its existing spatial conflicts and socially disadvantaged population have been neglected by both the authorities and professionals ("Urban Incubator Belgrade", 2013). Before the spin-off of cultural organisations, activities, and conversions of old neglected houses into trendy cafés and restaurants in the neighbourhood, Savamala had a reputation as a home to outcasts, a place of prostitution and criminality.

Even though Savamala was known as a Christian neighbourhood in Ottoman Belgrade, its rich cultural and architectural heritage dates back to the period of the Serbian monarchy from the 19th and early 20th centuries. Furthermore, during communist rule Savamala was disregarded as the legacy of the capitalist era and was turned into a transit roadway surrounded by corresponding building stock (warehouses and manufactures). After the major political shift in 2000, the attractive location of this neighbourhood put it at risk of becoming a training ground for the interests of corrupted public authorities and powerful private developers, working together under the hood of urban development and economic prosperity. Despite the ownership change, Savamala was saved for a while from this new development trend, mostly because of its long-term decay that had made it a complicated case for the limited investments with short-term turnovers that were dominant in Serbia. However, it has recently changed, as powerful international investors found a counterpart in Serbian authorities at various levels to jointly use their economic and political dominance for gaining control over a highly profitable waterfront area of the capital city (Zeković *et al.*, 2016; Cvetinovic *et al.*, 2016b).

In the meantime, taking advantage of the long gap in development, a number of local and international organisations and cultural entrepreneurs have focused their actions on Savamala. Their initiatives to transform abandoned places and to reactivate them through participatory, cultural, artistic and educational activities have been mainly supported by the local municipality Savski Venac and international cultural institutions and programmes. What at first seemed like a sum of ephemeral local activities has become a driving force for the possible urban future of Savamala, at least the future preferred by most local urban actors who have taken an active role in it. According to the organisers, it has gradually grown into a testing ground for the implementation of an innovative tool for "action and learning by doing" (Lydon, 2012) in the urban planning of transitional post-socialist cities (Cvetinovic *et al.*, 2013). However, this new picture of a trendy and rather safe Savamala renders the same with facing threats of expulsion of the local population and hidden gentrification (Krusche and Klaus, 2015). Participatory activities are mainly rounded up in an urban transformation programme named *Savamala Civic District*, in the *Urban Incubator Belgrade* project activities and their successors, and cultural entrepreneurial collectives.

All these circumstances bring to light that Savamala has kept its shape[3], but different social conditions have influenced its development. Namely, four crucial political periods have left their mark on Savamala: pre-socialist, socialist, post-

[2] For more details on Multi-agent system (MAS) see Crooks *et al.* (2014); and on Actor-network theory (ANT) see Latour (2005).

[3] a triangular form of a neighbourhood on the right bank of Sava River dates back to the times when it was a village only a kilometre away from the city centre and outside the walls of a Turkish city.

socialist and transitional[4]. All of its cultural and architectural heritage dates back to the pre-socialist period when Savamala was promoted as a major trade and artisanal area and a communication hub with bus and train stations in its proximity, while noise and pollution have been caused by its role as a passageway for heavy transit introduced during socialism. Therefore, we could summarise its life-cycle as follows:

- Pre-socialist period: amorphous urban form of the neighbourhood, recognisable cultural and architectural identity;
- Socialist period: disintegration of tradition and heritage, middle-class society and marginalised groups living in the area;
- Post-socialist period: lack of data on social structure, deteriorating industrial area and abandoned buildings, and leasehold of empty plots to private investors without transparent bidding procedures;
- Transitional period: market led economy, dominance of private ownership, vivid night life, creative cluster and limited citizen participation governed by the non-governmental sector, and start of the huge redevelopment project initiated by a foreign investor.

However, several important characteristics have been continually developed during the different periods such as (Figure 1): (1) restricted and ideologically-framed civil rights, (2) state control over capital areas, resources and infrastructure, (3) a top-down approach to spatial and social development, renovation and revitalization, (4) public ownership of land and building stock, (5) hybrid market circumstances, and (6) societal self-management planning (Vujović and Petrović, 2007; Petrovic, 2009; Vujošević *et al.*, 2010; Simmie, 1989). These characteristics have made Savamala a scaled example of a "pre-socialist material legacy, socialist cultural and societal matrix, a transitional reality and a condensed case of multi-faceted circumstances of post-socialist urban development" (Cvetinovic *et al.*, 2016a).

METHODOLOGICAL APPROACH

Post-socialist urban development induced radical political, economic and cultural shifts in neighbourhoods in Belgrade. Savamala is therefore a representative case for intensive collision of top-down and bottom-up pressures. Endowed with a prime location in the Serbian capital, Savamala has been directly or indirectly targeted by most General Urban Plans since the beginning of the 20th century (GUP 1923, GUP 1950, GUP 1972, GP 2003 (revised in 2005, 2007, 2009, 2014), and GUP 2016) as well as having captured the attention of national and international capital through large-scale architectural projects ("Town on the Water", CIP Europolis, Beko Masterplan, Belgrade Waterfront Project etc.). In Savamala, a complement of post-socialist urban development is found in small-scale cultural practices, crowdsourcing activities, creative industries, urban factories, and cooperative economies which, slowly but surely, spread from upper Savamala to the riverbanks (Cvetinovic *et al.*, 2013). The hybrid field of overlapping the MAS (multi-agent system) and ANT (actor-network theory) methodological approaches proposes an innovative concept for defining causal relationships between different urban elements, and the developmental prospects of their interrelations and interconnections.

Data were collected from context-based information and knowledge and also traced from relevant influences, interests and interpretations on Savamala.[5] In this respect, the actors in the bottom-up participatory activities in Savamala taken into account here are (Figure 2): (1) Cultural centre "*Kulturni Centar Grad*" *(KC Grad)*, (2) Old depository in Kraljevića Marka Street (MKM), (3) *Mikser* multidisciplinary platform, (4) *Nova Iskra* design incubator, (5) *Urban Incubator Belgrade* project (UIB), (6) *Ministry of space collective*, (7) *Ne da(vi)mo Beograd* initiative (NDVBGD), (8) *My piece of Savamala* – participatory urban design workshop, (9) *The game of Savamala* - participatory urban planning workshop, (10) *Savamala, a place for making* participatory project, (11) *Streets for cyclists* NGO, (12) Common space in Kraljevića Marka 8 street (KM8).

We applied ANT for interpreting the state of the local context. The most prominent characteristic of ANT is flattening the social by symmetrical treatment of all human, social and technical elements (Latour, 2005). Therefore, ANT serves for structuring the data on human and non-human agents and urban assemblage networks at the neighbourhood level. An actor's existence is its status in a connection or connections. According to ANT, actors do not exist if their networks are not labelled. In this way they become agents.

[4] The pre-socialist period ended with WWII; 40 years of self-managed socialism finished in the 1990s; the period of Milošević's rule is marked as post-socialist; and the transitional period started the political shift in 2000 and is still at play, even though the post-socialist period is not over yet.

[5] Key informants on these issues were: (1) experts, (2) young professionals, (3) participatory cultural and design activities, and (4) documents on Belgrade Waterfront Project.

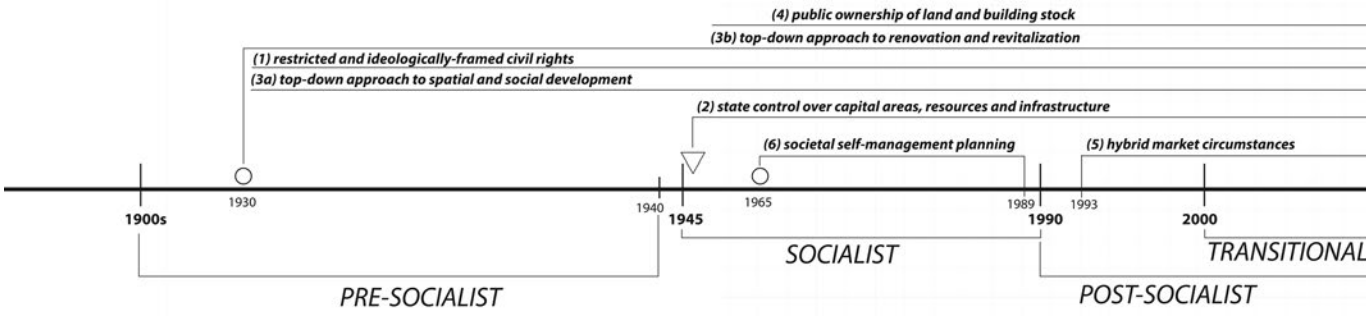

Figure 1. Savamala time-frame
(Source: authors)

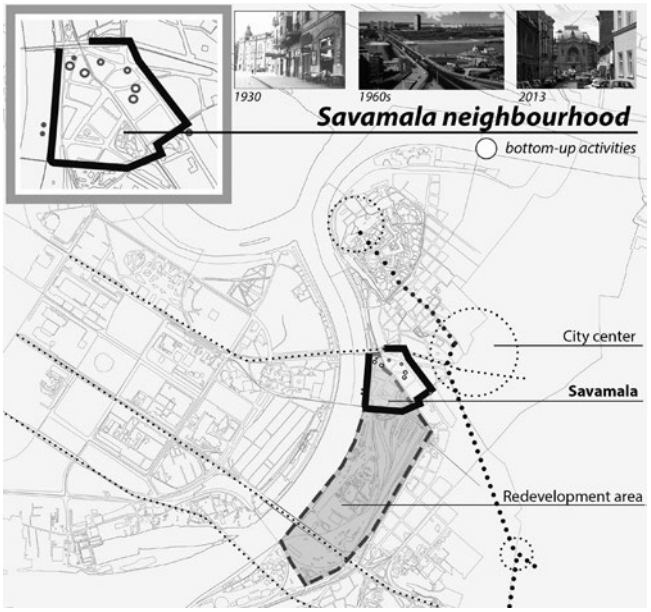

Figure 2: Savamala neighbourhood - its position and distribution of activities (Source: authors)

Within an urban system, all agents are interdependent. The agent, while being influenced by the others, also influences them simultaneously (Bousquet and Le Page, 2004). MAS traces agent profiles and the character of their inter-relations and inter-connections. An agent profile is a combination of the agent's structure, preferences, and behaviour. The behaviour of agents is identified by qualitative surveys and analysed using multi-criteria MAS analysis of their profiles and references to system development (maintenance, transformation or change). We defined it here through the categories of: social practices, urban conflicts and contextual resources (spatial capacities and social potential), which are continuously produced within this initial networking.

They come into existence from already identified agents and have a crucial role in tracing the urban development process: (a) resources instigate transformations, (b) practices identify system maintenance, and (c) conflicts boost potential changes. Moreover, these interactions also define what is possible (through contextual resources) and what is happening (urban conflicts and social practices). The analysis of the identified bottom-up agents according to these principles gives us the opportunity to determine their influence on the system evolution, their capacity to intervene and their biases that cause eventual negative effects.

CASE STUDY OF SAVAMALA BOTTOM-UP ACTIVITIES

For the analysis of the Savamala bottom-up urban transformation, we relied on the defined agent profiles. First of all, we investigated agent structure and preferences. We treated these as dynamic features of urban agency in Savamala. Then we tracked the behaviour of these agents and their influence on the state of the urban environment in Savamala. Finally, this allowed us to sum up their capacities and limits to influence urban transformations and changes.

Dynamism of urban agency in Savamala

Contextual analysis of the social circumstances in Savamala has shown that the contextual capital, which was identified therein, has been gradually attracting a number of small-scale public initiatives and creative services to settle in Savamala (Cvetinovic *et al*., 2013). The very first bottom-up activity in Savamala was the establishment of MKM cultural space in 2007. However, the intensive aggregation of participatory activities started when *KC Grad* gained an abandoned building in Braće Krsmanovića street for their cultural activities in 2009, though the peak came at the end of 2013, and this condensed interaction between urban spaces and civic life lasted for 2 years (Figure 2).

When we analysed the structure of the agents, we addressed their basic characteristics already identified within the key categories from the ANT methodology (Figure 3). These ANT categories indicate the figuration of the chosen agents in their environment. They are adapted according to our interpretation of the ANT methodological approach. Agent structures are circumscribed based on the roles these agents play in Savamala, as follows: (1) agent nature – its operational manifestation, (2) level of influence – the boundaries of the activities and target groups, (3) structural networks – the agent's primary activity, (4) socially functional networks – social function, and (5) secondary networks – subordinate function(s) (Cvetinovic *et al*., 2016b, Cvetinovic *et al*., 2016a). In terms of agent nature, the chosen bottom-up agents figure as sets of horizontal entities of events/projects/activities. In our case, the strict focus on bottom-up activities has limited the scope of secondary network characteristics mainly to either those focused on the urban or NGO sectors or small-scale services. Moreover, socially functional networks formed from the ground up are mainly formal/informal collectives with non-transparent or unclear internal organisational or foundational procedures.

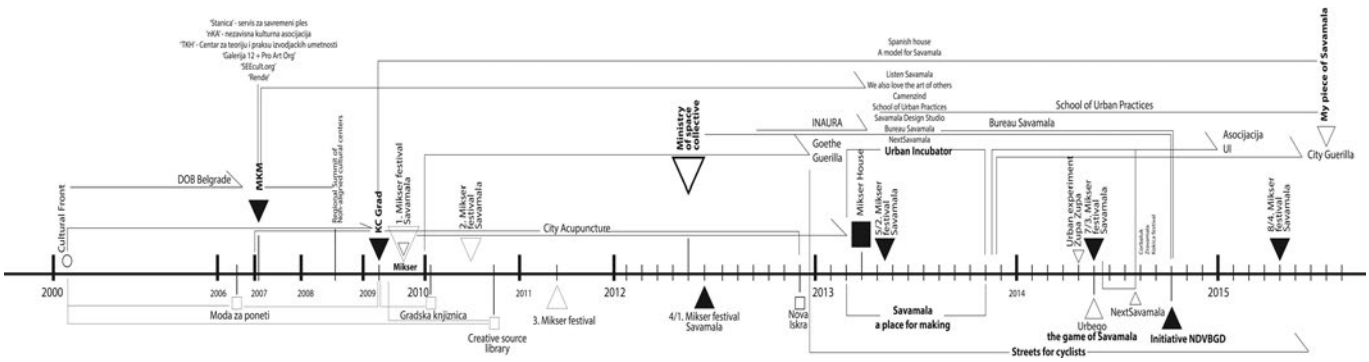

Figure 3: Timeline of bottom-up activities and actors in Savamala (Source: authors)

Consequently, various structural networks clarify agents' roles and indicate the paths of their behaviours and networking capacities at the local level.

For further analyses we have chosen the most influential public and private organisations. However, several of these agents have an unclear and non-transparent funding structure – while they receive some public funding, they are also partly profit-oriented (*KC Grad, Mikser*). *Nova Iskra* is the only explicit privately-based organisation. The social function of the agent is strongly connected to their level of influence in this case. All these bottom-up actors are active at the local, but less often at the city and international levels, though their international visibility is also more in the domain of funding – several are recipients of international financial support (foreign embassies and foundations, European cultural and art organizations and programmes) or under direct supervision of international entities (*Urban Incubator Belgrade* was the initiative of *The Goethe-Institut*). However, there are others with transparent financial schemes (*Ne da(vi)mo Beograde* initiative[6]). Even though some of the activities of *KC Grad* and *Mikser*, for example, are publicly funded, they also incorporate profitable services (café-bars, shopping areas, concerts, exhibitions and other lucrative events/activities).

Furthermore, following the nature of these agents, we apprehend that the cultural and artistic activities in Savamala do not belong to institutionalised art and culture. In this respect, most of them relate to the NGO sector or they acquire or occupy publicly owned spaces which they use for these activities. MKM and KM8 are municipal spaces shared with different NGOs and offered for multiple projects/activities/events by different actors. Finally, the majority of these agents aspire to have a consulting role on a wide range of urban issues, culture, art and education or to implement a range of ideas/solutions/interventions at an urban or social level. In the Serbian context, they aim to provide an alternative body for catalysing available human resources and translating global knowledge into the local context of Savamala and Belgrade.

Based on the MAS-ANT methodological pollination, agent preferences are defined in relation to their relationality towards the contextual resources, social practices and urban conflicts figuring in Savamala and the social artefacts they are influenced by or they have influence on. In this manner, we become aware of their field of manoeuvres in Savamala. In order to identify and elaborate how participatory activities influence urban development in Savamala, it is essential to translate these qualitative categories into factors which could denote a positive impetus. Contributing to the body of local social practices, and benefitting from social potentials and spatial capacities (contextual resources), as well as addressing urban conflicts involve the continuous reviewing of how the collision of these positive and negative influences actually produces a variety of opportunities for transformation and change. In this case, the conceived social aspects (political, economic and cultural) of Savamala are those that contribute to local resources, conflicts or practices and thereafter aspire to generate qualitative urban transformation or change (Cvetinovic *et al.*, 2013).

Based on our qualitative research on Savamala, the most prominent aspects in direct correlation with agent functioning at the local level are: political (participation, transparency, and institutionalization of culture), economic (public funding), and cultural (global flows of ideas, trends, information and knowledge). Consequently, we recognise the following clusters of resources, conflicts and practices (Figure 4):

- Spatial capacities (SpC): (1) accessibility; (2) central position in the city; (3) brownfield area; (4) architectural diversity; (5) proximity of the river; (6) deteriorating area; (7) green area; (8) waterfront area; (9) recreation area;
- Social potentials (SoP): (1) lack of private investment in the area before 2012; (2) architectural and cultural heritage; (3) social diversity; (4) aroused interest in this neighbourhood from cultural and artistic groups, individuals and organisations; (5) trade and artisanal area – cultural heritage and traditional crafts; (6) creative cluster; (7) participative and self-organisational initiatives in the area (*KC Grad, Mikser*, etc.); (8) small commercial area; (9) underdeveloped area; (10) diversity of interests and power poles in the area;
- Urban conflicts (UC): (1) disintegration of heritage; (2) lack of systematic investments in the construction industry (debt crisis 2008-2012); (3) lack of data on the state of physical structures; (4) lack of data on the social structure of the neighbourhood, (5) attractive location for private investments, (6) poor population, squatters and marginalised groups in the area;
- Social practices (SP): (1) support of urban related activities (urban design & public participation); (2) support design activities (interior, fashion, graphic), art, culture, education at the city level; (3) translation of global trends into local and regional practices; (4) design, communication and creative industry activities in Belgrade; (5) local and global economic trends in the area; (6) develop the waterfront recreation area and sustainable transport (cycling).

The data in Table 1 show how different agents opt for these contextual resources, urban conflicts and social practices in Savamala and what the relation is between their nature and these preferences. Accordingly, we may conclude that contextual resources, either spatial or social, are the attraction factors that make Savamala a neighbourhood saturated with different actors and interests. On the one hand, all bottom-up agents that have an active approach to the urban environment through projects, activities and events, also direct their initiatives toward solving urban conflicts. On the other hand, those that include profit converge more to social practices that maintain the current urban order. Consequently, these agents refer to their contextual preferences, and they organise and engage in networks at local or superior levels, in this way influencing the state of the urban environment in Savamala.

[6] Information on funding
https://nedavimobeograd.wordpress.com/podrzi-nas/

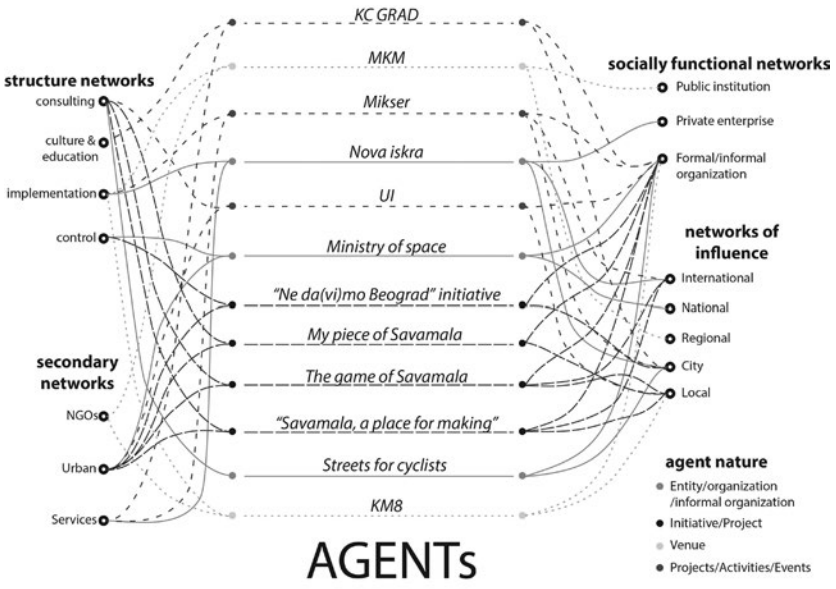

Figure 4: Agent structure (Source: authors)

Network of civic engagement

The agency and relationships between the above identified human/non-human actors in Savamala are the cornerstone of bottom-up networks constituted at the local level. As they primarily depend on the contextual preferences which the agents attribute to their activity and relations, tracking these associations is also a crucial factor of urban transformation or change, if changes occur. Therefore, with the MAS-ANT method we aim to estimate whether this bottom-up management of social exchange and urban transformation contributes to an improvement in the life and functionality of urban systems.

The analysis of the agents' structure and preferences and qualitative data on the Savamala neighbourhood indicates urban assemblage networks formed and contributed to from the ground up. Namely, the implementation and management of participatory activities is the focal point of urban interventions in Savamala, and these networks involve a range of local and city NGOs as well as several IOs, initiatives and collectives. In a few cases (*Urban Incubator Belgrade, Mikser* festival etc.) the municipal authorities provide support in these managerial networks. However, local, municipal and city authorities as well as international funding organisations (embassies, foreign institutions) take part in financial networks (funding instruments) and in several projects in the implementation networks (Savamala, a place for making; *The game of Savamala; Camenzind, NextSavamala* and *Savamala design studio* projects within UIB). In the case of UIB, the activities in Savamala also comply with the Goethe-Institut campaign to focus some of their activities in their branches worldwide on "Cities and Urban space". Speaking of these participatory projects, they are pillars of bottom-up research and education networks and in this manner they cooperate with Serbian and European universities[7]. At a limited level, a few agents (*My piece of Savamala, KC Grad, Mikser*) engage in consulting networks with municipal and city authorities (City mayor, City architect, Municipality of Savski venac) and real-estate actors (*Eagel Hills*, Belgrade Waterfront Project). Finally, the sole interest of the *Ministry of Space* collective and *Ne da(vi)mo Beograde* initiative, which are overlapping in the course of individual participants and actions like NDVBGD, is the initiative led by this collective, namely the activation of control and verification networks for all urban questions, problems and solutions, and they refer back to the city and national urban and political authorities and experts.

Figure 4 visualises the MAS-ANT analysis of these bottom-up networks with reference to the agent structure, preferences and behaviour. In this diagram the relations between contextual preferences, the social aspects addressed and the agents with their explicit structure (level, nature, and functions) are explicitly represented. In this respect, we can acknowledge urban system references - the indicators of maintenance, transformation and/or change.

Based on agent profiles and networks, we have identified multiple maintenance, transformation and change actions that influence the state of the urban environment in Savamala. First of all, the settlement of civil organisations has supported service and commercial activities and recreation zones already present there. Several traditional craft shops have been in Savamala for decades and now, following the hype of its low-profile bars and restaurants, as well as art and culture initiatives fostering cooperation, globalisation and modern business trends have positioned themselves there. Their significance, not only at the city but also the international level, promotes Savamala among architects, artists and all young creative workers of the region and Europe.

Visible spatial transformations are activation of the waterfront area (for a while activities and events were organised on abandoned ships on the Savamala coast before they were removed), and the preservation and improvement of cycling paths (initiative of *Streets for cyclists* NGO). The

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Table 1: Agent preferences – contextual preferences for agent activity

AGENT PREFERENCES					
Key agents Agent nature: ○ venue; ◌ entity/organisation/informal organisation; ● projects/activities/events; ● initiative/project;		Contextual resources		Urban conflicts (UC)	Social practices (SP)
		Spatial capacities (SpC)	Social potentials (SoP)		
KC GRAD	●	+	+	-	+
MKM	○	+/-	+	-	+
Mikser	●	+	+	-	+
Nova Iskra	◌	+/-	+/-	-	+
Urban incubator Belgrade	●	+	+	+	-
Ministry of space collective	◌	+	+/-	+	-
"Ne da(vi)mo Beograd" initiative	●	+	+/-	+	-
My piece of Savamala	●	+	+	+	-
The game of Savamala		+	+	+	-
Savamala, a place for making	●	+	+	+	-
Streets for Cyclists	◌	+	+	-	+
KM8	○	+	+	-	+
Agent passivity:		□ SP;	▒ UC & SpC;	■ SoP & SP;	

preservation of skills and traditional crafts (Savamala a place for making); fostering the sense of community and sharing (UIB was the pioneer in participation, followed by *Goethe guerrilla* collective, which organises and supports civil, participatory and design activities and operates in KM8 community space); and informing and educating public (*The game of Savamala, My piece of Savamala* etc.) are the major social transformations which have been directly induced by this pioneer bottom-up agency. Moreover, the local population emphasises that these participatory programmes, with reference to their organisational preferences and capacities, take into account the needs of the locals, youngsters (UIB) (Müller-Wieferig and Herzen, 2013) and marginalised groups (*Ministry of space* and NDVBG) (Mitić and Miladinović, 2016). Conversely, the development of Savamala's creative cluster and small-scale hype brownfield regeneration and public place design are major smooth transformations that have made Savamala visible on an international scale.

Finally, urban change induced by these bottom-up activities is limited in its scope, but it shows significant potential if these activities encounter understanding and support from city authorities. Forming the *Savamala civic district*, as well as participatory urban upgrade, and brownfield and urban heritage regeneration are their ultimate goals. It is also important to mention that the combination of Savamala's spatial capacity (its central urban position and the proximity to bus and train terminals) and the primary activity of these bottom-up agents (inclined to boost knowledge and vision building as well as experience sharing potentials) has led to prompt and adequate reactions to the current refugee crisis that has hit Europe, and with it, Belgrade. The activities for helping refugees/migrants are coordinated by *Mikser* and financially supported by many national and international organisations –the United Nations High Commissioner for Refugees (UNHCR), CARE International (Cooperative for Assistance and Relief Everywhere), the Red Cross etc., as well as by supplies and care from the locals.[8] These efficient actions also speak of the competence and alertness of bottom-up agents to respond to the dynamics of the modern urban context.

CONCLUSION

Having followed the aims and results of the activities in Savamala analysed herein, we have identified the following capacities for Savamala to transform a crisis of aggregated urban conflicts into an opportunity for urban development: mobilise available local human resources, comply with current global trends in participatory urbanism, low-budget revitalisations and creative economy initiatives, educating the apathetic local population on the importance of active participation in urban planning and development, having a critical attitude and "learning by doing" towards urban planning. It is also important to acknowledge that local citizens are not the main actors in these interventions. In this manner, the bottom-up nature of the agency in Savamala is rather limited to the activation of the alternative and non-institutionalised cultural scene with the focus on the whole city, as well as the aggregation and multiplication of such NGOs in Savamala. However, negative changes have taken place as well – the first intrinsically bottom-up organisation in Savamala (*Club of Savamala funs and friends*) having been placed in the middle of different agendas and interests, has ended up as a type of informal political body in party service.

To this extent, the livelihood of Savamala is still assumed to be at least disseminated from the ground up through the social bonds between different social groups (artists, youngsters, students, senior citizens) and among neighbours and locals, and achieved through the mutual efforts of participation and dialogue from these urban actors with different backgrounds. At some point, these internal relationships have surpassed all their campaigned and institutionalised initiators (UIB, Mikser festival), being followed by informal events such as: meetings of the locals in the "*Spanish house*" space, the co-action of roasting peppers, and open access to spaces for artistic and educational purposes (KM8). Moreover, through several of the activities, a variety of urban actors have become engaged in using these open public spaces (UIB, KM8, Mikser festival) and they are actively

[8] Miksalište, a sister organisation of Mikser, coordinated 1,200 volunteers from 68 countries and provided help (food, advice, clothes, medical examinations, education etc.) for more than 130,000 refugees.

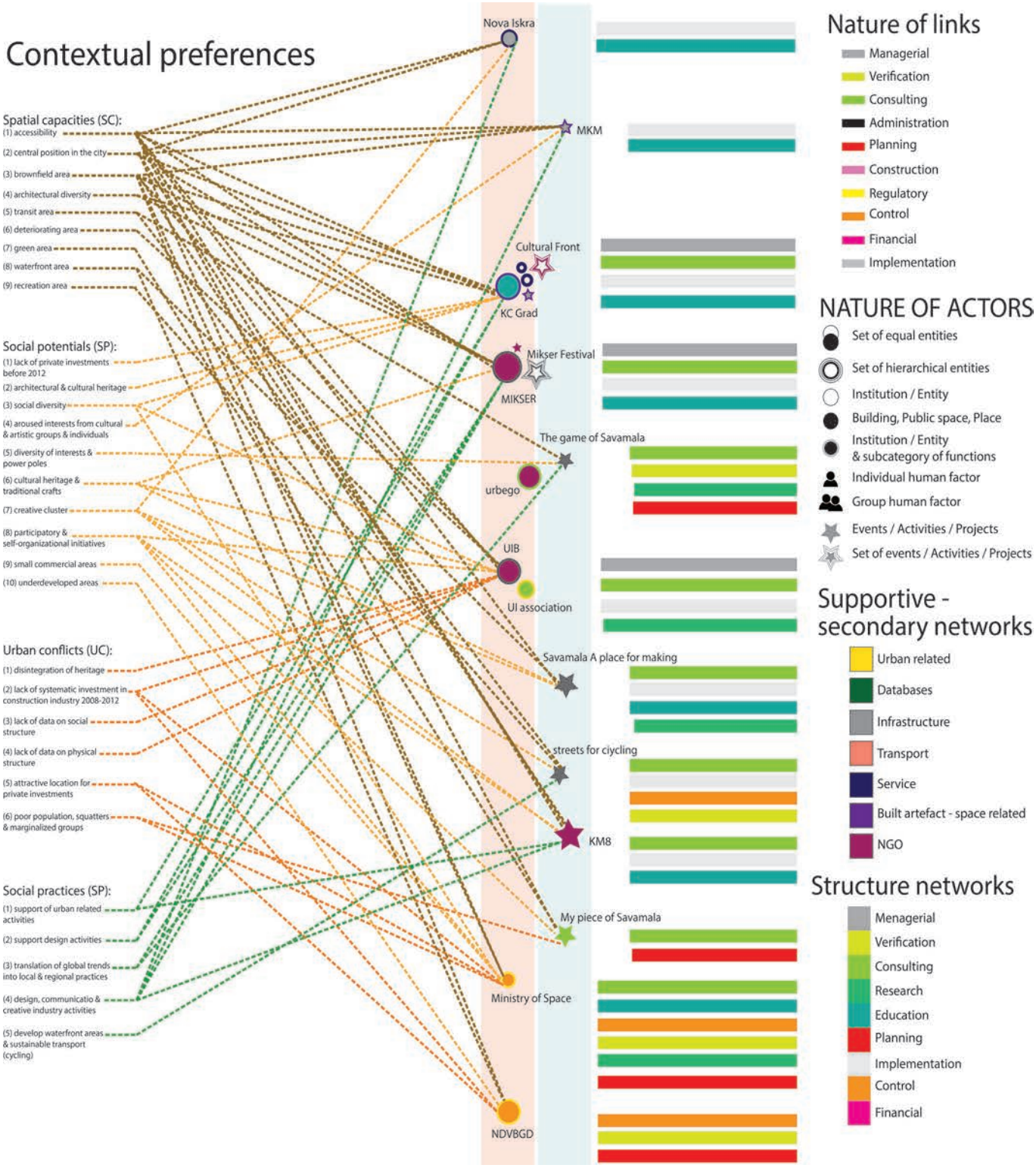

Figure 5: Urban assemblages
(Source: authors)

thinking and imagining what the positive future of these places might be. In this light, the major benefit that could transform the socio-urban landscape of Serbian cities is the strong expression and statement of cultural and artistic interests within the agendas of these activities and raising the awareness and promotion of participation in the urban domain.

Though it may also sound pretentious, the intensive UIB media campaign[9] and the role of the Goethe-Institut have certainly paved the way for Savamala and have ensured a place for Savamala among the European neighbourhood symbols of creative clusters and urban upgrade potentials[10].

[9] Bureau Savamala, a project within UIB, attentively followed the UIB project roll-out and acknowledged and analysed its presence in local media.
[10] http://house.mikser.rs/en/guardian-mikser-house-one-10-best-industrial-chic-spaces-worldwide/

In response, it should be attentive to the possible negative effects of such a trendy image that could lead to gentrification and the expulsion of the current population. The growing presence of Savamala in the media has also led to the exposure of its contextual resources to several powerful and uncompromising actors. In addition, instead of exploring the potential of bottom-up approaches, actions and actors, certain decision makers have contributed instead to the commodification of culture and space and resorted to transnational companies[11] to support their activities. In sum, the lack of strategic development goals, public funding and institutionalised approaches for cultural institutions and agendas certainly makes these bottom-up activities seem ephemeral and sporadic. Consequently, they could be wiped away by any whim of more powerful interests and political influences focused on Savamala spatial capital.

Acknowledgements

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CONTEMPORARY FACADES OF MULTISTOREY RESIDENTIAL BUILDINGS IN KIEV: VIDEOECOLOGICAL ASPECT

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The article is devoted to one of the actual problems concerning the current state of the facades on apartment buildings in residential districts in Kiev - videoecology. The main purpose of the article is to determine the degree of visual aggressiveness of multistorey residential buildings in Kiev. It also investigates the problem of finding the optimal criteria for creating an ecologically healthy and friendly inhabited environment in the capital city of Ukraine. The modern visual environment in the capital is contaminated, not only because of the increasing numbers of promotional billboards, but also because of the contemporary architecture of high-rise buildings such as office buildings, apartment buildings. Their composition is usually based on a simple description of a rhythm. There are also repetitions of the end parts of buildings in "lowercase" buildings, which are high-rise buildings that alternate with nine or identical apartment groups. It creates a sense of oppressive monotony and leads to psychological and visual fatigue, especially when these repetitions are the only pattern the eye perceives. In the article a theoretical block of ecological-aesthetic criteria is defined, which must be met by the modern architecture facades of multistorey residential houses in Kiev.

Key words: **multistorey residential building (MRB), facade, videoecology, ecological beauty, ecology-aesthetic criteria.**

INTRODUCTION

The main problems in large modern Ukrainian cities, which create discomfort among people and encourage them to improve the ecological and aesthetic qualities of the architectural environment are: 1) ecological and related to urban development (destruction of the natural framework, the absence of territorial reserves for landscape construction, functional and transport overload in the historical center of the city); 2) artistic and aesthetic (lack of artistic and aesthetic expressiveness, visual chaos of the urban environment) (Figure 1); 3) social (the necessity for the functional adaptation of architectural sites, the lack of modern landscapes and recreational areas for daily short and long rest, minimal educational influence of the landscape architecture on children and youth); 4) economic (low economic efficiency) (Tsigichko, 2007).

A person grows among different forms (there are no identical leaves, trees, landscapes, etc.) and among curved spatial systems (there are no identical planes and angles). So, a person instinctively feels environmental beauty (such as richness of natural landscapes, color and its variety, suitable to the sensory environment) (Filin, 2009; Day, 2004: 9-31; Pallasmaa, 2012; Holl 2006). Meanwhile, some environmental parameters are unusual for the residents of modern buildings, as they have conventional ideas about beauty and harmony that do not correspond to the historically compiled images of a beautiful home or town (Zaero-Polo, 2011: 121). The architectural parameters of ecological housing and cities (Rodney, 2002; Tetior, 2006, 2008) are very important for big cities, megapolises and urban areas, Kiev being an example. An ecologically beneficial visual environment for urban housing is important for life (Ristić, 2013; Rodney, 2002; Yudelson, 2007; Đorđević and Vujić, 2010), especially for the residents of high-rise buildings (Binder, 2002; Havik, 2006; Bhatt, 2013). In these kinds of buildings people feel that they are further away from nature, not only physically but also spiritually and visually.

The composition of multistorey residential buildings is usually based on a simple description of a rhythm (Binder, 2002). There are also repetitions of the end parts of buildings in "lowercase" buildings, which are high-rise buildings that alternate with nine or identical apartment groups. This creates a sense of oppressive monotony and leads to psychological and visual fatigue (Wilkins, 1995: 109-115; Filin, 1997, 2007, 2009), especially, when these

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Figure 1. Buildings in the residential district of Poznyaky on the Dnieper River. The number of floors is 20-30 (Source: author, 2008)

repetitions are the only pattern which the eye perceives in urban developments (Ikonnikov, 1971: 30). Filin notes that the "eye does not like" straight lines and right angles. Unfortunately, the present architecture uses only these elements. As a result we have nothing more than a visual cacophony. Most present-day cities lack such comfort, as their visual environment does not correspond to the visual norms, with great planes, monotonous colors and static objects all of which have an influence on a person, on his visual organ, in particular. The special set of visual elements and specific color spectrum in cities creates a visual environment quite different from that in which humans were formed as a biological species. The problem becomes aggravated year by year as cities are expanding and tearing people away from nature. Besides, the materials used in constructions resemble natural ones less and less. Most of our cities have reached the limit of plainness. The problem of the visual environment has become extremely important. The scientific trend based on the role of the visual environment in human life is called "videoecology" (Filin, 1997, 2009).

VIDEOECOLOGY

The main basis of videoecology is the automation of saccades (Figure 2). "An eye is the most dynamic sense organ never resting at a fix point. It is easy to be sure if one looks into an interlocutor's eyes. There are two basic types of eye movements: slow and fast. In scientific literature fast movements are called saccades (originated from the French term which means "a sail flap"). Saccades of both the right and left eyes are absolutely synchronous and of the same amplitude. They are oriented in the same direction. There are many saccades – approximately two or more in a second which means that the direction of the look changes every half second. So the eye is constantly scanning the environment" (Filin, 2009).

According to Filin's theory the city divided into three types of visual environment. There are: "*homogeneous visual environment* - a visual environment where visual elements are absent or their number is sharply limited is called homogeneous. Such an environment can appear for different reasons. In persons with weak vision the number of visible objects in the environment is decreased because of a reduction in the descriptive ability of the eyes. In the present day humans often face a homogeneous visual environment in cities, at home, at their places of work and in transport; *aggressive visual environment* - a visual field can be considered aggressive if it consists of a great number of similar evenly disposed visual elements. Modern architecture in most cases creates such visible aggressive fields in cities"; and "*a comfortable visual environment* exists only in old towns (examples of classical architecture), which were created using the laws of proportions" (Filin, 1997: 121). The design of a visually enabling environment in Kiev should be directed to creating a comfortable, healthy, beautiful environment for its residents.

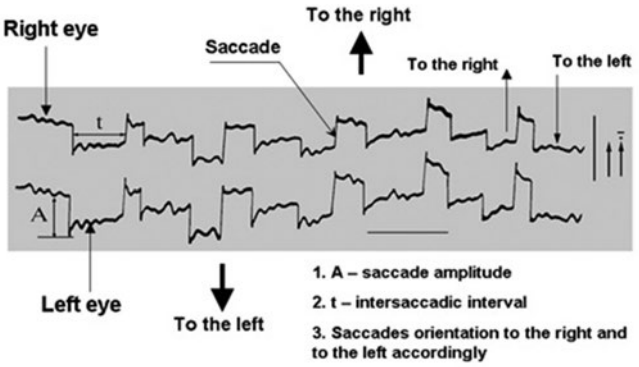

Figure 2. The recording of eye components (12, 32)

If we turn to the appearance and image of the facades of buildings and structures of most eras and styles, we should stress that the number of different elements and details that are related to the composition exceed the capabilities of human perception. However, in terms of videoecology details are the major aesthetic and functional basis for a facade.

Filin proposed the requirements for forming a comfortable visual environment, saying that people must use two indicators:

- the size of the clear vision of the eye retina;
- the saccades of the eye amplitude (elements with a maximum distance of 5 angular degrees).

It is also necessary to consider the optimal performance of visible fields:

- people clearly recognize an object that fits into 2 angular degrees;
- the optimal distance between objects is 2.5^0;
- the number of identical objects is 5 ± 2 (Miller's Number);
- objects must have completely different configuration, either horizontally or vertically;
- the central area of vision is 1.5^0 (the interval between two adjacent objects is 0.5^0).

We should remember that the greatest harm is caused by aggressive dynamic fields. In addition, the exclusion of moving stimuli from the visible environment leads to the necrosis of brain cells responsible for movement.

THE VISIBLE ENVIRONMENT HAS THE GREATEST INFLUENCE ON THE HUMAN CONDITION

In connection with the consolidation of housing estates in Kiev, there is a problem not only with the image of the whole city, but also the appearance of a new many-storied housing estate (Kozlova, 2008, 2009a, 2009b). Today's residents of Kiev and other major cities can generally see the fall flat surface facades, squares, streets and the right angles that intersect of these surfaces (Figures 1, 3-5). In nature, there are many different combinations of right angles. The main color of urban buildings and structures is monotonous grey. It is the color of concrete and asphalt. However in nature, there are a wide variety of colors enjoyed by the human eye, such as green and other colors, especially in regions with warm climates. In cities many details on the facades of buildings are repeated (Figures 1, 3). This is related to the manufacturing of standard industrial units (Zaero-Polo, 2011: 127): windows, panels, balconies etc. From the standpoint of architecture and construction ecology, city residential buildings should meet the main requirements of ecological balance, and the resemblance of natural and sensory ecological compatibility. It should be noted that greening is one of the parameters of buildings, and it may disrupt other equally important parameters of visual ecology (Tetior, 2008: 122).It is very important is to keep the city's flora and fauna in good condition. One of the most important factors is using natural technologies (Tetior, 2006: 125), which include diverse of environmental resource-saving solutions.

The architectural solution for the facades in Kiev since the early 1990s has been one of stylistic pluralism. Researchers have different interpretations of the stylistic direction of the outer shell of modern living:

1. interpretation of various architectural styles and the search for a modern architectural image;
2. the tendency of forming a Ukrainian national style, stylization, imitation, borrowing, innovation;
3. traditionalism, regionalism, westernization, modern avant-garde flows.

In the examples of modern MRB in Kiev, two major stylistic trends are evident: the house-context (mainly located in the city center) and the house reminiscence of modern Western styles, which can be in the form of home-styling. It has become the tendency nowadays to borrow "European" architectural style.

a

b

Figure 3. a) A typical facade of a multistorey residential building on the new alluvial sand areas. The residential district of Kharkovskiy in Kiev. The facade consists of monotonous windows and bay windows which are repetitive in form, it creates an aggressive visual environment in the city (Source: author, 2008); b) A fragment of the multi-storey residential complex of South Gates, in the residential district of Osokorky in Kiev. The usage of the monolithic skeleton frame for buildings made it possible to set new high-rise landmarks in the city. However, the monotonous facades have remained aesthetically poor (Source: author, 2013).

Figure 4. Buildings in the residential district of Teremky-1 in the 1980s. The facades reveal the essence of constructive precast housing. The monotonous grey colour and empty sides of the buildings are repeated, and as a result appear as more aggressive and homogeneous visual fields in the city (Source: author, 2014)

An increase in the size of houses and a significant increase the number of storeys (while maintaining their former general form) are in conflict with the necessary conditions for normal human life, since they negatively affect people's psyche and visual apparatus. Yards which are surrounded by huge walls of 16-27-storey buildings are not perceived as recreational spaces. A combination of architecture and the peculiarities of human perception is a kind of source of aesthetic pleasure. This is a source of internal and spiritual health for the urban residents. That is why today there is an urgent need for the clarification of the optimal ecology-aesthetic criteria.

METHODS

In order to determine the available videoecological and aesthetic criteria for forming contemporary facades of multistorey residential buildings (MRB) in Kiev city, the existing ecological criteria and parameters of ecological beauty were analyzed from the standpoint of: the science of videoecology (Filin, 1997, 2007, 2009; Wilkins, 1995), architectural ecology (Tetior, 2006, 2008; Fedosova, 2008), aesthetic architecture (Bhatt, 2013; Ikonnikov, 1971; Kozlova, 2009b; Stevanović, 2011, 2013), and the videoecology of the architectural environment (Chechelnickii and Fomenko, 2012).

Methods of full-scale analysis were used, as well as photo fixation of the existing multistorey residential environment from 2007-2016 in Kiev. A comparative analysis was made of the theoretical component of the videoecology science in confirming the hypothesis of the videoecology of multistorey residential buildings. The analysis shows (Kozlova, 2009a, 2009b) that all sciences essentially contemplate one of the same parameters and criteria. In our view, the parameters and criteria must be met by an ecologically beautiful architectural environment and thus by an ecologically justified facade of the building. The theoretical data collected include the following features of the ecological beauty of the buildings:

- meaningfulness (the property of buildings as architectural objects, inseparable unity meets the material and spiritual needs of mankind (Day, 2004; Pallasmaa, 2012);
- the presence of architectural style (strong association with the main properties of the architectural form of multistorey residential buildings);
- integrality (unity of the "internal" and "external" content of the building, indissolubility of the MRB shell and space that it creates);
- organic properties (the harmonious combination of the natural landscape and the "artificial", incorporating the building into the landscape, taking into an account the "spirit of the place" (Day, 2004));
- scale properties (a person is the measure of all things. Provides compliance with buildings and their elements by human size (Bhatt, 2013));
- ensemble properties (the greatest spatial organization of forms in which artistic unity, meaningfulness and integrality cover a group of buildings on individual streets, micro neighborhood and districts according to the city);
- proportionality (availability in composite structure patterns of MRB in construction, according to the rules of "golden section", and submission of identical elements according to the Fibonacci series (Bhatt, 2013));
- ecological friendliness (greening elements in the structure of the city and its buildings: planted design houses using permaculture, integration of buildings and environment) (Tetior, 2006, 2008; Rodney, 2002; Ristić *et al*., 2013; Elgizawy, 2016);
- visual ecological friendliness (design of the city which visually enables the environment details. Consideration: visual corridors to local points and interesting zones of the city (Ristić *et al*., 2013), perception of the planning area and other parts of the MRB) (Tetior, 2006, 2008; Đorđević *et al*., 2010; Filin, 2006, 2007);
- self-descriptiveness (presence of the vertical and

horizontal zoning of a building and identifying it on the facade area, roof shape and silhouette, shape and silhouette of entrances and staircases, lift nodes in the house, make the corners of the building. Using light artistic murals, art therapy, vertical and horizontal planting (Ikonnikov, 1971; Filin, 1995; Tetior, 2006, 2008; Fedosova, 2008; Ristić *et al*., 2013; Iosifidis, 2009; Chechelnickii and Fomenko 2012));

- adaptability (the system of multistorey residential building should be flexible, and open to further development; keeping the overall harmony of forms according to new needs; ability to change the shape and function of the building) (Rodney, 2002; Binder, 2002; Yudelson, 2007; Charleson, 2014).

Trend formation analysis of modern multistorey residential buildings and the features of ecological beauty inherent in modern apartment buildings in Kiev (Kozlova, 2008, 2009a, 2009b) and elsewhere makes it possible to distinguish the following parameters of ecologically beautiful MRBs:

- harmony with the landscape (harmonic dualism with the landscape, inscribed into the landscape, and into the urban landscape);
- landscaping of neighboring territories (environmentally friendly and diverse planting areas outside the landscape, to solve small forms of outdoor areas near MRB);
- "green corridors" (all kinds of "green corridors", including over and under roads);
- horizontal/vertical greening (greening roofs, terraces, buffer spaces, planting green walls with special panels (Nadia *et al*., 2013; Cameron *et al*., 2015; Elgizawy, 2016), green graffiti);
- permaculture (availability of areas and buffer zones which are designated for food cultivation);
- buffer spaces in the structure of multistorey residential buildings (orangeries, public areas for socializing, green gardens in the structure of buildings, social areas for residents encouraging of architectural tools);
- the visible material of structures (ecologically natural materials - ceramics, brick, wood, glass. a minimal amount of materials with polymers (Charleson, 2014; Nagy *et al*., 2016));
- quantity of house floors (compliance with human size and landscape components (not higher than trees), construction of green areas in the buffer zones of MRBs, the advantage of low-rise and medium-storey building with single inserts and high-rise reference points);
- variety of architectural forms and styles (harmonious diversity of architectural shapes and styles. Taking into account the national traditions and culture of the local people);
- architectural details (availability of mirrored blinds on the facade of MRBs, and mirrors to improve the illumination, light and shade pattern, architectural lighting (Cuttle, 2003) and wall supergraphics (Santen, 2006), presence of advertising and graphic guidelines);
- form of the windows and doorways, entrances into the buildings, roof shapes and silhouettes (availability of spatial structures of flat, variety horizontal and vertical forms of windows, roof height and its shape, derogations from "Red line", floor projection and hanging, open spaces in the MRB structure, division of the facade and its articulation, glazing pattern, stained glass windows, clearance of angles, solution of entrances into building, entrances into garages, resolving the 1st and 3rd vertical tiers of a home, the availability of composition accents);
- size of spatial elements in the house (ecologically justified dimensions of the height and area of the apartments in the MRB, presence of spacious rooms adequate for activities within the human spiritual and emotional sphere, proportionality of spatial elements and building rights);
- roofs and walls with visible devices (electricity, heating, ventilation). Natural ventilation to improve the air (Charleson, 2014; Nagy *et al*., 2016);
- color of the building (ecologically appropriate solution for colorful MRBs and their elements, considering the coloristic basin of the district and city, the presence of art-therapy (Santen 2006) on the facades of buildings, free space on the walls for street art and murals (Figure 9a));
- finishing of the house (environmentally appropriate finishing materials which do not have a negative physiological and visual load for person);

The Fedosova method was used to make a graphic-analytical analysis of the vertical visual fields in the city (Figure 5). The viewing angles were calculated for 31 multistorey residential buildings in Kiev, as well as the coefficients of aggressiveness for these objects: 1) for horizontal planes a = $\arccos((C_1^2 + C_2^2 - L_2/ 2*C_1*C_2)$, and vertical viewing angles 2) $\beta = \arcos(d^2+L^2-H*d/\wedge((d^2+L^2)*((H-d)^2+L^2)$ the number of grooves for the stakeout net that applies to the façade 3) $N_g = a/\varphi$, $N_v=\beta/\varphi$, the coefficient of aggressiveness of visual environment 4) $K_{agr}=H_n/\Sigma H$. The results for 5 multistorey residential objects can be seen in Table 1.

The method of sociological survey (Figures 7, 8) was used to determine the significance of the aesthetic and ecological components in a residential urban environment. Figure 7 shows the assessment of visible elements in the whole of Kiev by the group of people "over 30 years of age". Figure 8 shows the emotional assessment of the respondents at the age of 30 years old and above who live in residential buildings in the series of typical BPS projects (Figure 9b).

RESULTS

From the position of the videoecology science, we can classify the modern facades of MRB according to the following ecology-aesthetic criteria of formation:

- proportion (golden section method, Le Corbusier's Fibonacci series, "Modulor");
- self-descriptiveness (decorative elements and small architectural forms, the form of windows and balconies, the silhouette of the house, the color pattern of the city, the architectural bionics);
- environmental friendliness (greening of the city - availability of vertical/horizontal landscaping, "green corridors");

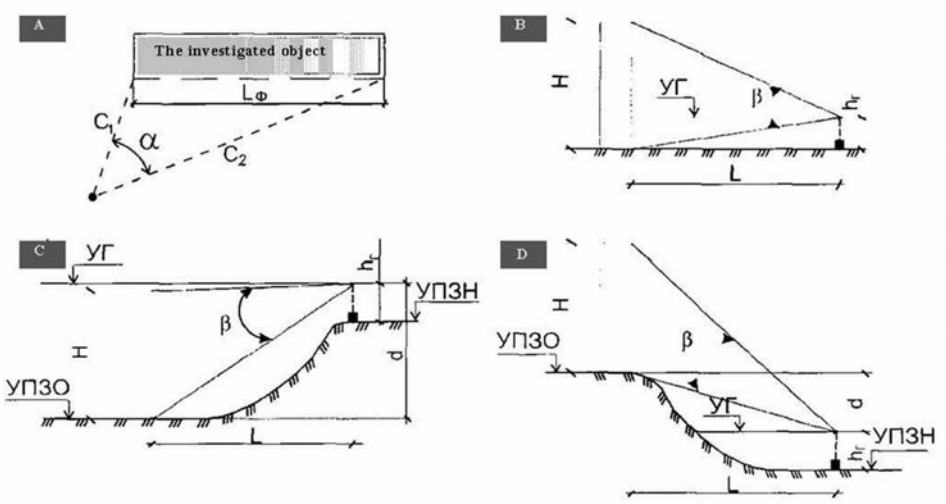

Figure 5. Graph-analytical method of determination of a comfortable visual environment in the city.
Settlement schemes for determining horizontal (a) and vertical (b, c, d) viewing angles in assessing the aggressiveness of visible fields of vertical surfaces.
A - The investigated object; УГ- eye level of the observer; УПЗО and УПСЗН - ground levels in the area where the object and the observer are located; α, β – horizontal and vertical viewing angles; C1, C2 – distance from viewer to object
(Source: Fedosova, 2008)

- optimal number of storeys (low-rise building).

Besides the videoecological criteria, the multistorey residential buildings in Kiev must comply with the canonical methods of constructing artistic images in architectural composition: subordination, balance (symmetry, dissymmetry, asymmetry), reiteration (rhythm, meter), proportion, scale, comparability (nuance, contrast, identity), tectonics, synthesis of the arts. The parameters of ecological beauty are very different. They constantly change while architects and builders think about ecologically friendly architecture, and also use more modern technologies.

During the graphic-analytical analysis of vertical visual fields (Figure 6), 31 multistorey residential buildings objects from different areas of Kiev were investigated. The coefficients of aggressiveness in the urban living environment range from 0.7 to 1, which indicates the poor condition of the architecture of the multistorey apartment houses in the capital of Ukraine. Initial data for an assessment and the values of the coefficients of aggressiveness of five vertical surfaces of objects are shown in Table 1. Furthermore, the most aggressive coefficients refer to the residential buildings built in the 2000s.

A sociological survey of Kiev residents (over 30 years old who were born and live in the city) showed that the majority of respondents give preference to the architecture of the buildings (88.9%) (Figure 7) and greening local area (70.8%) (Figure 8). In addition, the majority of the houses which were constructed in the 70s cause boredom (23.9%) or the absence of any emotions. According to the survey, the most beautiful street in the city is St. Andrew's descent. According to the survey, the most ugly streets in the city are located in residential districts such as Osokorky, Poznyaky and Kharkiv array.

CONCLUSION

The organization of the environment in which we live, and especially the environment of permanent residence, is important for the consolidation and maintenance of people's health and spiritual harmony. What is being built now will be the material and technical base of the 21st century and we must not allow decisions which will be useless after a few decades.

Table 1. Determining the coefficients of aggressiveness of vertical visual fields in Kiev MRBs

specific point №	Output data						Calculated data						
	C_1, м	C_2, м	$L_ф$, м	L, м	H, м	d, м	α^0	$N_г$	B^o	$N_в$	$H_п$	$\Sigma_н$	$К_{агр.}$
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Object №1. 13 Holosiyivska str.													
1	100	65	50	79	70	1.57	25.5	**13**	12.5	**7**	91	91	**1**
1_2	65	174	94	130	70	1.57	41.3	**20**	25.5	**13**	260	260	**1**
Object №2. 1 Teremkivska str.													
	27	31	6	29	52.2	1.57	8.86	**5**	45	**23**	85	115	**0.73**
Object №3. 8, 10 Akademika Zabolotnogo str.													
1	250	249	57	248	46	-1.93	13	**6**	11	**5**	29	30	**0.96**
Object №4. 27 Akademika Glushkova str.													
1	100	59	61	76	40	1.57	34	**17**	28	**14**	238	238	**1**
Object №5. 38 Berezniakivska str. (facade fragment)													
1	56	33	33	43	26.5	1.57	35.5	**17**	35.7	**17**	271	289	**0.93**

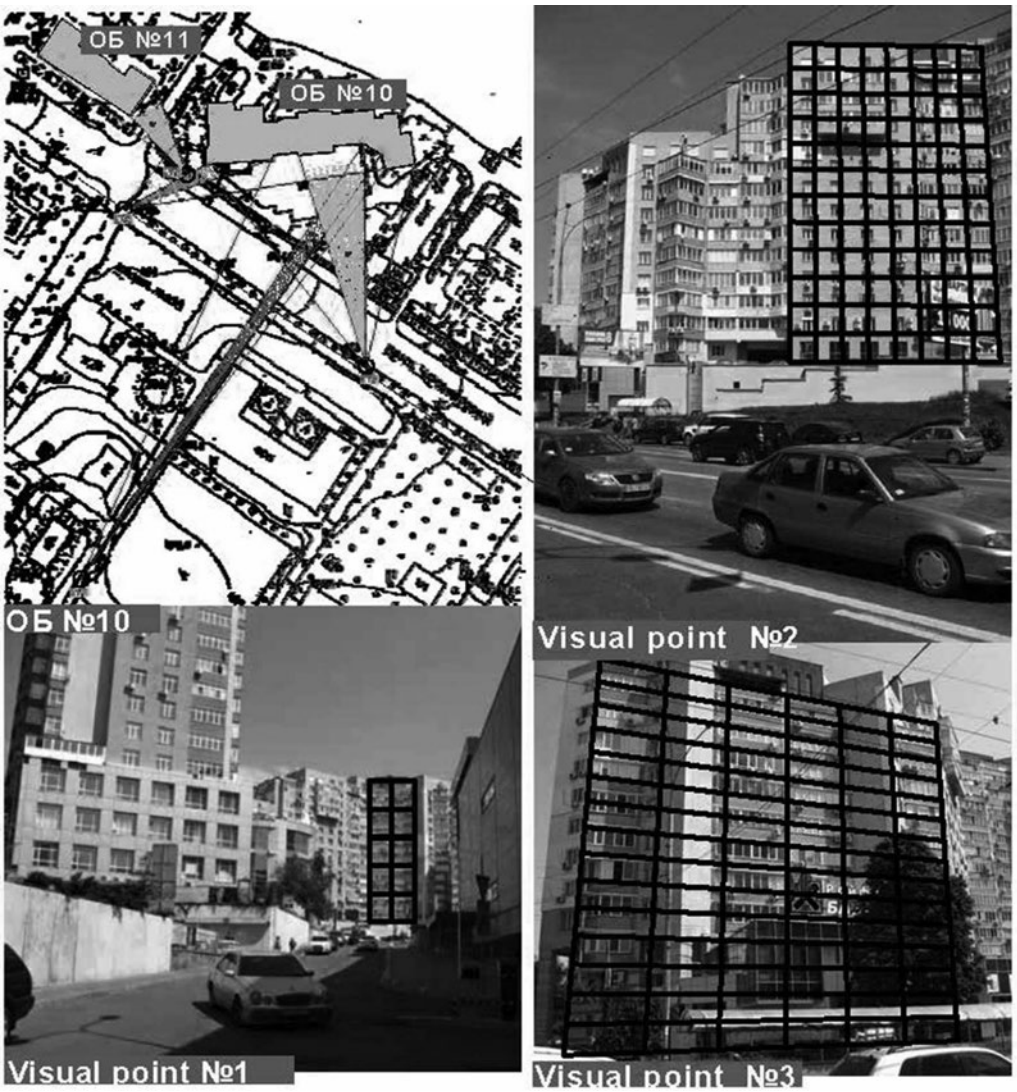

Figure 6. Graphic-analytical analysis of a multistorey apartment house, Lobanovskogo avenue. Schemes to determine the coefficient of aggressiveness. The grid was overlaid on the photo image using the program CoralDRAW 4. The point of perception №1, 2, 3 (Source: author, 2016)

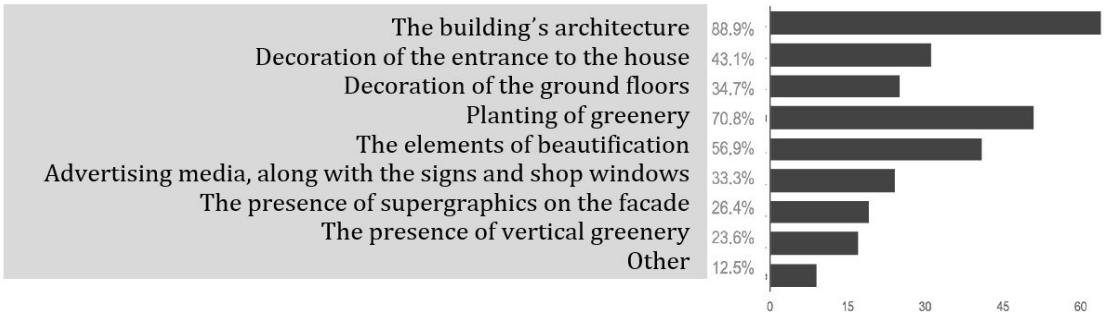

Figure 7. Assessment of the visual environment in Kiev by its residents (Source: author, 2016).

Therefore, the main requirements for environmentally beautiful buildings are: the architectural-spatial structure, their forms, and the finishing material, which must be beautiful and naturally similar. Buildings must harmoniously fit into the landscape without breaching its main components (this requirement is not met for almost all of the densely built center of Kiev). All city objects and districts should be in ecological balance with the natural environment. The natural area around the city must be almost completely environmentally sound, and only such an area or region can meet the environmental concept of beauty.

According to the requirements of videoecology, the architectural environment should be informative and interesting to the eye level of the human silhouette, from the overall dimensional arrangement to the level of details and decoration of balconies, loggias, bay windows and window openings. Thus, taking into account the features of an ecologically beautiful house and the factors which affect the

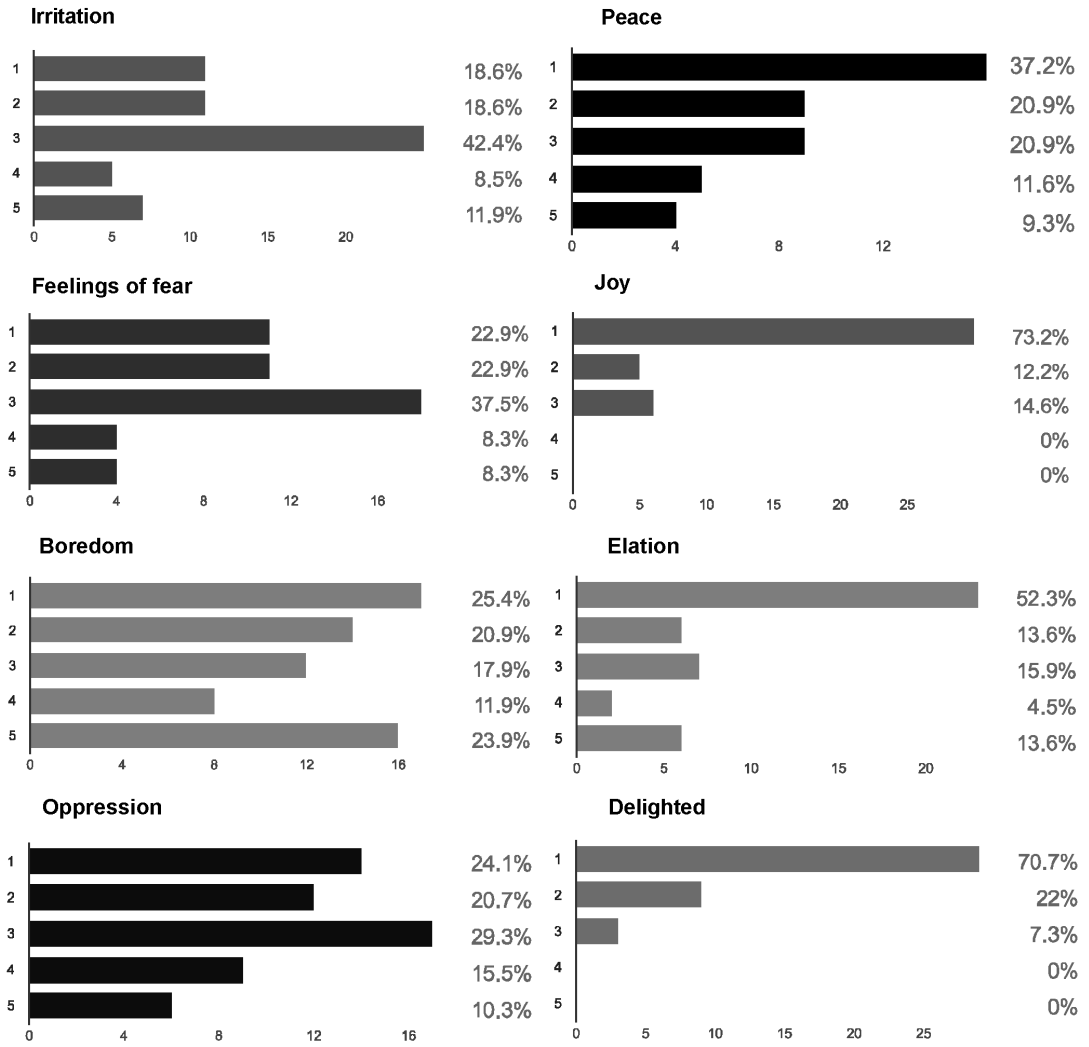

Figure 8. Assessment of the visual environment in Kiev by its residents (Source: author, 2016)

level of visual comfort of MRBs, we can define the following ecology-aesthetic criteria for the modern facades of Kiev's MRBs:

- ensemble properties (morphology of multistoried urban houses should include features: meaningfulness, integrality, organic properties, proportionality, scale properties);
- polyfunctionality (a residential structure should go to its metabolic development, be adaptable through the use of mixed architectural-planning schemes and mixed structural systems);
- descriptiveness (the facades of residential buildings should encourage visual interaction between human and spatial elements, it includes large, medium and low plastic elements, vertical/horizontal zoning, and layering in the third zone of the house facade);
- environmental friendliness (the field of the facade of the residential building must have the architectural qualities of videoecology).

Future research will make possible to identify the main front-spatial, architectural and planning methods of architectural formation of the MRB facades in Kiev. The graphic-analytical analysis of multistorey residential buildings in Kiev reveals that the majority of the city is occupied by aggressive and homogeneous field vertical facades. This indicates the impoverishment and loss of the face of Kiev as a historic town. The research showed that the residents of Kiev are not indifferent to its architecture, including the architecture of their houses. They are dissatisfied with the existence of monotonous and faceless architecture, and despite the difficult political and social situation and military operations in the East of the country, they are ready to do everything possible to improve their living environment, illustrated by the existence of a Mural Social Club 2016 (Figure 9a). Also, it is worth noting that the concept of ecologically beautiful residential buildings should be considered only in close connection with "the person (the consumer) – a house – the environment of the city". Only with such systematic approach to the investigation of aesthetic and ecological characteristics of the environment and object is it possible to get the most reliable results for actual design. The complex results of the graph-analytic analysis and sociological survey will help in future research to develop a Kiev city videoecological zoning map.

Consequently, modern multistorey residential buildings and their facades (facade fields) must have the ecological

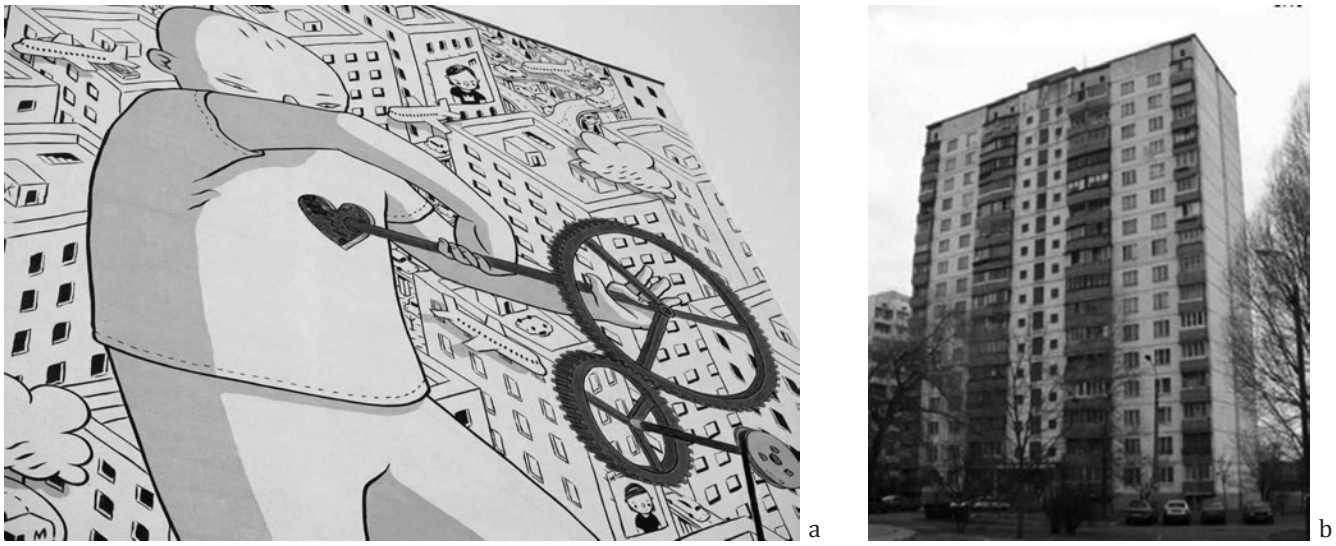

Figure 9. a) The new mural at the end of the panel residential house 8, Verbitskogo str., in Kiev. The author is Italian artist Millo. The mural was created as part of a festival by Mural Social Club 2016 (Source: author, 2016); b) Typical residential building from the BPS project series (Source: author, 2015).

and aesthetic criteria of ensemble properties, such as polyfunctionality, informativity and environmental friendliness, and they must possess of own-, twice- or more parameters of ecological beauty. Moreover, optimally it should reveal tectonics of multi-story residential building and, at the same time, preserve visual connections between the urban and natural environment.

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THE ARCHITECT MILAN LOJANICA'S *BELGRADE REALM AND VISIONS* – FROM A GRADUATION PROJECT TO JULINO BRDO AND GOCŁAW, 1962–1972

Aleksandra Mokranjac[1], Belgrade, Serbia

Attempting to highlight the specificity of the architect Milan Lojanica's design approach, clearly distinct in his first professional decennary 1962–1972, the focus of this paper is on his firstly designed and developed, and afterwards awarded architectural masterpiece, which he realized with his associates, architects Cagić and Jovanović – *i.e.* the urban suprastructure of Julino brdo/*Jula's hill* (1967–1970). As fifty years has passed from its first drawings, and the project documentation consists of exceptionally rare fragments only, one of the main goals of the research was the attempt to reconstruct the complete creative process – including its particular modality of construction/materialization.
Although in its results merely a brief recapitulation of Lojanica's innovative beginnings, the discourse still may provide a source-material for the genre of textbooks – from student to technical practice – regarding the rarest and almost forgotten discipline of experimental urban (mass)housing, with artistic/spiritual/serene touch of a refined prefabricated system.
Nonetheless, the opus of the eminent author, the respected creative endeavor of Milan Lojanica, future professor of architecture and the SASA academic, arises from its earliest stages and then permanently confirms itself as an entirety in its continuity. Therefore, the small-scale Julino brdo/*Jula's hill* settlement case study is reanalyzed/rethought within Lojanica's antecedent thematic preoccupations, and additionally within the most challenging subsequent one – the Gocław project (1972), Poland (Polska), throughout its emerging, unrivaled, innovatively envisioned – town/city of *hundred-thousand-inhabitants*.

***Key words*: Milan Lojanica's architecture, Belgrade experimental (mass)housing, refined prefabrication, structural/visual articulation, ambience/environment/townscape.**

INTRODUCTORY PREFERENCES – THEMATIC APPROACH

Influencing and interweaving three multifarious architectural domains – moderated modernity postulations, urban-social issues and practicing experimental contemporary design – these were Milan Lojanica's *calling-for-a-solution-frames* in his opening professional decade (1962–1972), as they shape a composite subject matter of the research presented in this article. Beginning with the graduation project (1962), poetically, yet modernist oriented, throughout his first leading assignment in 1965, the young architect faced the unfavorable reality of Belgrade's substandard housing fund, thus both these experiences complemented and permeated each other – bearing a fruit of Julino brdo settlement, the winning competition project (1966/1967). Nevertheless, all these engagements ensured an introduction to the next, higher level of contribution, the ultimate city modernization with the design of a whole new structure area for the Polish capital.

The appropriate methodological approach for the research unfolded in the form of a multitactic qualitative-interpretive study, in addition with comparative analysis based on *reading* Milan Lojanica's projects and developments, and, furthermore, on their comparisons and interpolations with thoughts, ideas and concepts of other contemporary authors-architects and theoreticians chosen for their awareness of multifold aspects of human evolving through urban development. The pursuit was undertaken with the goal of acquiring more detailed and stratified knowledge in order to understand and depict generally ignored hidden aspects of architectural complexity.

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Assuming David Leatherbarrow's (2009:11) point that "both communication among people and dialogue between buildings rest upon the acknowledgement of the limitations of the individuals that enter into conversation", one could conclude that all architectural efforts actually rely on the hope that those limitations could be transcended. Consequently, it is of major interest to comprehend Lojanica's architectural process, for he had never restricted a design method by reducing it to ordinary patterns detached of meaning, nor to (al)ready-existing typologies, nor he ever reached for any easy/fast prefix, common for the auto-pilot-shortcut manner of thinking. Instead, Lojanica relentlessly acted against oversimplification in design. Thereby formulated hypothesis consists of several additional ones: a) for an earnest architect there are no limits between being a researcher and designer, b) previous research experience – the most important part of it – continues to reshape designer's project methods, which remain recognizable in his future realizations as a special distinction; c) furthermore, each subsequent project leaves a trace in the experience, and d) throughout it modifies the (angle of) inspection even to the point of becoming e) a major part of the forthcoming project assignments. Although unwritten, unspoken, and sometimes even unconscious f) – it flourishes as the internal leading reason.

BACKGROUND OF MILAN LOJANICA'S PERSONAL DESIGN APPROACH

Indeed, as Leatherbarrow portrays it (2009:11) "Always a matter of degree, the individuality of building, like that of a person, is measured by its participation in shared conditions." Moreover, the intriguing, thematically diversified, complex and polyphonically oriented architectural opus of Milan Lojanica has a renaissance meaning, comprehensiveness and vitality. Exceptional and sublime, Lojanica's creative endeavor arose over his student interest in CIAM causing his active participation in Young Architects Conferences (YAC) which published CIAM's statements, offprints and declarations in Serbian. Thereafter, launched with his graduation project in 1962 (discerned in Mokranjac's overall review of Lojanica's pedagogical engagement(s) (2015:212)) "Design of Jaz beach near Budva", his unique creativity lasts until nowadays – in a full-scale architectural accomplishments of over five decades. In the final outcome, his rich and varied multi-layered pedagogical activities, always overcoming initial institutional and media limitations, have progressed simultaneously within his architectural achievements.

The interweaving of three motivational lines is a common trait of every Milan Lojanica's architectural artifact. Passionate, scientific research method, unconditionally adopted at his earliest professional outsets, appears to be the initial methodological key. *Structural architectonics* constitutes the web/frame of contemplative/speculative, textual and visually influenced improvements – commencing with the sketch, up to the design and final spatial and design expression. *Architectural and urban ambientalization* – are targeted and achieved effects of spatial and culturological interactions; they likewise present a particular author's recognizability – the measure of a qualitative *domain*/intervention/locus enrichment.

Professional initiation of Milan Lojanica coincides with his scientific-research beginnings. He was heading a research team and was a secretary to the Commission for [examining] Functionality, CfF (Komisija za funkcionalitet) at the Institute of Architecture and Urban & Spatial Planning of Serbia (Institut za arhitekturu i urbanizam Srbije, IAUS) in 1964/1965 (Lojanica, 1965:73), as he also participated in the conferences on *social housing* and *construction industrialization* (two international conferences took place in Belgrade (1965, 1966)). Additionally, in the 1960s, Lojanica made study visits around Europe related to the industrialization and rationalization of the construction process, starting from France, Belgium and Denmark, to the Netherlands and Sweden. Although, besides certain indubitable technical innovations and augmented capacities of the construction industry, the only modern milieu/*mise-en-scène*/ambience he could behold there, Nathaniel Coleman (2005:175) describes as follows: "Unfortunately, what had begun in the late nineteenth century as a movement for radical architectural reform was, by the 1950s, resulting in an increasingly alien environment. Wonder and hope were overwhelmed by management agendas characterised by a near sacralisation of economy, efficiency and the quantification of human need and desire." Moreover, Aitchison (2012:630) observes, "The early years of post-war reconstruction witnessed the rise of scepticism regarding planning, a feeling that where the bombs had failed the planners might yet succeed."

Thenceforth, Milan Lojanica's research of social issues presented an introduction to defining the notion "apartment of minimum standard", aiming to examine and determine "objective – physical special phenomena [...] in the reality of [Belgrade]" while examining theoretical design principles and scientific findings (Lojanica, 1965:I-3, 1984:13). Belgrade *reality* of the time, its unfavorable housing fund and living conditions inside it, therefore, were (through the formation of the CfF) in the focus of scientific-research method of leading architects and professors of architecture in Serbia. For young architect-researcher Lojanica, that became an unforgettable encounter with organizational, morphological and typological, paraarchitectural/paraurban artifacts – latent and immanent to human *constructing gene*. At the neighborhood organization's level, and achieved ambient-values effects, this was a mere scream of human urge – not only to find a retreat/shelter – but a *dwelling poetics*; a considerably higher reach of human spirit, for most, hidden below the opaque layers of miserable drifts in existential suffering and hardship (Lojanica, 2016a, 2016b; Mokranjac, 2016). Consequently, Milan Lojanica always engineered thoughtfully, cautiously avoiding the pitfalls of modernism. Wherein lies his courage to be one of the few, who, as Powers formulated (2012:698) "While supporting Modern architecture, […] came to deplore its self-referential tendency to become, 'a cause practiced by an élite for an élite in the cause of elitism […]'."

Lojanica made a rather unusual choice for his graduation project (Figure 1), thus, the beach situated on the South-Adriatic coast as a topic counterpoints his vision, conceptual and design solutions – witnessing his early vivid interest in the superposition of public-private theme, for there

is no such intense overlapping of collective and private, as in human activity of visiting the beach. By further observing Lojanica's drawings, a strong visionary moment reveals itself – a burst of poetic and rational code fused together, suggesting a carefully arranged, almost futuristic ambiance. Light aspects, light apperception of architectural composition have equal form-relevant role in visual terms. *Light imprint* emphasizes the concept of *architecture-in-motion* – motion paths and assembling areas including central and service facilities... synchronously celebrating encounter between the land and the sea.

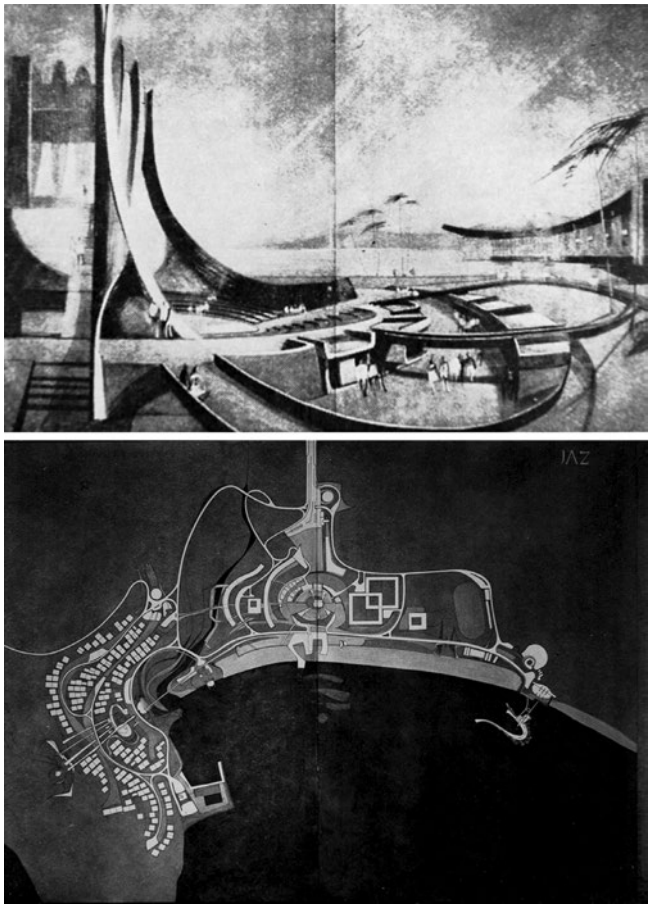

Figure 1: Milan Lojanica, Graduation project (1962), Beach Jaz, Budva (ex SFRY), Perspective and situational display (Source: courtesy of author, Milan Lojanica.)

JULINO BRDO/'JULA'S HILL' SETTLEMENT[2], 1967–1970

Introducing general remarks

Architectural design competition for Belgrade-based Julino brdo settlement was announced in 1966/1967. A three-member team of Belgrade architects, led by Milan Lojanica (Figure 2) including Predrag Cagić and Borivoje Jovanović, won the competition (Bjelikov, 1969:18; Aleksić, 1975:48). Subsequently, Milan Lojanica was heading the design team, during the development of the main architectural and structural design, as he was overseeing the construction site until the completion of works (1970). Eventually, Milan Lojanica and his collaborators were awarded the *Belgrade City's October Prize* in 1971, for an unprecedented innovative realization.

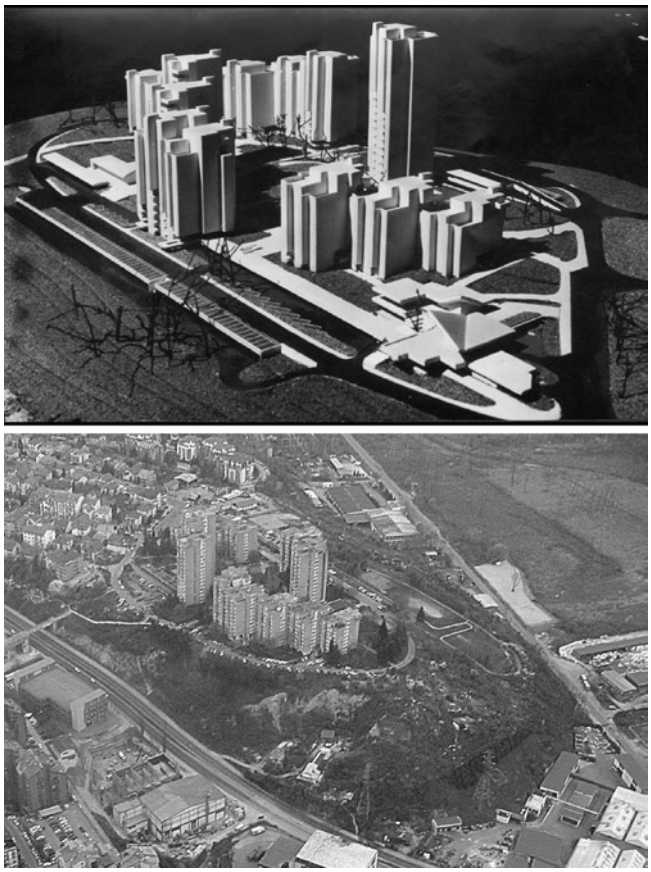

Figure 2: Milan Lojanica, Julino brdo settlement (1966/1967), Belgrade/Čukarica. Spatial model (Source: courtesy of author, Milan Lojanica) – juxtaposed to Actual aerial view https://upload.wikimedia.org/wikipedia/sr/thumb/b/b1/Julino_brdo_from_airplane.jpg/435px-Julino_brdo_from_airplane.jpg, accessed 12th May 2016

As the aftereffect of the innovativeness in the domain of mass-prefabricated/industrialized development and successful implementation, the Yugoslav Civil Engineering Centre (Belgrade) and Ljubljana-based Building and Civil Engineering Institute recommended explicitly Milan Lojanica to select the team of experts and lead them throughout the International Competition in the Polish capital Warshaw (Warszawa) (1972). The competition topic/purpose was modern town/city of one thousand citizens, envisaged on the undeveloped, inundated bank of the river Vistula (Wisła). Justifying expectations, Milan Lojanica and his chosen team – Predrag Cagić, Nedjeljko Neđa Borovnica, Miša David, Borivoje Jovanović and Sofija Vujanac–Borovnica – responded to numerous challenges by presenting architectural visions of their country, clearly defined in their major project, a study-vision of the new town Goclaw, elaborated with organizational and technical assistance of the CEP (The Centre of Urban Planning Development, Belgrade). The *grand prix* won at this Competition was additionally the first significant post-war international affirmation of Serbian architects, and thereby – of the *Belgrade School of Architecture*.

[2] *Investor* - HC Betonjerka, Belgrade. Contractor C.C. "IMP" [*Industrijsko montažno podjetje*], Ljubljana. C.C. "IMOS", Ljubljana is also stated as a Contractor (Bjelikov, 1969:18; Aleksić, 1975:48). *Structural system*-panels/vertical reinforced concrete (RC) structural walls constructed using sliding formwork; the same, shared formwork served for all floors of a building. Façade(s)—constructed/installed as prefabricated reinforced concrete (RC) panels.

Structural and form aspect

The form of Julino brdo/*Jula's hill* – that small town on its own (Figure 3), appears to us from afar as *the monolith analogue of a crown*, with only a few vertical panoramic gaps-intervals.

As virtually summarized in Vasiljević-Tomić's study (2007:109-111/185, 2009:19), "Monolith forms generally assume monochromy or polychromy of low-degree activity", which is here properly confirmed. Should we approach just slightly closer to *Jula's-town-on-its-own*, we shall notice, on a sunny day, that concrete of *its walls/ramparts*, in which we start discerning more articulated structures, embraces warm and golden reflections on which vertical stripes of whiteness remain, consisting of windows-parapets arrays. Indeed – "forms of medium articulation [...] [impose] more active polychromy", (*ibid.*), achieved here through light that harmonizes the constructed whole with the landscape from which it arises. (Figure 3)

Furthermore, in nearing *Jula's town*, we perceive advanced degrees of articulation – which are still in harmony with the natural environment. Also, it shows that "the most articulated forms, which [...] [almost] melt with space, entail [...] low-degree polychrome activity [...] close to monochromy." (*ibid.*). Finally, if we arrive close-up – within the walls/ramparts of *Jula's town*, which move apart before the visitors to allow them in – we will be welcomed by the dance of light and shadows (Figure 4), *the ode to geometrical purity*. Only a few will ask themselves: *And yet – how did it all originate?*

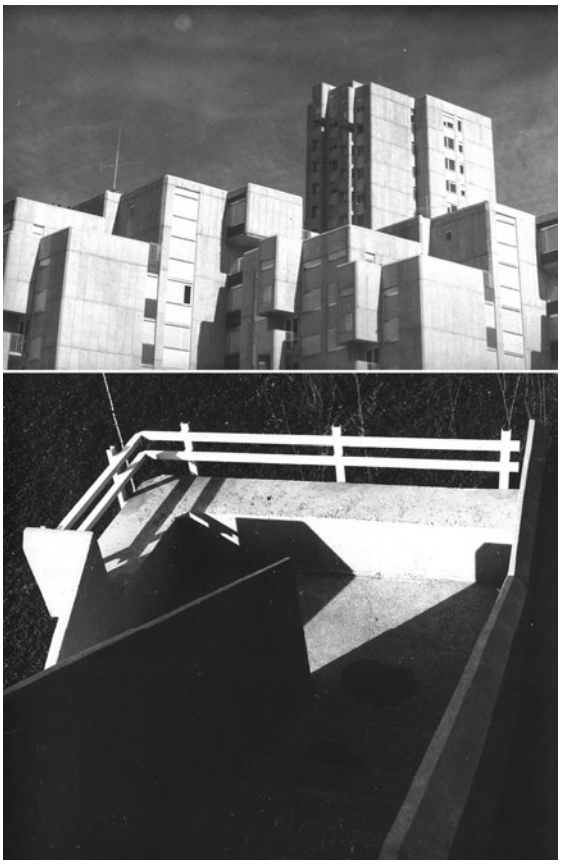

Figure 4: Milan Lojanica, Julino brdo settlement (1970). Close-up photographs (Source: courtesy of author, Milan Lojanica.)

Figure 3: Milan Lojanica, Julino brdo settlement (1967-1970). Situation and photographs. (Source: courtesy of author, Milan Lojanica.)

Structural and technical aspect

Since fifty years has expired from the outset of the design for Julino brdo settlement (1966/1967) – its project documentation exists no longer, except for a few random fragments (in Lojanica's private archive) – to prevent the utter extinction/disappearance of the precious *knowledge-source*, this research focuses on disclosing its treasure of data, accentuating the constructive-technical information as particularly important for the architectural practice.

The construction of supporting (RC structural) walls-grinders was implemented by placing the metal framework (implying the static calculation, specification, details and formwork plans) into prefabricated flexible/adaptable industrial steel formwork (skeletal, filled with glued wood), thereafter grouted with concrete (type of concrete as per calculation). *Standrad plate floor* is a monolithic slab *cast-in-situ* and homogenized with floor construction. Precast-monolithic facades, made to fit the formwork plan(s), were delivered and marked *in situ*, directly from the plant-factory organized on the location... (Figure 5) Upon installation, thermal insulation on the inside was added – 8 cm Styrofoam, and, using the sliding formwork – the concrete grouting was done, thus the outer prefabricate remained as a *lost formwork*. Only after the completion of the facade on the entire floor, and with previously erected supporting walls, the next (upper) floor was cast. Facade thus became wedged between two floor constructions, hiding the plate floor by the outlet, "reveal" of the panel, behind which the anchors were connected to the metal framework of the lower floor construction. Before casting the next/upper floor slab, the sliding formworks of the grinders were erected/positioned onto that level. Typical facades are floor high, 60 cm wide, according to design modular grid of 60 x 60 cm. Special facades are floor high (except the fence-roof parapets), at 40 cm, 80 cm wide, and larger or smaller, likewise specific ones – final-angular (Lojanica, 2016c).

All concrete facade elements were prefabricated – shaped in the aforementioned plant-factory, by *pervibrating* on the steel vibrating tables, in specially constructed ribbed steel flumes. Concrete was homogenized by vibration. After solidification, the homogenized-smooth outer/visible layer of the *glaze* concrete remained along with its non-hygroscopic feature. The surface panel profile retained the flutings form, in finishing nuance/shade of nature-concrete.

Quoining of *angular prefabricated facade* elements was resolved by a special detail of *bevelled edge(s),* thereby the final appearance of the structure/settlement gained refinement and elegance.

Roof is flat. Insulation and protective layer were placed over cast/molded slab, with the waterproofing thereafter. Finishing layer is synthetic – epoxy-resins/polyurethane, reinforced plastic cloth/mesh with multi-coatings. Polyurethane was designed as a unique insulation basin, pulled over the parapet, instead of the tin drip. The passable areas (secured by 110 cm high parapet), have concrete moldings over the polyurethane – thus forming the ventilation layer – with final setting of pebble panels. On impassable parts (40 cm high parapet), the river ballast protects the polyurethane. Drainage is internal, with no visible gutters and/or downpipes on the facade. Gutters/downpipes *hiding* – characterizes all Milan Lojanica's projects and realizations, as a *purity-marking* of his architectural space(s). That specificity expressly implicates certain correlations with Louis Kahn's design process, as indicated in Banham's (1969/1984:249) quoting of Kahn's deepest conviction: "I do not like ducts, I do not like pipes. I hate them really thoroughly, but [...therefore], I feel that they have to be given their place." Skillfully hidden places, are equally Lojanica's choice.

Layout – dispositional and function-form aspect

The orientation of all apartments is two-sided; the angular apartments are closed by the adjacent walls (at right angle), and the rest by the opposing facade planes (Figure 6). According to Aleksić (1975:48) "Four apartments on the floor offer equality of conditions (orientation and organisation) to all apartments. Concurrently, the favorable effects (rationality) of the usable living space ratios/surfaces and the common horizontal and vertical communication areas in the building are [estimably] close. Structural system scheme [...] is simple and statically stiff (the possibility of frontal and diagonal centerlines). Standard residential floor of Julino brdo was built using the system of vertical grinders – [RC structural] walls in the sequence of orthogonally set 'comb-like' symmetrically upon diagonal. Sanitary facilities, groups of coupled bathrooms and kitchens occupy the zone(s) around [elevators and] staircases, thus forming [...] a buffer ring toward effective residential premises around it".

Although seemingly the facade cladding camouflages the construction of facilities/structures, concurrently, the very modular prefabricated fluted nature-concrete panels undoubtedly testify about the epoch of their creation – the industrialized era of construction and mass-

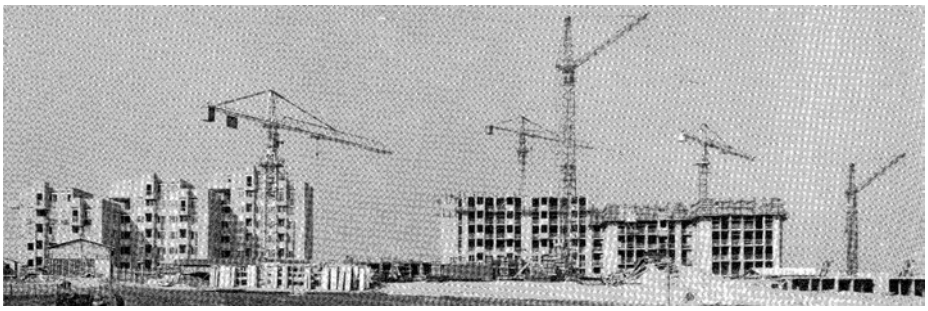

Figure 5: Milan Lojanica, Julino brdo settlement under construction (1969)
(Source: Bjelikov, 1969:18)

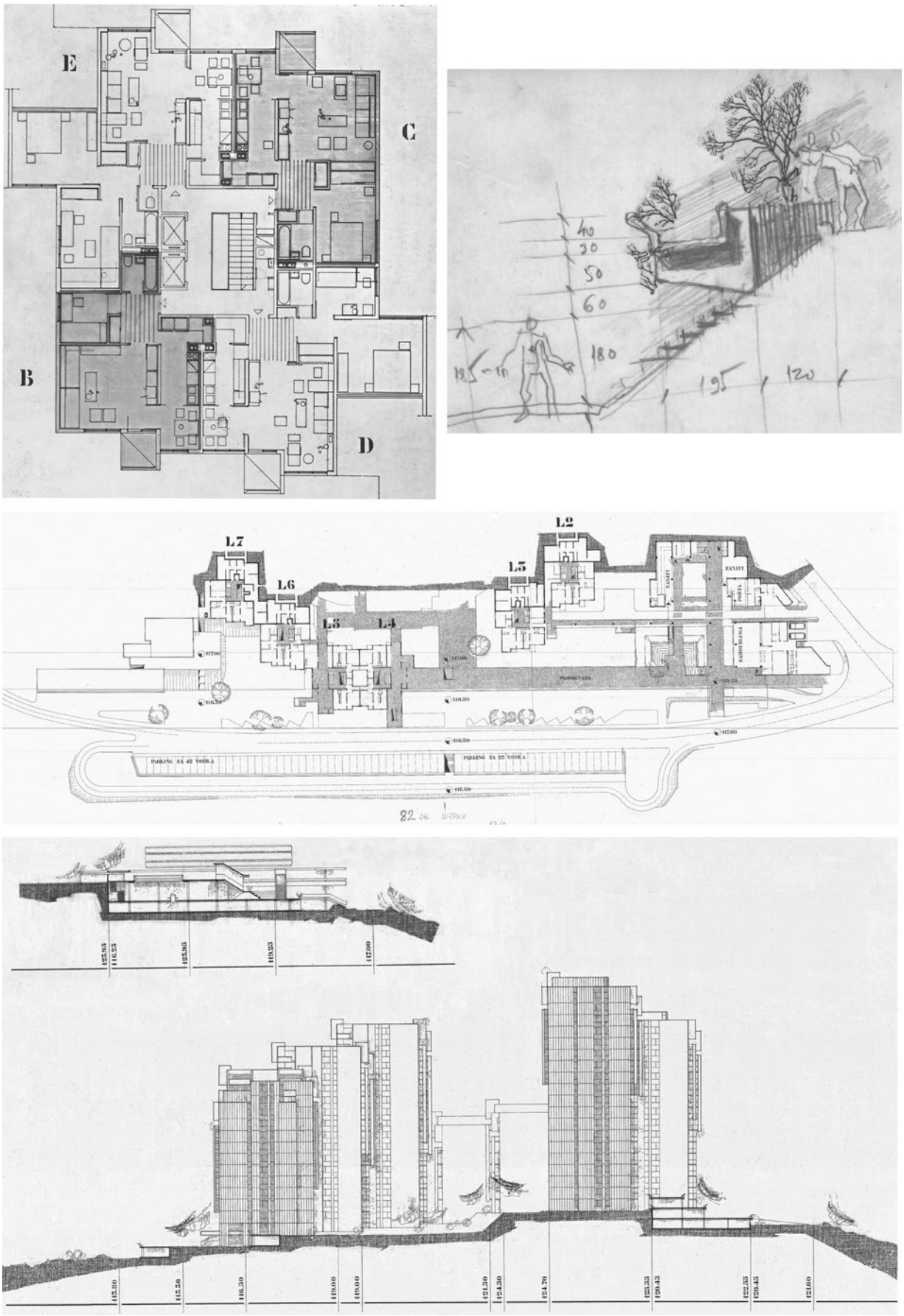

Figure 6: Milan Lojanica, Julino brdo settlement (1970). Original drawings: Typical floor plan (top-left); Walkway throughout the staircase and verdure – Sketch (top-right); Structures L2-L7 – landscape layout (middle); Settlement cross-section – walkway with a staircase (below)
(Source: courtesy of author, Milan Lojanica; with the assistance of Kosana Rošulj, architect.)

residential production – and thereby directly about the reinforced-concrete structural system. The prerequisite for the rational industrialization, as *qualitative* and not just quantitative transition of construction from craftwork to industrial domain, is designing research of various typologies and possibilities of modular systems. Similarly evident is Lojanica's devotedness to the final product – *apartment diversity* realized on Julino brdo – understood/conceptualized and fulfilled as living space, with obtained multifunctionality both on the level of a stand-alone unit, and furthermore as a part of greater organizational group, the *urban unity-assembly* of collective residential buildings… up to the orchestrated complex of the entire settlement.

In principle and formwise – jagged floor base with loggias overhung outward is multiplied with gradual and discreet variation per floors, which in its final form provides the structure that, although composed of almost identical elements, achieves outstanding effect – *anti-monotonous* form. Through consistently multilayered vocabulary of permeating horizontal and vertical plan flows a complex narrative – from differing treatment of the terrestrial and floor level(s), betwixt *longitudinal* and *orthogonal* angular elements of vertical concrete surfaces, to witty separated loggias on the final floors... and final roof and parapet elements – in the visual semantics of the symbolically reduced cornice. Attentively designed *facade modularity* emphasizes a distinct, *discreetly articulated* and volumetrically intriguing geometry of the structures. The realization frankly outlines the initial developmental idea, supports logic and appropriateness of the creative act, uncovering the *technological-feature* and *style key*. Overall interweaving of designing motifs preconditioned by the rationalization – from functional and constructive, through form and visual, to productional – is not perceived as restricting. Contrariwise, its expertly created and applied compositional potential becomes completely integrated into expressive mode, into genuine designer's power of a final gesture.

Conceivable theoretical discourse and its contextualization

Observing Julino brdo, Aleksić's (*ibid.*) scope extends into a discernment that "by disassembling and recombining forms, with rhythm change of roof heights and interpolating other corrections, with visual and aesthetic contents eluding an easily perceived formula though which by distracting a fundamental order create free rhythms and optional, almost spontaneous form structures are simultaneously achieved". Aleksej Brkić (1982:257) noted that Julino brdo is "in superform-type the first accomplishment of pure definition […] including wholeness […] of functional formation and presupposing a free form [...] it is the first that highlighted itself as influential on the general platform of Belgrade Circle development. [...] Visual key was found in spontaneous relation to unconditional economy […] [T]his complex, although […] a century distant from the first garden city concept – made in [ex-SFRY] […] a decisive influence […] on redefining [both] the concept of supporting settlement […] and phenomenology of mega-shapes".

Indeed, even on the purely typological level, Julino brdo is so unique, incomparable with the European modernist housing estate production, from its emerging period – until nowadays. Let us just enumerate the settlements (Monclús an Medina, 2015) concurrent with Julino brdo, such as Bijlmermeer (Amsterdam, 1966-1972), Sarcelles (Paris, 1955-1970), Gropiusstadt (Berlin, 1962-1977), Quarto Cagnino (Milan, 1964-1973), etc. – which predominantly suffer from insatiable monotony and repetition of mono-defined, identical apartment blocks. Accordingly, in his sequel, Brkić (*ibid.*) is more explicit: "All elements of formal mega-structure acquired in this assemblage, primarily signs of space integration and linkage with vastness, the omission of the polygon schematism and free construction line with the emphasized rhythm of the pediment, along with the omission of the straight axis with the conventional street profile, […] and even the presence of […] [skyline] […], a unique shaped procedure which did not lack aspiration towards pictoral, decorativeness […], all that was later found in subsequent numerous [Lojanica's] creations […] labeled by the author's personal attitude."

Yet, in Aleksić's (1975:48) further depiction that "terrain motion was hiding the opportunity to achieve [horizontal and vertical] vehicles isolation [...]. Vehicles remained [...] farther on the lower levels. Interspace gained features of complete, unrestrained pedestrian domination" – there is a lack of comprehension for Lojanica's design procedure, which is based on the determination to gain the traffic separation, in favor of pedestrian safety and comfort (theoretically-practically the CIAM and Team X tradition).

Considering a broader socio-historical context, Mecanov (2007:151,160) indicates: "Cessation of mass-residential construction due to abolition of social housing led to subsiding of industrial Modern(ism) [...]. Julino brdo […] will represent the turning point in urban planning of residential areas." From a concept to its realization, Julino brdo is undoubtedly the turning point, indeed, apart from its numerous echoes, although – less effectual. *Nor block, nor slab, nor tower*... with structure heights, from four to six, and gradually to nineteen floors, within all the other complexities with a purpose to imitate *town genesis* – that type of undertaking is a confirmed practice for public buildings exclusively, from university campuses to hotel assemblages. Otherwise, as an *architectural statement*, it represents Lojanica's profound criticism of common practices which oversimplify the domain of collective housing issues.

Feedback and relations – ambientalization

Essential relation between researching fullest potentials of mass-construction and the composition of an architectural structure as elements-factors of the ensuing *urban ambient of decidedly higher order and quality* – was and persists to be the architect Milan Lojanica's major preoccupation, evident in all his contemplations, projects and realizations. Architecture as a modality of creating contemporary spatial ambient/environment, that cherishes reminiscences of the most successful architectural experiences, i.e. – *ambientalization* [coinage by A.M.] as the vital organizational principle is the crucial motif/impetus/aim to which Lojanica subjects everything else, defending this key stronghold by market competitiveness. Transforming the socio-historical conditionality and assigned production limits into powerful

contemporaries-allies, accepting the challenge of rational/cost-effective construction methods/procedures to its limits, Milan Lojanica finds himself in the center of invisible side of the equation that in return imposes much more complex requirements on design-engineer, sometimes hard to bypass, than the classical-craft approach.

Finally, for Milan Lojanica himself, Julino brdo/*Jula's hill* "represents the theme variation of the Serbian medieval towns origins", (Manević, 1971:11; Mokranjac, 2012:277-278). Despite centuries of destructions and devastations... there are still examples such as Maglič Fortress from the beginning of the 15th century, at the river Ibar Gorge. Similarly, Monastery Resava (Manasija), 1407–1418, founded by Despot Stefan Lazarević, Serbian ruler and Knight of the Dragon Order, educator and patron of art (*ibid.*), though less obvious choice – will re(de)fine the saga of *Jula's town*, with contours of its ramparts and towers (Figure 7).

Furthermore, the concept and realization of *Jula's town* will open numerous new questions about the position of modern man in the reality of possible directions of progress and improvement of urbanity of our region. For, architecture as art remains always – *the art of possible,* and consequently possible choices, amid the determinants of the given socio-historical and technical, productional and technological circumstances. Challenges and ethics of *Jula's town* will conclude into "research of the *System for design and construction of apartments and other facilities NS 71* [(Lojanica, 1971) design and study verification]", (Mokranjac, 2015:212), then into the new views/panoramas of the new town/city Goclaw with the "project topic 'Town-Model' (1972) [withal] the first significant [post-war] international affirmation of the Serbian architects – by winning the first prize at the international open competition in Warsaw", (*ibid.*) as well into the reconstruction of the Valjevo town center 1971–1980 (Lojanica, 1981).

GOCLAW, A TOWN/CITY OF A HUNDRED THOUSAND INHABITANTS, 1972

Evidently, the Leatherbarrow's insight (2009:13) that "Shared passions give rise to community, just as they transform sovereign objectivity into true singularity – which is not self-sufficiency", particularly concerns the architects themselves… while engaged in team research-design project(s). The thirtieth page of the publication issued by the Centre for Spatial System Analysis (ISPU) – *Belgrade*: *International Contest-seminar Warshaw-Goclaw* 1972, on the first prize winners, the architectural team – Lojanica, Cagić, Borovnica, David, Janković and Vujanac-Borovnica, reveals an indicative outline of Milan Lojanica (Figure 8). The analytic and ambient display/illustration of the neighborhood concept assembly is concise in it – designed around a new micro-model of public space which contains the reflex of a spontaneous encounter-flow of an alley into an indication/hint of a *piazzetta*/small square. The entire lessons/moral gained through the researches of spontaneously formed, self-grown Belgrade settlements (1963–1965), of their ambiental "treasures from nothing", has been improved and articulated into a new urban matrix. Public space has been visualized/outlined through a short pedestrian street-alley formed by new slabs/lamellae –

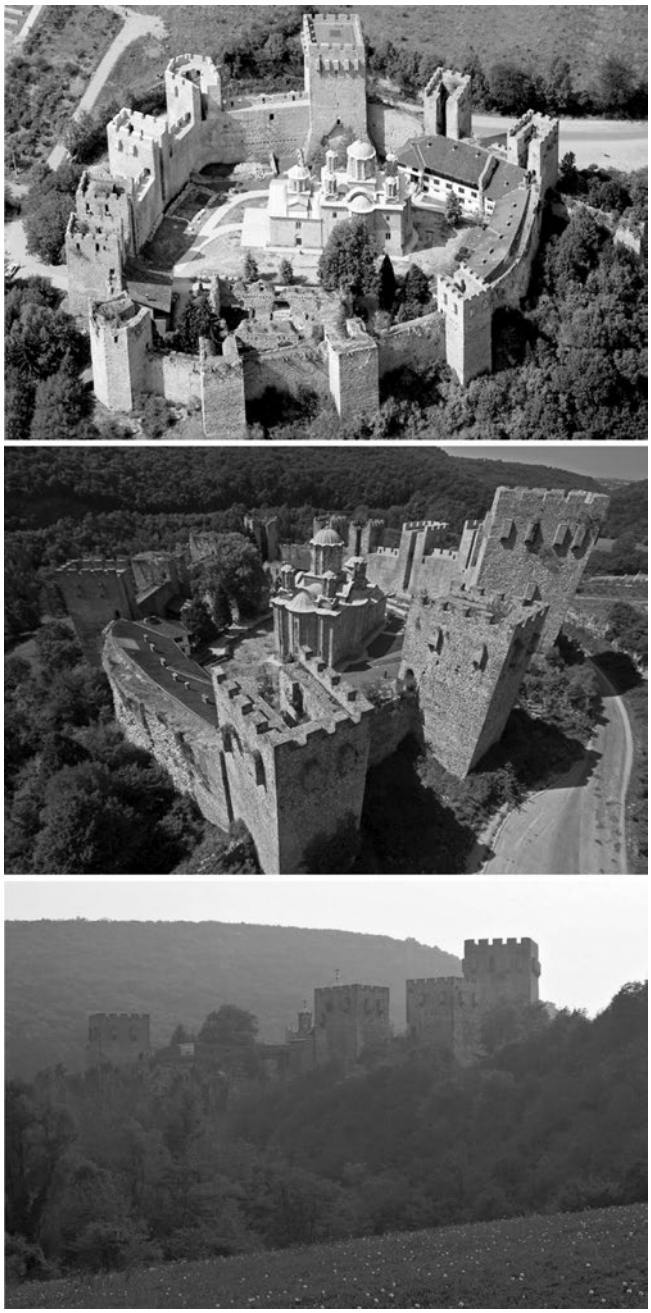

Figure 7: Monastery Resava (Manasija), 1407–1418, founded by Despot Stefan Lazarević, (Source: http://www.nacionalnarevija.com/images/images/Broj%2010/Galerija/manasija%20a%2001%2008%202008.jpg, http://www.sekcijatvrdjava.rs/?p=49, http://resavskapecina.rs/images/IMG_For_WP/Manastir_Manasija/Images-for-Manasitr-Manasija-Portfolio-003-Utvrdjenje-Manasija.jpg (adapted by author), accessed 1st Jun 2016.

with interrupted physical continuity on one side, and with visual breakthrough further on the opposite side. Town *piazzetta* with a thoughtfully short street-alley flowing into it as designed by Milan Lojanica for the future of Goclaw, is in slightly refracted direction to the street axis. The theme of morphological and typological variation of the motifs aiming to gain graded views and exponentiation of situation/layout forms – are consistently followed by vertical and other compositional plans. As Giedion ([1941]/1966/2012:868) ascertained once: "A unique complex […] was carefully designed in order to allow all the much possible of personal freedom, as well as visual diversity."

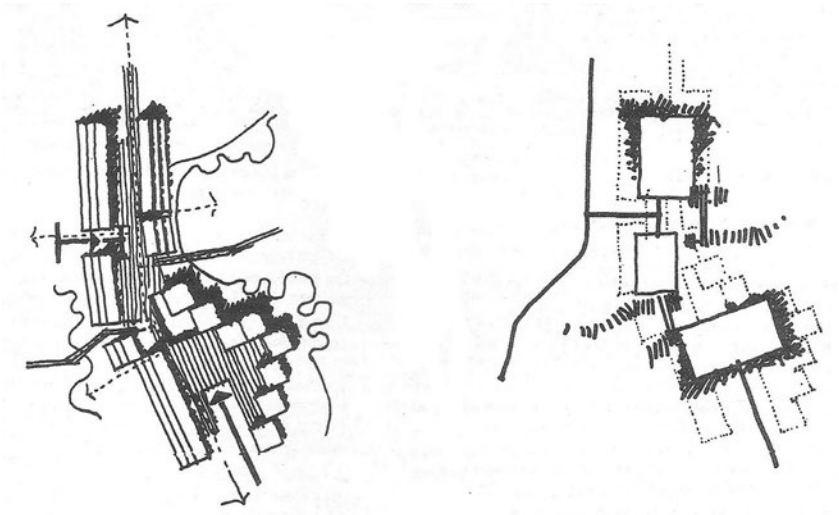

Figure 8: Milan Lojanica et al. ([1972]/1973:30).
Warshaw-Goclaw – Typical motif.
(Source: courtesy of author, Milan Lojanica.)

Trying to reveal such an importance of the short pedestrian street-alley, we may understand it for the simplest reason that – nothing can successfully rival a long-street-front emerging from the historical 'over-layering' of architectural creations/achievements; even the projects performed by differentiated teams, *as a tiny sequence of (contemporary) Time*, they still remain – a *single-design-move-of-one-hand*. Historical street's façade-front is *an image of time-flow itself*, subliming varied nexuses of motives, circumstances and faiths… (Hebbert, 2005). Its modernist-block replica left a bitter taste even amongst the most eminent Modernists. Frampton (1980/2004:277) states: "In his numerous writings of that period [1970s] he [Aldo van Eyck] stresses the role modern architecture has played in the destruction of both style and ambience." Similarly, the Smithsons [Alison & Peter] and van Eyck, who, having challenged four crucial functional achievements of the Athens Charter (*living-work-recreation-transportation*), during CIAM IX (1953) on behalf of a new generation of architects, wrote: "'One can easily identify himself with his own fireplace, but not that easy with the town/city he lives in. 'Belonging' is fundamental emotional need [...]. That 'belonging' – *i.e.* identity – develops into good-neighbourly relations. A short, narrow street/alley in the poor/slum suburb, often in that sense gives better results than spacious, renewed quarters.'", (*ibid*.:271).

Figure 9: Milan Lojanica et al. (1972). Warshaw-Goclaw – Composition plan.
(Source: courtesy of author, Milan Lojanica.)

Complex issues and structures that Milan Lojanica masters, commencing with the wholeness of a new city – to the tiniest urban segment, lucid in the *Composition plan* (Figure 9) and carefully articulated in the display model (Figure 10), all that precious Goclaw experience has been transposed into the following great competition challenge – New Belgrade's Block 19a.

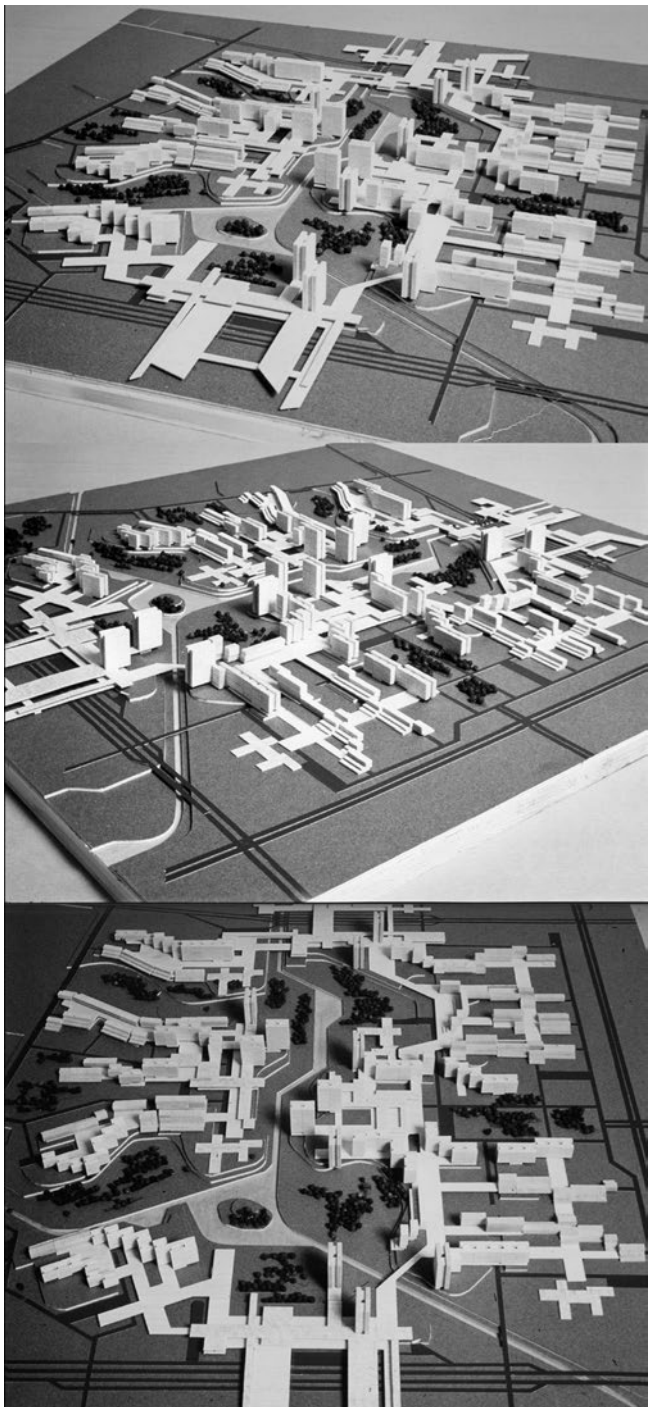

Figure 10: Milan Lojanica et al. (1972). Warshaw-Goclaw – Model, photographs simulating aerial view. (Source: courtesy of author, Milan Lojanica.)

CONCLUSION – ON LONG-LASTING ECHOES OF MILAN LOJANICA'S FIRST CREATIVE DECENNARY

A distinguished Marguerite Yourcenar's quotation: "one foot in scholarship [meaning science], the other [...] in that *sympathetic magic* which operates when one transports oneself, in thought, into another's body and soul", also invokes (inly) the essence of being architect. What else is an architect, if not a constant concern about future users, guessing their bodies and souls' needs, as their entire cognitive time-space presence? This also recalls Milutin Borisavljević's (Borissavliévitch, 1926:42) discernment: "Aesthetically, the architecture is – art of time; while geometrically or actually/objectively – it is spatial art."

The fact is that *ambientalization* of public spaces presents primary motivational and functionally-formative designing means of Milan Lojanica – as we were/are convinced by his own graduation project (1962). Commencing with Julino brdo settlement (1967–1970), and concluding with Goclaw project (1972) – three defining principles of that process were crystallized. Briefly, those *tasks* are: 1. *intimately*, but not provincially, 2. *Modern-industrialized* – but – *not rigid*, and eventually – the most difficult one, 3. *Typified/ standardized, but not – banal/obvious* or *monotonous/serial*.

All the Milan Lojanica's projects and realizations accentuate *the scales of spatial plans/visions* – reflection and developmental procedure are visible – running simultaneously into several reverse directions, through carefully constructed game along with superposition of large and distant plans. Design engineer Milan Lojanica always envisages the beneficiary – user, tenant, visitor, passer-by... – a person as *the most sensitive focus* of the complex public-private relation.

Rational poetics or *poetics of the rational*, presents the sophisticated creativity hallmark of modernism-oriented architect and contemporary pedagogue of architecture, the academic Milan Lojanica. Impressive mastering of architecture *subject matter*, as compositional and constructional principle, as functional and technological procedure, as artistically shaped medium, and as aspiring socially projected pulsation, and finally as a historical and layered mechanism of collective heritage is revealed by a somewhat more consistent analysis of the project and realization of Julino brdo settlement.

From *objects – to the settlement*, and vice versa, from *micro-urban* – to *macro-urban form*, in the achievements of Julino brdo and, a decade later, of Block 19a, with his more than evident erudition of Helmholtz, Vischer, Maertens and Sitte legacies (Moravánszky, 2012), and for all that to be interpreted as purely intuitive foreknowledge, Milan Lojanica examines traditional and modernist aspects/modalities and valuable urban ambiances. Because, "as eternal modulator of actuating structuring capabilities, *town/city* is the last privileged memory people would voluntarily agree to be deprived of." (Mokranjac, 2012:266).

Nevertheless, Ljiljana Blagojević's review of Stanek's book on Lefevbre (2012:811-812) invokes certain analogy, since Lojanica also, "[...] positions the project of architecture and urbanism beyond both heresy and utopia and, rather like Lefebvre himself, [...] rejects the contradiction between reform and revolution [...]". Notwithstanding, Lojanica supremely differentiates/discerns which traditional architectural values should be preserved, and which are to be renewed.

Even in the global context Milan Lojanica is one of the rare who managed to avoid temptations of repetitions and monotony, while accomplishing the optimum of all functional, structural and formatively visual demands of highest standards. Balancing the ethical and aesthetic architectural components and thereon in his achievements mainly expressing himself through strictly limited, parametrically precise, and the most demanding combinatorics of prefabricated structure vocabulary in design, Milan Lojanica is *supremely qualified* to transpose such *production architectonics* – which is a technological progress compared to craftsmanlike approaches – into the spheres of sustainable concepts, including prefabricated systems for obtaining energy efficiency of already built facilities, too. Otherwise, the long-term sustainability of housing domain will remain, on a worldwide scale – permanently reserved for the elite. The initiative for such projects should originate from urban development planning. It is where local architectural scene must return, as urban development planning presents the only meaningful method of the aimed sustainable progress, innovated in accordance with future challenges, from urban to rural environments – to terminate forever multi-decennial chaotic and random scourge of investor capriciousness cacophony on the Serbian soil. Let it be a unanimous answer of Serbian architects-urbanists-planners on Frampton's (1995:376) more than justified concern "how to maintain the tectonic trajectory in the face of a postindustrial civilisation that seeks nothing less than the reduction of the entire world to one vast commodity." Moreover, let us overcome Giedion's *precise curse* ([1941]/1966/2012:857): "In history of architecture, urbanism of a particular time is always in delay." Considering that, Serbian primary contemporary/modernist architectural-urban practice – and especially Milan Lojanica's heritage – obliges us to accomplish nothing less.

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RADIATION-RELATED HYGIENIC ASSESSMENT OF CONSTRUCTION MATERIALS IN URBANIZED COMPLEXES IN THE VOLGOGRAD REGION

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The concept of safety and assurance of vital human activities in urbanization is one of the most significant backbone concepts of human ecology. The comfort of residential buildings is largely owed to the radiation properties of the construction materials used. Therefore, the radiation-related hygienic support of technological processes and construction procedures is an important issue for the construction industry. Solving problems associated with improving the radiation safety of urbanized complexes depends on implementing legislation in the sphere of limiting human exposure to the impact of naturally occurring radionuclides. The paper presents the results of studies carried out by the authors on the specific activities of naturally occurring radionuclides in the construction materials manufactured and used in the Volgograd region. Through these large-scale studies, it was found out that the construction materials manufactured in the Volgograd region are in compliance with the national legislative and standard requirements; they are referred to as class 1 and can be applied for the construction of residential and public buildings.

Key words: **radiation-related hygienic assessment, naturally occurring radionuclides, technogenic background radiation, effective specific activity, radiation safety of buildings.**

INTRODUCTION

Current scientific and technological development is characterized by growth in the number of technology-induced ionizing radiation sources which produce enhanced background radiation. Nowadays, the conceptual approach to the problems of radiation safety control is changing. Earlier, the radiation safety problem was reduced mainly to the assurance of radiation safety control for a limited number of potentially hazardous objects (nuclear fuel cycle enterprises, particular research and defense objects etc.), but at the present time the problem has a global character.

In order to provide human safety and to preserve health, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) has developed three basic areas of activity:

- ensuring human safety;
- preservation of health;
- recommendations for improving the radiation situation (related to reducing dose rates and the specific activity of naturally occurring radionuclides (NOR), and reducing the use of industrial materials and wastes with highly active NOR etc.).

Interest in the problems of radiation safety related both to residents and the personnel working with ionizing radiation sources is permanently growing. The objectives of state policy in the sphere of ensuring radiation safety include a progressive reduction in the impact of technology-induced radiation on the population and environment in order to reach an acceptable level, and a decrease in the impact of natural sources of ionizing radiation so as to reach the allowable standards. The growth in technogenic background radiation due to the transfer of huge amounts of naturally occurring radionuclides (uranium, thorium and their progenies) in the process of industrial activity became one of the negative ecological consequences of intensified industrial development in the second half of the 20th century, and it has led to changes in human exposure to radiation. The level of concentration of these radionuclides on the Earth's surface has risen sharply as a result of mining for certain

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mineral resources from the earth's depths, and their further processing. Various construction materials and products including those used for finishing contribute significantly to the growth in technogenic background radiation. When indoors (in the absence of artificial sources), we are exposed to technologically-altered natural background radiation caused by natural sources of ionizing radiation: cosmic radiation and NOR from the soil underneath the constructed building and from the construction materials used for the building envelope, as well as radiation coming into the room with air, water and as a result of fuel combustion. High levels of human exposure to radiation have been revealed in many developed countries of the world where the doses significantly exceed permissible levels due to the use of construction materials with enhanced NOR content, and radon daughters accumulating in the indoor air. The greatest opportunities for the reduction of human exposure to radiation can be found in the justified selection of construction materials bearing in mind the amount of NOR contained in them (UNEP, 1988; NRC, 1999; Henchel, 1988).

The action of enhanced background radiation on individuals, which is determined to a great extent by the NOR in construction materials and structures, appears in the form of somatic-stochastic and genetic effects which can be observed with small doses of radiation. The risk of the manifestation of these effects increases with a growth in the amount of enhanced background radiation. Indeed, according to data from the World Health Organization, the annual indoor exposure dose is comparable to the dose received in the process of X-ray diagnostics. In addition, routine activity such as burning coal, flying by plane and staying in hermetically enclosed rooms can lead to a considerable increase in exposure level due to natural radiation.

The International Commission on Radiological Protection recommends reducing radiation exposure doses to the lowest possible level, bearing in mind the importance of ensuring radiation safety. Ensuring the radiation safety for those exposed to radiation from natural sources is based on three main principles: norm setting, justification and optimization. It should be noted that the radiation safety requirements are applied to controlled natural radiation sources in industrial, utility-service conditions and in everyday life: radon isotopes and their progenies in indoor air, gamma radiation of naturally occurring radionuclides contained in construction materials and products, naturally occurring radionuclides in water, mineral fertilizers and agricultural chemicals, as well as in manufactured products that apply mineral raw materials, and construction materials containing naturally occurring radionuclides.

The strategy for ensuring radiation safety involves the extension of radiation safety requirements to all the sources of ionizing radiation, taking into account the significance of particular types of radiation and their contribution to the total effective dose.

TOPICALITY AND SCIENTIFIC SIGNIFICANCE OF THE ISSUE

Throughout life, a person receives most radiation from natural sources. On average, they cover more than 5/6 of the annual effective dose, and the radiation from naturally occurring radionuclides contained in building construction materials amounts to more than 50% of that value.

The naturally occurring radionuclides: radium-226 (^{226}Ra), thorium-232 (^{232}Th), potassium-40 (^{40}K), and radon-222 (^{222}Rn) are most significant in terms of radiation hygiene, ecology, and controlling their presence in construction materials and products. The important consequences of the natural radioactivity of construction materials are: exposure to gamma-radiation of the whole human body and exposure of lungs tissues to radiation from the decay products of ^{222}Rn and its daughter products. Therefore, the task of building radiation safety is to develop methods for the assessment and forecasting of the radiation situation caused by naturally occurring radionuclides in order to ensure standard working and living conditions.

The radioactivity of construction materials depends on a lot of factors, among which are: the type of rock used in manufacturing; the place where it is mined; and the type of waste materials involved in the production of the construction materials in the form of the aggregate or binding matter. The radiation contamination of construction materials can be determined not only by their origin, but also by the introduction of radioactive contaminators from the environment. It is the radioactivity of construction materials that becomes the main component of the technologically-altered background due to the redistribution of NOR. Since a person stays indoors for most of the day, the leading role of the construction industry in the limitation of human exposure to radiation from ionizing natural sources is evident (Bakaeva and Kalaydo, 2015; Khorzova *et al.*, 2013; Vasilyev and Zhukovsky, 2013).

All this proves the topicality of research on ensuring radiation safety. The main results of the research demonstrate compliance with the sanitary-hygienic principles of radiation safety according to the laws and by-laws adopted in Russia, as well as particular technological methods of reducing radiation parameters in construction objects. However, the integrated analysis of possibilities aimed at reducing the indoor human exposure to radiation is not paid sufficient attention.

The growth of the requirements regarding ecologically safe construction is associated not simply with the creation of a comfortable living environment in a building, but also with ensuring the total safety of the residential space for human health.

TASK

The tasks considered here are: the study of the specific activities of ^{226}Ra, ^{232}Th, ^{40}K in construction materials, raw materials and industrial waste; the assessment of the effective specific activities of NOR in the construction sector of the Volgograd region; the reduction of the radiation load.

MATERIALS AND METHODS OF THE STUDY

The preliminary hygienic assessment of construction materials can be carried out on the basis of their effective specific activity (A_{eff}). The A_{eff} value of naturally occurring

radionuclides is applied to set the standards (and control) the radioactivity of the construction materials, and it determines the rate of the indoor gamma radiation dose. The rate of the gamma radiation dose is proportional to the weighted average A_{eff} of naturally occurring radionuclides in construction materials used for buildings. The standardization and control of the A_{eff} value is a means of reducing this constituent in human exposure to radiation (Krisyuk, 2002).

The qualitative and quantitative analysis of the specific activities of NOR in samples was conducted using a scintillation gamma-ray spectrometer. The values of the specific activities of ^{40}K, ^{226}Ra, ^{232}Th were obtained through experiments, and the effective specific activities of NOR were calculated. The efficiency calibration of the gamma-ray spectrometer in Marinelly geometry was carried out by the equipment manufacturer. In order to determine the efficiency the manufacturer used the reference standards of radioactivity. For the purpose of creating the control value of efficiency, the sources contained radionuclides with energies of gamma-ray lines in the required energy range. The energy calibration of the gamma-ray spectrometer begins by placing the standard source of ^{137}Cs+^{40}K in the detection unit and the measuring process is started in the mode of energy calibration. The energy calibration of the scintillation gamma-ray spectrometry tract is conducted automatically at the tops of the total-absorption peaks in the spectrum of the built-in calibration source. In the course of the calibration process, the program automatically finds the numbers of the analyzer's channels matching the tops of the total-absorption peaks, and it assigns the corresponding values of energy and conducts the linear approximation of the energy dependence on the number of the ADC channel. After that, the newly-obtained approximation coefficients are automatically recorded in the random-access memory. The preservation of the designed-in counting characteristic of the spectrometer is checked according to the built-in spectrum of the calibration source. In addition to the calibration results, the value of the counter speed check from the calibration source in the given energy range is displayed on the monitor. The calibration is carried out prior to the background check or any measuring of the content of naturally occurring radionuclides in construction materials. The time need for the measurement of the background and the construction materials samples is 1800 s.

Examination of the amount of NOR in construction materials was carried out as follows. According to standard sampling requirements, no less than 5 samples were taken from different parts of the object. The construction materials were powdered to achieve a particle size of no more than 5 mm. These samples were kept in glass vessels of 1 liter at the required level of hermetic encapsulation for two weeks. After this, one of the samples was poured off into a Marinelly vessel, and the measurements were taken immediately to avoid the loss of the daughters ^{214}Bi and ^{214}Pb. Their half-life is about 20 minutes, which is comparable with the time needed to measure the sample, therefore additional inaccuracy caused by the given fact amounts to less than 15%. The results were based on the analysis of no less than 5 measured samples for each type of construction material in compliance with the requirements of National State Standard GOST 30108-94, 1994.

Any limit set for exposure to radiation can be extended only to those sources which allow human influence on the dose of radiation emitted (the principle of radiation controllability). Controllability is understood as more than just an in-principle possibility for influencing the created dose. The dose of indoor gamma-radiation is determined mainly by the effective specific activity of naturally occurring radionuclides in construction materials. The form and dimensions of the room, and the thickness of the walls and floors slightly influence the indoor dose rate. The value of the mean dose of exposure to radiation (or the collective dose) depends on the weighted mean A_{eff}. That is why it can be changed only through the influence on the materials used for example, by refusing to use materials with a high NOR content for residential construction. It can be achieved through the standardizing of A_{eff} in the materials mined at some deposit fields. Compliance with the standards for all the materials used in the construction of buildings guarantees the observance of standards for the gamma-radiation dose rate and the equivalent equilibrium volumetric activity of radon (EEVA).

Pre-project, project and control studies of radiation-hazardous factors (NRB-99/2010, 2010, GOST 30108-94, 1994) include:

- measuring the level of the equivalent dose rate (EDR) at the construction site (the permissible values do not exceed 0.15 mSv/h);
- measuring the content of NOR (the permissible values of A_{eff} do not exceed 370 Bq/kg);
- measuring the level of the radon flow density (RFD) at the construction site (the permissible values do not exceed 80 mBq/m^2•s);
- measuring the level of the radon volumetric activity (RVA) in a residential room (the permissible values do not exceed 100 Bq/m^3 for new buildings under construction and 200 Bq/m^3 - for buildings already in service);
- measuring the EDR level in a residential room (the permissible values should not exceed the values of the background in open territory by more than 0.2 μSv/h).

The value of the effective specific activity $A_{eff} \leq$ 370 Bq/kg has been set for the materials used for the construction of residential and public buildings. In compliance with the legislative and regulatory legal acts in force in the Russian Federation, it is necessary that the specific activity of naturally occurring radionuclides in materials used for all the new residential and public buildings under construction should not exceed 370 Bq/kg for ^{226}Ra, 259 Bq/kg for ^{232}Th, and 4810 Bq/kg for ^{40}K.

For the mixture of the stated radionuclides with their specific activity (A, Bq/kg), the condition should hold:

$$I_{ex} = A_{Ra} / 370 + A_{Th} / 259 + A_K / 4810 \leq 1 \quad (1)$$

I_{ex} – is the external hazard index with regard to the external exposure to radiation due to the γ-radiation of construction materials, which corresponds to the maximum equivalent activity value of ^{226}Ra 370 Bq/kg. For the materials permitted for all the types of construction, $I_{ex} \leq 1$ (Office European, 1999).

Construction materials in which the concentration of naturally occurring radionuclides exceeds the standard level are referred to as materials with enhanced radioactivity. Depending on the degree of radioactivity, they can be used for constructing objects where people spend significantly less time than in residential and public buildings.

The value of the effective specific activity of naturally occurring radionuclides A_{eff} is used to set the standard and control radioactivity in construction materials. According to the regulatory documents (NRB-99/2010, 2010, GOST 30108-94, 1994):

$$A_{eff} = A_{Ra} + 1.3A_{Th} + 0.09A_{K}, \quad (2)$$

where A_{Ra} and A_{Th} – are the specific activities of ^{226}Ra and ^{232}Th in the material, in equilibrium with the other members of the uranium and thorium series, A_K – is the specific activity of ^{40}K in the material (Bq/kg).

The effective specific activity of naturally occurring radionuclides A_{eff} in construction materials (crushed stone, gravel, sand, quarry stone and sawn stone, raw materials for cement and bricks etc.), mined at their deposit field or as an industrial by-product, as well as in industrial waste used in the manufacture of construction materials (ashes, cinders etc.) and in final products, should not exceed the following values (Radiation Safety Standards NRB-99/2010, 2010):

- for materials used for residential and public buildings under construction or reconstruction, such construction materials can be used for all types of construction without any limitations (I class) - $A_{eff} \leq 370$ Bq/kg;
- for materials used in highway engineering within populated settlements and zones of prospective development, as well as for the construction of industrial facilities (II class) – $A_{eff} \leq 740$ Bq/kg. When such materials are used for the construction of industrial buildings, a sufficient air exchange should be provided inside them (no less than three times an hour);
- for the materials applied in highway engineering outside populated settlements, (III class) - $A_{eff} \leq 1500$ Bq/kg. Within populated settlements the materials belonging to class III can be used only for underground constructions where there is no human presence (sewage pipelines, sewers etc.), if they are covered with a soil layer of no less than 0.5 m or with a low-radiation material.

With 1.5 kBq/kg < $A_{eff} \leq 4.0$ kBq/kg (IV class), the question of the material used is solved individually in every particular case on the basis of the sanitary-epidemiological conclusion of the federal executive body authorized to conduct the state sanitary and epidemiological surveillance. With $A_{eff} > 4.0$ kBq/kg, the materials should not be used for construction purposes.

Such classification allows a correct assessment for all types of construction materials including industrial waste with various specific activities of naturally occurring radionuclides without regard to human exposure to radiation. It should be taken into account that the standards refer not to raw materials but to final products – construction materials (cement, aggregate, crushed stone, concrete and others). This is why in cases when in the process of manufacturing raw materials undergo treatment which can change the total specific activity of radionuclides (cleaning, roasting etc.), the products of such treatment should meet the requirements of the standards.

The permissible content of naturally occurring radionuclides in mineral raw materials, and in products manufactured using such materials (articles made of ceramics and ceramic granite, natural and artificial stone etc.), as well as in the requirements for ensuring radiation safety when handling those materials and products, is set by the sanitary regulations for the limitation of exposure to radiation from natural sources (Attalla and Abdel-Moneim, 2014, Sidyakin *et al.*, 2016).

In addition to the values A_{eff} and I_{ex}, gamma-index I_{γ}, one more criterion characterizing the gamma-radiation of construction materials, and one which is currently applied in many countries is calculated according to the formula (Office European, 1999), (Righi and Bruzzi, 2006):

$$I_{\gamma} = A_{Ra} / 300 + A_{Th} / 200 + A_{K} / 3000. \quad (3)$$

Gamma-index is applied to determine the potential annual effective dose of public exposure to radiation which is formed due to the gamma-radiation from naturally occurring radionuclides contained in construction materials. For the construction materials which are applied in large volumes, for example concrete, the annual effective dose will be no more than 1 mSv with $I_{\gamma} \leq 1$. With $I_{\gamma} \leq 0.5$, the annual effective dose will be no more than 0.3 mSv (Righi and Bruzzi, 2006).

In the 1950s, a number of scientists began studying the concentrations of radionuclides in mountain rocks and construction materials. An analysis of studies in this sphere shows that it is necessary to use a differential approach to the selection of construction materials at the stages of designing and erecting buildings and other constructions in order to ensure the safety of human life and activities in urban areas.

RESULTS AND DISCUSSION

It is possible to carry out the comparison of construction materials according to their radiation properties by applying the A_{eff} value. The effective specific radioactivity is practically the only controlled parameter in the process of determining the ecological safety of construction materials. The value of the effective specific activity of naturally occurring radionuclides characterizes the dose rate of gamma-radiation emitted by the large amounts of material

with uniformly distributed radionuclides. The coefficients in the above-mentioned expression were calculated for infinite space with uniform distribution of radionuclides and gamma-radiation spectrums (4π-geometry) (Goritsky *et al.*, 1990). The calculations of the gamma-radiation dose rate for a semi-finite space (2π-geometry) carried out using the Monte Carlo method gave the values of these coefficients close to those achieved in the above-mentioned relation (Saito *et al.*, 1990).

The specific activities of NOR significantly differ for various materials. The mean specific concentrations of naturally occurring radionuclides in various countries change within wide limits. Table 1 shows the distribution of NOR in the construction materials used by various countries

As seen from Table 1, the fluctuations of the specific activities of NOR in the construction materials of the Scandinavian countries are usually higher than in the analogous construction materials of other countries, and they differ

Table 1. Distribution of NOR in the construction materials used by various countries

Type of construction material	Country, region	Specific activity, Bq/kg			A_{eff}, Bq/kg	I_{ex}	I_{γ}
		^{226}Ra	^{232}Th	^{40}K			
Earth crust (bulk earth values)		33	39	656	140	0.38	0.52
Earth soil		25	25	370	89	0.24	0.33
Brick	Denmark	42	34	-	86	0.24	0.31
	Finland	80	62	962	249	0.66	0.90
	Sweden	63	74	1136	255	0.69	0.96
	Norway	96	127	962	337	0.95	1.28
	Federal Republic of Germany	59	67	407	200	0.50	0.67
Concrete	Denmark	16	13	-	33	0.09	0.12
	Finland	61	37	370	137	0.38	0.51
	Norway	28	36	-	75	0.22	0.27
	Sweden	47	80	1295	192	0.70	0.99
	Great Britain	59	26	370	122	0.34	0.45
Lightweight aggregate	Denmark	40	45	-	99	0.28	0.36
	Norway	51	56	-	124	0.35	0.45
	Sweden	170	164	-	384	1.09	1.39
Slag aggregate	Finland	102	60	-	180	0.51	0.64
	Sweden	118	148	-	312	0.89	1.13
Granite	Federal Republic of Germany	100	81	1295	296	0.85	1.17
	Great Britain	89	81	111	200	0.58	0.74
Cement	Hungary	-	19	148	38	0.10	0.14
	Great Britain	-	19	155	39	0.11	0.15
	Algeria	41	27	422	114	0.31	0.41
	Cameroon	16-48	12-33	0-286	32-117	0.08-0.32	0.11-0.42
	Egypt	78	33	37	121	0.33	0.44
	Brazil	62	58	564	188	0.51	0.68
	Ghana	36	25	251	92	0.25	0.33
	Italy	38	22	218	86	0.24	0.31
	Nigeria	44	22	72	79	0.21	0.28
	Netherlands	27	19	230	72	0.20	0.26
Fly ash	Federal Republic of Germany	211	130	-	381	1.07	1.35
	Poland	63-610	33-320	-	106-1029	0.30-2.88	0.38-3.63
Tuff	Federal Republic of Germany	111	126	1073	363	1.01	1.36
	Italy	174	152	1813	581	1.43	1.94
Slag	Poland	19-460	22-590	-	21-1232	0.14-3.52	0.17-4.48
Gypsum	Federal Republic of Germany	14	19	259	62	0.17	0.22
	China	35	35	370	114	0.31	0.41
	Finland	37	43	1034	186	0.50	0.68
	Bangladesh	88	68	256	199	0.54	0.72
	Spain	14	17	267	60	0.16	0.22
	Turkey	45	4	11	51	0.14	0.17
	India	22	9	233	55	0.15	0.20
	Egypt	32-105	42-55	116-500	97-222	0.26-0.60	0.36-0.79
By-product Gypsum	Poland	580-740	-	-	580-740	1.57-2.00	1.93-3.70

(Source: UNSCEAR, 1982; Saito *et al.*, 1990; Ndontchueng *et al.,* 2013; Baykara *et al.*, 2011; Korna *et al.*, 2014; Turhan, 2008)

approximately by an order of magnitude from the bulk earth specific activities of NOR in the corresponding mountain rocks due to the geological features of the territory. The content of NOR in the raw material of the same type depends on the deposit field. The radiation assessment of the fields of mineral resources applied to construction materials includes the determination of the gamma-radiation dose rate produced by the radioactive elements of mountain rocks in the place where they are deposited and the determination of the total specific activity of radionuclides in the rocks.

Table 2 presents the concentrations of the specific activities of NOR in construction materials in the Russian Federation (Sidelnikova, 2002).

Table 2. The specific activities of NOR in construction materials in the Russian Federation

Type of construction material	Specific activity, Bq/kg			A_{eff}, Bq/kg	I_{ex}	$_{I}\gamma$
	^{226}Ra	^{232}Th	^{40}K			
Soil in Russia	28	28	629	118	0.31	0.44
Clay	20.4	33.7	444	102.2	0.28	0.38
Sand	7.8	12.3	192.4	40.3	0.11	0.15
Crushed dolomites and limestone	12.6	4.8	40.7	22.4	0.06	0.08
Crushed granite	27.4	35.9	614.2	126.6	0.34	0.48
Light-weight concrete	21.8	15.2	185	55.5	0.16	0.21
Heavy-weight concrete	23.7	16.7	277	70.3	0.19	0.25

(Source: Sidelnikova, 2002)

In Russia the concentration of the average effective specific activity of NOR differs within a range of 22.4 to 126.6 Bq/kg; this does not exceed the value for class I construction materials.

The radiation control laboratory at Volgograd State University of Architecture and Civil Engineering carried out a number of studies to determine the content of naturally occurring radionuclides in construction materials and industrial waste. Table 3 gives the results of the large-scale studies concerning the specific activity of NOR for construction materials manufactured in the Volgograd region (Sidelnikova, 2002).

The effective specific activity of end construction materials and products manufactured in the Volgograd region ranges from 20.8 Bq/kg to 237.6 Bq/kg, which meets the sanitary standards for the content of radionuclides in class I construction materials according to the criterion of radiation. The value of the external hazard index I_{ex} in all the materials studied is < 1. The value I_{γ} is also < 1, thus if all the materials mentioned are applied for construction purposes, regardless of the volume, the annual effective dose due to gamma-radiation caused by construction materials will amount to no more than 1 mSv.

The largest values of A_{eff} refer to the interval 20-100 Bq/kg. Thus, 55.6 % of all the materials examined from the Volgograd region belong to this interval, and on average in Russia no less than 10% of the materials belong to the same interval. The smallest values for the Volgograd region can refer to the materials with A_{eff} of more than 100 Bq/kg.

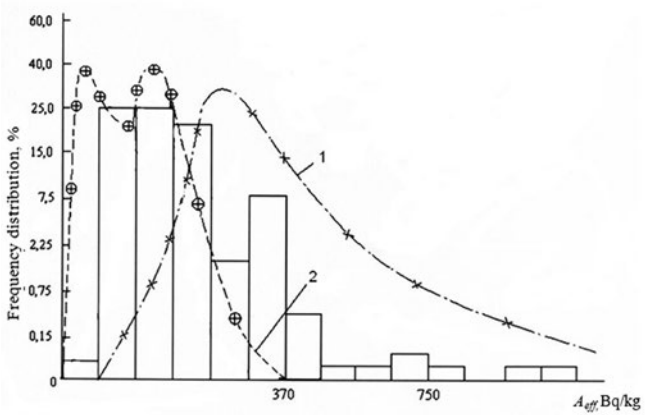

Figure 1. Frequency distribution of A_{eff} in mineral raw materials and construction raw materials in the Volgograd region (2) and in CIS countries (1) (Source: Sidelnikova, 2002; Sidelnikova and Kozlov; 2013)

The data obtained through these measurements were applied for the assessment of the construction materials' contribution to the background radiation of indoor spaces. It can be concluded from the above that the population of the Volgograd region is exposed to radiation from materials with A_{eff} less than 100 Bq/kg to a greater degree than from those with A_{eff} larger than 100 Bq/kg.

Table 3 and Figure 1 show that the effective specific activities of both end construction products and raw materials being used in the Volgograd region meet the sanitary standards for the content of radionuclides in construction materials. Due to the considerable variability of natural radioactivity, the range of the individual doses of the public exposure to radiation reaches one order of magnitude or more even within one and the same territory. Therefore, the necessity arises to determine the level of radiation exposure caused by natural sources for the whole population.

According to the results of the investigation, local construction materials can be applied for all types of construction including for residential use.

The data presented here make up only part of the study. For the Volgograd region, the distribution of construction materials according to the effective specific activity appears to be asymmetrical, both with the linear scale and the logarithmic scale along the specific activity axis. The asymmetry is smaller with the logarithmic scale, i.e. the distribution is closer to the logarithmic scale than to the normal one. The possibility of the distribution to be polymodal increases with a larger standard deviation. In such cases the reliability of the assessment of the limits for the total activities intervals decreases. Therefore, the data obtained by the authors should not be considered as evidence of the impossibility to reveal a high total activity of NOR.

Raw construction materials are characterized by a large range of variability in the naturally occurring radionuclide activity. This is an important fact testifying to the possibility of radiation quality management for construction materials and products which excludes or reduces a proportion of the raw materials with high radioactivity. The positive experience convincingly denies the assertion that it is

Table 3. The scope and results of studies of the specific activities of naturally occurring radionuclides in construction materials manufactured in the Volgograd region

Material	Where sample was collected	Number of samples	A_m, Bq/kg				I_{ex}	I_γ
			^{40}K	^{226}Ra	^{232}Th	A_{eff}		
Binding materials								
Cement M500-D20	AO "Sebryakovcement"	5	100.1	35.3	22.5	73.3	0.20	0.26
Cement M500-D0	AO "Sebryakovcement"	5	60.7	20.5	12.3	41.8	0.12	0.15
Gypsum G - 4	AO "Sebryakovcement"	3	26.3	12.6	10.9	29.1	0.08	0.11
Lime	KSSM (Integrated plant for silicate construction materials)	3	72.2	71.3	8.4	91.5	0.24	0.30
Gypsum G - 6	Plant for gypsum articles	5	45.0	9.25	6.5	21.6	0.06	0.08
Gypsum G - 8	Plant for gypsum articles	3	137.7	11.6	9.4	35.6	0.10	0.13
Lime	AOZT SIM (Silicate and insulation materials Plant)	5	40.4	76.2	12.5	96.0	0.26	0.33
Wall materials and articles								
Ceramic brick	Elshansky Ceramic Plant	3	118.2	28.3	30.1	77.8	0.21	0.28
Silicate brick M50	AOZT SIM	4	59.8	14.9	8.9	31.6	0.09	0.11
Silicate brick	AOZT SIM	3	71.5	16.8	7.2	32.3	0.09	0.12
Ceramic brick	AOZT VKZ (Volgograd Ceramic plant)	3	531.2	56.6	49.4	166.5	0.45	0.61
Silicate brick M75	AO VKSSM	5	47.5	28.7	9.7	45.4	0.12	0.16
Ceramic brick	AOZT Keramik-3	5	926.1	41.3	45.4	159.8	0.43	0.67
Ceramic brick	AOZT Keramik-3	4	689.3	32.7	36.9	139.6	0.38	0.52
Ceramic brick	AOZT Plus	3	516.7	53.5	52.9	166.7	0.45	0.62
Silicate brick M50	AO VKSSM	4	20.7	15.0	3.1	20.8	0.06	0.07
Asbestos Cement Products								
Asbestos-cement board	Sebryakovsky plant for asbestos cement products	3	118.6	28.3	30.2	77.9	0.21	0.28
Asbestos-cement tubes	Sebryakovsky plant for asbestos cement products	3	116.3	30.7	19.6	66.3	0.18	0.24
Concrete and Reinforced Concrete								
Concrete B-15	ZhBI-1, Volgograd (Reinforced concrete products plant)	3	321.7	19.8	13.3	64.6	0.17	0.24
Concrete B-20	ZhBI-1, Volgograd	3	57.6	29.3	4.6	40.2	0.11	0.14
Concrete B-30	ZhBI-2, Volgograd	3	56.1	27.1	5.85	39.5	0.11	0.14
Concrete B-30	ZhBI-4, Volgograd	4	411.0	21.9	23.5	87.6	0.24	0.33
Concrete B-40	ZhBI-2, Volgograd	5	838.8	21.9	31.9	134.9	0.36	0.51
Concrete B-20	ZhBI-2, Volgograd	3	234.6	15.7	17.7	58.8	0.16	0.22
Concrete B-15	ZhBI-1, Mikhaylovka	5	62.5	15.9	7.8	31.4	0.08	0.12
Concrete B-20	PSP "Vektor", Mikhaylovka	5	59.6	17.5	20.7	49.7	0.13	0.18
Porous Aggregates for Concrete								
Expanded clay	ZhBI-1, Volgograd	3	849.5	50.9	59.3	200.8	0.54	0.75
Expanded clay	ZhBI-1, Volgograd	3	698.5	28.4	43.2	144.4	0.39	0.54
Expanded clay	ZhBI-1, Volgograd	5	823.4	37.2	56.3	180.9	0.49	0.68
Expanded clay	Saratov plant of lightweight aggregates	5	386.5	35.4	15.7	88.8	0.24	0.33
Expanded clay	ZhBI-1, Volgograd	3	720.6	27.8	35.1	135.1	0.37	0.51
Expanded clay	KBI, Srednyaya Akhtuba (Integrated plant of concrete products)	4	938.2	52.4	42.1	187.3	0.51	0.70
Expanded clay	PO "Stroyindustriya", Volzhsky	5	854.1	25.1	53.4	167.7	0.45	0.64
Expanded clay	PO "Stroyindustriya", Frolovo	5	798.7	33.6	48.7	165.3	0.45	0.62
Ceramic Materials and Products								
Ceramic finishing tile	AOZT VKZ (Volgograd Ceramic plant)	4	289.5	149.1	38.6	224.3	0.61	0.79
Glazed finishing tile	AOZT VKZ	3	302.6	144.3	51.6	237.6	0.64	0.84
Belt roofing tile	AOZT VKZ	3	578.5	83.9	48.7	196.9	0.53	0.72
Arris hip tile	AOZT VKZ	3	543.6	54.2	41.2	154.4	0.42	0.57
Sanitary ceramic products	AOZT VKZ	5	373.8	84.4	53.7	186.5	0.50	0.68
Ceramic tubes	AOZT VKZ	3	652.3	74.6	62.1	211.4	0.57	0.78
Floor tile	AOZT VKZ	3	531.5	56.4	49.2	166.1	0.45	0.61
Glazed floor tiles	AOZT VKZ	3	501.6	132.7	51.8	243.2	0.66	0.87
Subway tile	AOZT VKZ	5	143.7	144.4	29.9	195.8	0.53	0.68

(Source: Sidelnikova, 2002)

impossible to influence the level of public exposure to radiation caused by natural sources.

The problem of getting ecologically safe construction materials using natural and man-made raw materials can be solved through a systematic approach which involves implementing a package of measures including the chemical binding of natural and man-induced radionuclides to form stable slightly-soluble compounds and their removal from the raw material content, or blocking them in the material structure.

With knowledge of the distribution of natural and man-made radionuclides in the structure of the initial raw components and of the behavior in the process of technological processing while producing construction materials, it is possible to assess their content in the end products at the design stage and to be in time to introduce the corresponding corrections.

At the present time, the determination of the class of a material according to the radiation safety criterion involves only the determination of the A_{eff} of NOR. However, this parameter does not characterize, for example, the hazard of radon emission to the full extent. The materials referred to as safe according to their NOR content may turn out to be very dangerous according to their radon content due to its high emitting ability. Revealing the special role of radon in human exposure to radiation in the living environment and in industry that is far away from radiation-hazardous technologies is one of the reasons for the increased attention to the problem of radon, to its origin and accumulation in indoor spaces (Lukuttsova, 2001; Khorzova *et al.*, 2016).

CONCLUSIONS

Safe residential space is the most important component of a healthy lifestyle. The problems of radiation safety in buildings can be efficiently solved if the issue is under control at all the stages of the construction procedure. Obviously, a compulsory radiation-related hygienic assessment of raw materials is necessary for the management of their quality during construction works. Therefore, it is necessary to control both the construction materials and construction sites together and not rely on the assessment of only one parameter. All the types of construction control should be focused on reaching the maximum quality, and on ensuring the non-exceedance of radiation-related hygienic standards, as well as on human safety.

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FORMS OF INTERNATIONAL MOVEMENT OF CAPITAL WITH SPECIAL EMPHASIS ON THE PPP AND CONCESSIONS

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The state has always cooperated with the private sector in order to implement various activities in the best interest of public. The first models of public-private partnerships (PPP) appeared at the time of the Roman Empire in the context of public works in construction of public baths, markets and ports. Contemporary international movement of capital is a phenomenon that has existed for over a century. When discussing the PPP in modern day terms, the expansion of private involvement in the public sector starts in the 1970s and the 1980s of the previous century, in public infrastructure projects and in most developed economies. The primary purpose of these arrangements is to reduce expenditures in state budgets, but also to achieve faster and better execution of work, reduce risk and efficiently manage the projects. This paper will briefly present the evolution of PPPs and concessions, with an emphasis on understanding money and capital throughout the evolution of PPP, contemporary forms of movement of capital, as well as equity in terms of globalization. The subject of this paper are also examples of the important PPPs and concessions from the construction of the Suez Canal until today.

Key words: **public-private partnerships, concessions, contracts, capital.**

INTRODUCTION

In order to implement various activities of public importance, the state has always cooperated with the private sector. Public-private partnership (PPP) as a form of cooperation between the state and private sectors, dates back to the Roman Empire. In modern day terms, PPPs are a more recent phenomenon. The expansion of private involvement by the public sector has started in the second half of the previous century in public infrastructure projects and in most developed countries.

PPP engagement relates to infrastructure projects managed by the state in cooperation with the private sector, in which case the private sector undertakes what is, by nature, exclusive business of the state: it designs, finances, performs the work and manages the PPP project. The private sector, therefore, takes the largest share of the risk. The primary purpose of these arrangements is to reduce expenditures in state budgets, but also to achieve faster and better execution of work, to reduce the risk and efficiently manage the projects. This paper will briefly present the evolution of PPPs and concessions, with an emphasis on understanding money and capital throughout the evolution of PPP, contemporary forms of the movement of capital, as well as equity in terms of globalization. The focus of this work will be on cases of major PPPs and concessions worldwide, from the construction of the Suez Canal until today. It is believed that the construction of the Suez Canal is one of the most important and biggest concessions in contemporary evolution of PPP. It is subsequent to the concession for the construction of the Panama Canal and the Channel Tunnel. In addition to these concessions, representative examples of other forms of worldwide PPPs will be presented, such as leasing of the management of water supply in Yerevan, service contract for the urban water supply network in Malaysia and a management contract for governing a town in the United States.

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CASH AND CAPITAL THROUGHOUT HISTORY

Aristotle's concept of state, its economic role and the money itself, is the foundation of modern thought in economy, although his fame sprung from the field of philosophy. He determined three functions of money, namely: money as a medium of exchange, as a measure of value and as an asset for amassing wealth. One of Aristotle's interesting assumptions is that money itself is a sterile, i.e. infertile category, one that is not reproducing itself (Stakić and Jezdimirović, 2012: 17). Starting with a definition that the capital is a value to be fertilized, we can conclude that it is impossible for something to breed if it has no value of its own.

Adam Smith, the creator of the Economic Liberalism Theory, has considered frugality to be a key driver to the capitalist growth and increase of wealth. He believed that savings would enable investment and that consumption was a second-rated action (Smith, 2007). Smith's basic idea, which made him famous, was that the work of the individual with rational self-interests in a liberal economy would lead to the increase of well-being of all. This idea is the foundation of the market economy, and it shows how the seemingly chaotic market system has its internal logic and is governed by the regulation of the so-called invisible hand of the market. In addition, he was a proponent of free trade. He believed that the state could bring great benefit to the economy if it protected contracts and patents and undertook public education of the poor and the infrastructure projects (Smith, 1999).

Before Keynes, the economists had praised the automatism of the market mechanism, through which the individual factors of production mobilized themselves and combined between themselves, an action that lead to the appropriate structure and the adequate volume of investments. Keynes and his followers however, insisted that such system was unable to provide automatically, without the interference of the state, the volume of investments that would lead to full employment without inflation. He analyzed the period from 1923 to 1929, before the great economic crisis, and came to the conclusion that while the propensity for consumption and investment incentive influenced one another, this led to incomplete utilization of accumulation and to declination of the volume of spontaneous investment. Since the propensity to consume couldn't be significantly altered, a vicious circle could only be broken by the intervention of the state, while private investment, so far insufficiently utilized, could supplement public expenditures, and therefore the enhanced economic activity would achieve the full utilization of production capacities (Keynes, 1956).

From the beginning of the 20th century, the capital between countries generally moves in five basic forms: foreign direct investment (as a share in the ownership or management of at least 10%), foreign portfolio investments, loans and credits, investment and business in free zones and investment of capital in the form of PPP, and to a lesser extent through various donations, i.e. grants (Stakić *et al*., 2015: 48).

The period from the late 1980-ies and particularly in the '90-ies of the 20th century, was marked by the expansion of foreign direct investment (Stojadinović, 2013: 36). It is noteworthy that at the beginning of the 21st century, in addition to the non-banking sector, foreign investment was particularly important in the banking sector, in an era of transition and privatization (Hadžić, 2013: 14). In the last 20 years, there has been a large expansion of the free zone concept, which uses numerous different models of a specific mechanism for the foreign trade business, in order to have it freed from various state tax burdens (Stakić *et al*., 2015: 127).

EVOLUTION OF THE DEVELOPMENT OF PPP AND CONCESSIONS

The first models of PPP appeared in the time of the Roman Empire in the context of public works in the construction of public baths, markets and ports. There are testimonies of a toll charge, as a form of PPP, ever since the time of Caesar Augustus. Greek philosopher and historian Strabo wrote in his Geography that payment was charged on the usage of Saint Bernard's mountain pass (Little St. Bernard's Pass). This duty was entrusted by the Roman Empire to the tribe of Salasi, which in return had an obligation to maintain the aisle and provide guide service for passengers for a fee (Grimsey and Lewis, 2004: 42). Crossing the London Bridge was charged to the passengers starting from 1286. The toll from London to Litchfield was legalized in the 1364, by the British King Edward III. In 1555 in Britain, the Law on road maintenance came into force. The inhabitants who lived along the road were employed for the maintenance, while the supervision was entrusted to local parish priests. Forced maintenance of the roads lasted until 1835, and in remote parts of the United States even to the twentieth century. The need for more quality roads led to the development of concept of road toll. Some authors consider this concept to be the predecessor of modern BOT (Built-Operate-Transfer) scheme PPP (Smith, 1999: 11).

The development of modern type of PPP begins in the 1970s and 1980s, in the projects of public infrastructure, as the public sector increased the engagement of the private sector (BOT). The first modern PPP developed simultaneously in the US, EU, Australia and in the most developed Asian countries. The idea of a simultaneous increase in investment and the protection of public interest was carried out by the US government during the 60ies, by developing methods to stimulate private investment in infrastructure. Since the 1970ies, governments have focused on finding new and more efficient ways of providing public services through contracting.

FROM THE CONSTRUCTION OF SUEZ CANAL UNTIL TODAY

The concession for the Suez Canal

One of the most important and largest concessions in history took place for the construction of the Suez Canal, an artificial sea route that merged the Mediterranean and the Red Sea, making the voyage from Europe to India and the Far East much shorter and safer.

The construction of the Suez Canal started upon the initiative of the French consul in Cairo, Ferdinand de Lesseps, who was also the chief designer of the channel (Piquet, 2003: 6). Egyptian viceroy Said Pasha, as a sign of gratitude, issued the French diplomat with a decree that granted him the ownership over the channel for a period of 99 years.

Lesseps was awarded the concession to build the channel in November 1854 and a year and a half later, he has founded The Suez Canal Company (Compagnie universelle du canal maritime de Suez), whose capital amounted to 200 million francs and was divided into 400 thousand shares of 500 francs. Interest in the campaign of the company was so high that as many as 314,494 shares got sold in less than one month, out of which the largest part (over 200 thousand) was sold in France. The Ottoman Empire purchased 96,000 shares, the Egyptian Khedive (lord) went to about

85,000 shares, and the rest of the shares' purchasers were Americans, Britons, Austrians and Russians (Stakić *et al*., 2015: 140).

The construction of the canal officially began on 21st April 1859, on the Mediterranean coast near the present-day port of Port Said, at the northern end of the future channel. The channel passes through the Sinai desert and is 160 kilometers long, while its width has been expanded several times. The projected cost of the construction was more than twice lower than the invested 432,807,882 francs (ibid.: 141). Africa was separated from Asia and the waters of the Mediterranean and the Red Sea merged on 15/08/1869. The Suez Canal was officially put into use by King Ismail on 17th November 1869.

The canal was expanded, extended and deepened in 2015, in order to double the daily number of ships (from about 50 to about 100). The annual fee for navigation through the channel is more than US$ 5.0 billion and represents the main revenue budget for Egypt. About 10% of world trade takes place through this channel.

The concession on the Panama Canal

The Panama Canal is the shortest sea route between the Pacific and the Atlantic Ocean and is 82 kilometres long. The idea of digging the canal dates back to the sixteenth century, and it was in the nineteenth century when its construction was certain to take place. The first contract, Clayton-Bulwer Treaty, was signed in 1850. The contract foresaw the freedom of navigation through the channel both in peacetime and in time of war, and the guarantors were both contracted parties - the US and the UK (Hoyt, 1966). In the late nineteenth century, the United States politics turned towards domination over the channel, which was legally regulated by the conclusion of the Hay Pauncefote Treaty in 1900 and 1901 (Maurer and Yu, 2006: 9). In 1903, the United States concluded a concession contract for the construction of the channel, after recognizing a Colombian province of Panama as an independent state. The canal was opened for traffic on August 3rd 1914, and it wasn't until 1999 that a governmental agency the Panama Canal Authority was formed, having complete independence and financial autonomy with regard to all activities related to the channel (Stakić *et al*., 2015: 144). In mid-2016, it is expected for the expanded Panama Canal to be opened.

The concession for the Channel Tunnel under the English Channel

One of the earliest and largest BOT projects in Europe is the Channel Tunnel. The tender was announced in 1985. The contract was awarded to the Franco-British consortium Eurotunnel, formed by the British company The Channel Tunnel Group and the French France Manche (CTG/FM). On the British side, the participants in the consortium were five construction companies and two banks, and the same number of French construction companies and three banks on the French side. British construction companies were associated in a joint venture called Translink Joint Venture, while the French construction companies merged under the name of GIE Transmanche Construction. The bi-national project company TMLTrans Manche Link connected the two groups (Vasilyev, 215: 31). The contract with the governments of France and Britain was signed in March 1986, as a concession to 55 years, later extended to 65 years. The Eurotunnel is to be handed over in its operating state to the ownership of the two countries (Stern, 2001: 1) in 2052.

The project was late to open, and had much higher costs than anticipated. The costs exceeded the estimated GBP 4.8 billion to a whopping GBP 5.7 billion. There was a 12-month delay in the opening and a 19-month delay in starting of its commercial use. Eurotunnel had the biggest corporate loss in British history of GBP 925 million, which was published in 1995. Interest on the principal debt of GBP 9 billion was GBP 2 million a day (BBC, 1999). Before the channel began to make profit by putting charges to the transport, the payment of dividends was suspended for all shareholders, who owned 69% of capital and whose number reached as many as 683,000 in 1997. The project was credited by 225 banks from all over the world and due to the financial disaster of the project, the debt refinancing and extension of the concession for 10 years was arranged in 1998. This changed the structure of the shares, leaving the individual shareholders with 48% stake in the property after the initial 69%. On the stock market, prices of Eurotunnel's shares fell, dividends were still not being paid out, all this causing a formal bankruptcy of the company, in 2006. Goldman Sachs, owned by Rockefeller, bought off 87% of the capital in 2007 (Robinson and Vatkov, 2011).

Leasing of the management of water supply - the city of Yerevan

An example of PPP's development from a simpler to a more complex arrangement is one in the city of Yerevan. Before 2006, a management contract for the delivery of water was in force, signed in 2000 with an Italian company. The ten-year valid leasing contract has been signed between the State Water Committee and the French company Veolia Water. Veolia Water founded a new company in Yerevan - Yerevan Djur, in order to enable the implementation of the contract. Water supply for the city of Yerevan entrusted the management and maintenance of its plants to a private operator with a leasing contract, which entitled the operator to collect charges from the consumers, while the plant remained the property of the city. The city held responsibility for the maintenance and further development of the system. The operator was obliged to take part in providing maintenance to the system and to invest in certain equipment (OECD, 2008).

Armenia has established an independent public institution - Public Services Regulatory Commission, which was in charge of supervising the private operators' contract implementation. Experience has shown that the institutions supervising the implementation of the performance-based contracts are of great importance, and that these types of contract help increase the interest of foreign investors in providing funding. The agreement was signed by three contractors: the lessor (the State Committee for Water), the lessee (Yerevan Djur) and Veolia Water, the bidder, the tender winner and the owner of Yerevan Djur-a. During the term of the lease, the tenant was obliged to pay compensation to the lessor every 6 months. The Armenian government raised a loan of 18.5 million dollars from the World Bank,

in order to secure investments in water supply. To repay the loan, the government uses revenues from leasing fees. Both supplier and lessee are required to submit a bank guarantee from a reputable bank (Vasilyev, 2015: 26). Water quality, continuity of supply and efficiency in dealing with the customer issues are the indicators showing whether the contract's implementation is effective. The operator is obliged to hire local labour and, upon the expiry of the contract, to hand over the plant in working order, so that the continuous water supply can be provided for a minimum of 5 years to follow.

Management Contract in governing a town in the USA

In a referendum held in 2005, local authorities in Sandy Springs, Georgia, have won the status of a town with its 90,000 inhabitants, establishing the first new town in the last 50 years in this U.S. state. Apart from an ambulance, police and fire department, the town authorities decided to hire private partners for all matters concerning the city administration, in order to get more effective results at a lower cost to the budget. The tender was opened for two areas: infrastructure (transport, public works, recreation, parks, planning and zoning) and administration (accounting, human resources, IT and utility services for citizens). The company CH2M Hill won both tenders in 2005, for a period of one year, with the possibility of extending the contract for another five years (The National Council for PPP, 2011).

The contract envisaged that the company should establish management of all town services within three months. It was a short period for procuring office space, human resources, equipment and all the other resources, systems and processes required in order to manage the whole town. This agreement is the most innovative and the most complex PPP contract in providing urban services in the United States and worldwide (Vasilyev, 2015: 23).

CAPITAL IN THE CONDITIONS OF GLOBALIZATION

Samuelson made a significant contribution to defining the role of the state in modern economy, giving emphasis to a constant growth of public expenditure, due to the increasing intervention of the state in the economy and in the social sphere. He said that for more than a century, national income and production have increased in all industrial economies, but state expenditures have grown even faster. He claims that as the state intervenes more in the economy, therefore it constantly brings new laws and increases public expenditure and collects higher tax revenues (Samuelson, 2009).

Cooper gave a very good outline of contemporary causes of the crisis, but also a retrospective of past financial crises in his "Causes of the financial crisis." He starts with the role of central banks that lend money to vulnerable private sector banks, which happens when the banks have exhausted all other sources of lending through the private sector. Lending with bail, which does not ensure timely repayment or any repayment at all, is a new source of instability in the financial markets and therefore in the overall financial system, so the latest crisis could be named the credit crisis. It results in the decline of real estate prices and this affects the entire construction industry, which is considered to be one of the initiators of other numerous economic activities in all developed country markets (Kuper, 2009).

Piketty, professor at the Paris School of Economics, in his book "The capital of the 21st century", warns that by inequality in the distribution of wealth in the 21st century, we are regressing back to the 19th century, when wealth was concentrated in the hands of a small number of individuals, and when the economic elite were wealthy heirs, and not those who earned their place in the society with work. Piketty argues that the average rate of return on equity is 3 to 4 times higher than the average growth rate of productivity, which means that capital income is growing significantly faster than revenue labour (salaries of employees). (Piketi, 2015).

REGULATIONS OF PPPS AND CONCESSIONS IN THE EUROPEAN UNION

According to World Bank data for 2015, 63 world countries have laws on public-private partnership (World Bank, 2015a). In 2008, countries in Eastern and Central Europe signed in, through the EBRD, to participate in the project of evaluation of existing laws on concessions (Assessment of Concessions Laws). This document analyses the legislation on concessions in 28 countries, conducts comparison with international standards and recommends reforms to improve the legal framework for PPPs and concessions (World Bank, 2015b).

In countries that apply PPPs without specific legal regulations, PPPs legal framework usually falls under the laws on concessions and public procurement. Special legal regulations that directly regulate the implementation of PPP projects in EU did not exist in the member states until 2014. Instead of clear definitions and laws, regulations on public procurement in the EU which referred to the PPPs were executed from four EU legal instruments (Vasilyev, 2015: 64): The Treaty on the functioning of the EU; EU public procurement directives; Relevant law practices of the European Court of Justice (European Court of Justice - ECJ); The interpretative Announcements of the European Commission (Interpretative Communications) and the other so-called soft legal measures (Soft-law measures) of the European Commission. The first three documents are binding laws (Hard Law), as opposed to the Announcements of the European Commission which are not binding - soft legal measures (Soft Law), and represent a guide for implementing binding legislation and interpretation of the views of the European Commission with regard to PPPs.

In the past, existing legislation was focused on public procurement and concessions. The development of PPP partnerships assumed the need for more complete regulations. European legislation has regulated this important area in more detail only in 2014. In the "Official Journal of the European Union" of February 2014, three new directives were published, for the field of concessions and public procurement (Stakić *et al*., 2015: 81).

CONCLUSION

Aristotle's concept of the state, its economic role and the money itself, is the foundation of modern thought in

economy. One of Aristotle's interesting assumptions is that money itself is a sterile, i.e. infertile category, that money doesn't breed money. Adam Smith considered frugality to be a key driver to the capitalist growth and the increase of wealth. He believed that savings enabled investments and that consumption was a second-rated action. Smith's basic idea was that the work of the individual with rational self-interests in a liberal economy would lead to the increasing of well-being of all. Accordingly, Smith was an advocate to free trade both within the country and internationally.

Before Keynes, economists had praised the automatism of the market mechanism, through which the individual factors of production mobilized themselves and combined between themselves, an action that led to the appropriate structure and the adequate volume of investments. Keynes and the Keynesians however, insisted that such a system was unable to provide automatically, without the interference of the state, the volume of investments that would lead to the full employment without inflation.

Contemporary international capital movement is a phenomenon that has existed for more than a century. Over time, the importance of certain forms of international capital movements has changed. In the second half of the 1980-ies, after the debt crisis had reached its peak, there was a stoppage in the movement of loan capital. Private sector refrained from approving any new loans to developing countries, except in the form of direct investment. PPP, as a specific form of privatization of public utilities, dates back to the Roman Empire. In addition to the cost-effectiveness and efficiency in provision of public services, the PPP model contributes to the savings in budget by reducing the costs of public investments. By the end of the 20th century, the need for infrastructure development remained, but the privatization lost its momentum, and PPP models became an important way of providing managers and private investment in the development of infrastructure, in cases where privatization encountered problems or ceased to be implemented.

One of the most important and largest concessions in history took place for the construction of the Suez Canal, an artificial sea route made to merge the Mediterranean and the Red Sea. In addition to the Suez Canal, the Panama Canal also represents one of the most important waterways built in the world. The tunnel under the English Channel is one of the largest BOT projects in Europe. Its tender was announced in 1985, as a concession for 55 years, and was later extended to 65 years. The concession expires in 2052, when the Eurotunnel should hand over the entire project in fully operational condition to become a shared property between the two countries.

The water supply of the city of Yerevan entrusted the management and maintenance of its plants to a private operator through a leasing contract. A private operator was given the right to charge the consumers, while the plants remained the city's properties. Water quality, continuity of supply and efficiency in dealing with customer complaints are the indicators that show the effectiveness of the implementation of the contract.

All the advantages and disadvantages of the private-public sector can be seen in the examples above. The result of cooperation between the two sides, through various forms of PPP, can ensure enormous savings, considerably higher than the expenses the public sector embraces when employing a private company. The examples here show how this is a win-win situation for all the participating sides. All the more complex relationships between the public and private sectors require that institutions continue to bring new sets of rules and regulations in order to satisfy the demands of the market, which the European Commission did by adopting the Directive in 2014 that regulates this area.

However, we must point out in the end that what leaves a bitter taste is the fact that, according to Piketty at the beginning of 21st century, the average rate of return on equity is 3 to 4 times higher than the average growth rate of productivity, which means that the income from capital grows much faster than the income from work, leading inevitably to the increased social stratification in the 21st century.

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ON MINIMALISM IN ARCHITECTURE - SPACE AS EXPERIENCE

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Architecture has to be experienced to be understood. The complexity of the experience is seen through a better understanding of the relationship between objectivity (architecture) and subjectivity (our life). Being physically, emotionally and psychologically aware of the space we occupy is an experience that could be described as being *present*, which is a sensation that is personal and difficult to explicitly describe. Research into experience through perception and emotion positions architecture within scientific fields, in particular psychological disciplines. Relying on the standpoints of Immanuel Kant, the paper considers the juxtaposition between (minimalism in) architecture and philosophy on the topic of experience. Starting from the basic aspects of perception and representation of the world around us, a thesis is presented in which the notions of silence and light as experienced in minimalism (in architecture) are considered as adequate counterparts to Kant's factors of experience - the awareness of the objective order of events and the impossibility to perceive time itself. Through a case study we verify the starting hypothesis on minimalism (in architecture) whereby space becomes an experience of how the world touches us.

Key words: **minimalism, architecture, experience, silence, light.**

INTRODUCTION

Architecture provides an important setting for everyone's life. It must inspire. As architecture is a personal, enjoyable and necessary experience, it has to be experienced to be understood. The task of architecture is *to make visible how the world touches us*, as Merleau-Ponty wrote of the paintings of Paul Cézanne (Merleau-Ponty, 1991). We all have the capacity to sense architecture, but very few people understand how powerful architecture is or how it can effect everyone's life.

The house can be easily represented, especially by photos or film. This form of the house seems distant, and represents an idealized picture of the world we create, which eventually becomes perfectly good and acceptable. However, some spaces are not felt as different, but are very tactile. Some heights we cannot fathom until we go to those houses called skyscrapers, where we feel the sky is moving in the wind. And perhaps the strongest space experience we can have is to breathe and sense the enclosure of some surrounding walls. We all learn to love concrete, even if we cannot imagine the sensation of cement sticking to a wet palm. Being physically, emotionally and psychologically aware of the space we occupy is a feeling that could be described as being *present*, which is a sensation that is personal and difficult to explicitly or accurately describe. Bruno Zevi, Italian architect and theorist, who wrote about our real understanding of meanings in architecture, has written that no other art form could provide that sublime spiritual pleasure within the work itself. He called that feeling *live* movement (Zevi, 1948). A direct experience of space is highlighted by Tschumi as the ultimate pleasure of enjoying architecture (Tschumi, 1996). Jurgen Joedicke raised the question of how to explain the effect of space on a person. His attitude was that one had to take into consideration the experience of space as well as spatial perception (Joedicke, 2009). Gaston Bachelard recognized the desire for a total merging of the self and the house through a bodily intertwining. He called that feeling *curl up,* as the phenomenology of the verb *to inhabit.* He explained that only those who have learned to do so can inhabit with intensity (Bachelard, 1969).

The Dutch architect and Benedictine monk Dom Hans van der Laan (1904–1991) is known for his legacy of architectural writings and realizations arising from his search for the fundamental principles of architecture. He suspected that meaningful architecture had far deeper roots than the rules of style through the ages. He searched for those roots neither in technique nor in ideology, but rather looked for them in our experience of architecture. In his manifesto he aimed to combine spatial philosophical concepts with practical design tools (Laan, 1977).

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EXPERIENCE JUXTAPOSED TO ARCHITECTURE AND PSYCHOLOGY

Research into the term *experience* includes the terms perception and emotion, and it associates architecture with psychological disciplines, such as: environmental psychology, the psychology of perception and the psychology of art**.** Environmental psychology is an interdisciplinary field that includes areas which are not in the domain of space while studying the interaction between man and his environment, which can be understood in very general terms (e.g., nature, the built environment, the social environment) or very specific ones (an environment for education, information etc.). Architecture can affect people's emotions, behavior and health, and from the perspective of architecture, the users themselves, those who live in a certain environment, can be important participants in creating it. Scandinavian countries are known for their elaborate mechanisms for the active participation of residents and users in designing architectural space.

In the field of architecture, interest in researching the relation between the user and his environment arose in the 1960s, when numerous studies emerge in this field. Research by Kevin Lynch has had a major impact and significance in the field of environmental psychology and spatial planning[2] (Lynch, 1960).

Architectural senses for experience of space

The topic of perception and memorization is addressed by the psychology of perception. The basic psychological theory aimed to define the laws of perception is the Gestalt theory. Psychologists define perception as being *based on sensory data*. It is a cognitive psychological function which enables the body to receive and process information and to maintain contact with the external and internal reality. The appearance of an object is determined by crossing its actual content and subjective dispositions which contain individual and general history, the dynamics of the present and the anticipation of the future[3]. Our mind acts individually and often in the domain of the unconscious, leading to a process of individualization regarding our perception of reality. In this process our experience exclusively becomes ours (Jung, 1968). The process of perceiving space can be defined as a form of absorbing and ordering the information gained whilst experiencing and interacting with the space (RA, 2014). Perception can be seen as a process of *making sense* of this information, a process which is particular to each individual (Krstić, 1988). A cultural context could have a great impact on the aesthetic experience of images existing in perceived reality (Stevanović, 2011).

Our everyday conception of space is enabled by five senses: sight, hearing, touch, taste, and smell. A well-known statement by Louis I. Kahn suggests that hearing a sound is just like seeing a space, and Carlo Scarpa's architecture frequently presents the experience of taste. Until recently, philosophers and scientists have studied each of these senses in isolation. However, recent neuroscience has undermined this conception by showing that different senses are integrated. Everyday experiences – watching a film, eating a meal, walking along the street – are a result of the combined operation of different senses. To understand perception we need to understand multisensory perception. The science of perception has provided a great deal of empirical evidence concerning the multisensory operation of the senses. Philosophers, psychologists and neuroscientists should work together in an interdisciplinary and reciprocal way to develop an account of multisensory perception; they should also work with others in the humanities and the arts – including artists, filmmakers, and musicians – to trace the consequences for our wider understanding of the senses and our sensory experience.

Although many elements from the environment are recorded within different senses, and still not separated in our consciousness, they are of great importance for the image of a whole and for experiencing a particular environment. Juhani Pallasmaa (2005) advocates *architectural senses* instead of the dominant visual understanding of architecture, which are characterized as reduction, and which seek a possible explanation of the repulsion, impression of immateriality and architectural autism that people in their environment often feel. In minimalism, architects in their projects consciously or intuitively emphasize a sense of materiality and tactility, texture and weight, density and space materialized light, which result in the engagement of the senses in the perception of architecture**.** Choice is the result of complex physiological processes, but with the prevailing emotional tone. Emotion tints all human experience, including the high flight of thought.

Experience as a model of how we understand architecture

Architecture has to be experienced to be understood. Our physical exploration of space (Cornelis, 1987) is central to our understanding of architecture. It is detected first through the body and senses before being rationalized by the mind. We have to be physically present to experience space in its entirety (Böhme, 2005). By inhabiting space individuals can sense the character of the surrounding area.

Architecture is a personal, enjoyable and necessary experience. The key to the understanding of building is to grasp space and to know how to see it (Zevi, 1948). *Eyes, Which Do Not See* is Le Corbusier's famous thought (Le Korbizije, 1977). Knowing how to *see space*, or how to be spatially attuned is an ability with which we are all born. Experience is the meaning of all terms for the various modes through which a person knows and constructs a reality. Architectural experience for individuals means the experience of space. There are well-known examples of Chinese architecture such as the Forbidden City (Figure 1), which are laid out to be experienced as a sequence of spaces

[2] The particular focus of his research was the spatial visual perception of people in particular examples of American cities. He found certain laws and constants that show the possibility of making a typology of the elements that people perceive in urban space.

[3] Perception or observation can therefore be seen as a "direct experience through the senses, which stems from his relationship with the environment in direct contact" (Lazarević Bajec, 1989:36) and as an integral part of the learning process. "Perception is an active process through which we make sense of the world around us...we normally integrate the experience of all our senses without conscious analysis" (Lawson, 2001:85). "Our immediate awareness of the phenomenal world is given through perception" (Norberg-Schulz, 1966:27).

Figure 1. Forbidden City, Beijing, China (Source: author)

rather than a collection of individual buildings. Well-known architectural and philosophical theorists concerned with experiencing space include: Henri Lefebvre (1974), Brian Lawson (2001), Yi Fu Tuan (1979), Gaston Bachelard (1958), and Steen Eiler Rasmussen (1959). With reference to their work, the initial questions of how we perceive, experience, and interact with space can be explored.

EXPERIENCE JUXTAPOSED TO ARCHITECTURE AND PHILOSOPHY

An empirical or relative space which is an object of experience can be subject to one's sensibilities, in as much as it is symbolized by what can be sensed; and presumably the same must be true of time. Immanuel Kant, a German philosopher who is considered the central figure of modern philosophy, argued that the human mind creates the structure of human experience. In his *Metaphysic of Experience* he makes two statements:

1. In experiencing we are aware of the objective order of events.
2. We cannot perceive time itself. What we perceive is actually changes in time, and we measure time, not in itself, but by changes which take place in it.

Adequate counterparts to Kant's factors of experience in philosophy – awareness of the objective order of events and impossibility to perceive time itself – could be notions of silence and light as experienced in minimalism (in architecture).

Silence as the experience of space

The experience of the minimum can be called silence. It should be found useful and beautiful. The expressiveness of silence is more subject to the assessment of sharpened sensibility, developed on the basis of taste for the culture. Sensitivity is a philosophical category related to issues of meaning, a sort of spiritual instrument with which we feel the world as a kind of specific *flavor* of existence. (Vasilski, 2012). Gaston Bachelard wrote about *World of Silence* by Max Picard as a book written to express how silence acts simultaneously on human time and in human speech (Bachelard, 1969).

Silence means an ambiguous space. Ambiguous expressions are silent intervals, empty spaces with abstract nature. According to Ando, it aims at neither the void nor the figural Western form or the Eastern silence (Dal Co, 1997). Silence means tranquility, as the most essential auditory experience that is created by architecture. A powerful architectural experience silences all external noise; it is a responsive, remembering silence. In silence we are aware of the objective order of events, but at the same time our attention is focused on our very existence, and as with all art, it makes us aware of our fundamental solitude (Pallasmaa, 1994). Silence comes from space, emptiness, clarity, and transparency. In architecture, emptiness implies that a building is twisting and turning to accommodate our every movement and wish, squirming to please, since a building is formed according to innate principles of order, structure, shelter, and the evolution of architecture (Benedikt, 1987).

Light as experience of time

When one uses the axiom *Architectura sine luce nulla architectura est* (There is no architecture without light) by Alberto Campo Baeza, one can then say that it is not possible for architecture to exist without light (Vasilski, 2010). In minimalism natural light is transmitted into interior space, usually not directly, but through uniquely designed architectural elements in order to control and structure light reflections. The use of light creates plastic and artistic effects. Light and shadow create a playful interaction of color, texture and related emotion associated with the plan. The contrast between these can be sharp or blurry depending on the desired effect. This strategy displays the texture and is one of the strongest design features. Thus, by experimentation with the qualities of light, it becomes a space-defining factor through which a sense of spatial depth is brought about.

Based on sensibility in form and space making, minimalism concentrates on light as an architectural element or a structuring material. Architects experiment with the ever changing qualities of natural light and its spatial effect. It can be stated that they use light poetically. The transformation of space with light can be experienced in several ways: lighting is visual, environmental, and sensual. Initially, the combination of space and light design features creates a sensory observation for the individual. The metaphysical conditions of light affect how architecture is perceived; the visual dimension becomes abstracted and diffused, rendering the material immaterial and causing a shift in understanding about the world we inhabit.

Space is the lived space or the experience of the *anthropological* space (Merleau-Ponty, 1964). The sense of movement and spatial dynamism are the outstanding interior expressions of the building. Light can be stated as one of the significant qualities leading to creating the sense of movement in the building. As light is conveyed through shafts into the organic and bare surfaces of an object, sculptural light and shadow effects occur. The use of light, thus, intensifies the qualities of architectural spaces by offering changing spatial perceptions through which the dynamism of movement is made manifest (Vasilski, 2014).

Case study: Silence and light as experiences in Peter Zumthor's architecture

To create interaction between man and architectural work, Peter Zumthor wants the viewer to feel the space in all its aspects. He uses silence and light as the means for causing

different feelings. His building is both sensually palpable and emotionally experienced. In the simplicity of his buildings it seems that he ignores the theoretical attitude about architecture as an art or science and the viewer is left to his own intuition, association and experience. Intellectually and spiritually he returns to certain moments from the past in which he strongly feels reality, and with emotions evoked by what he saw, heard, and felt, smelled or touched, he then tries to creatively convert these emotions into an architectural work. Thought and association are turned into an object of perception. Silence comes from beauty and from being. His buildings have a beautiful silence that can be associated with attributes such as composure, durability, presence and integrity, and with warmth and sensuousness as well. He is entirely convinced that good buildings have to absorb traces of human life and thus receive their identity (Zumthor, 2005).

Peter Zumthor, Swiss pavilion *Sound Box*, World Expo Hanover, 2000

Pavilions are considered to be a special type of building, according to the way they communicate with the user. They almost always erase the borders between open and closed. Their only function is to attract and draw the observer to experience space. They are usually prefabricated, removable, degradable, biodegradable, temporary, entirely for the purpose of performance; they transmit messages from experiencing the play of light, pleasure and relaxation, leisure and discovery. And as such, with all these positive associations, they act as a medium. Static and movable, they are a medium of communication that covers all the senses and appeals equally to all generations, genders and expectations. Although completely public, they trigger one of the strongest instincts and mostly resemble the primordial shelter.

One such example is the Swiss pavilion *Sound Box*, designed by Peter Zumthor in 2000, for an exhibition in Hanover (Figure 2). The irrational use of wood sends a message. This message is silence. One is supposed to pass through this object with closed eyes, in order to better feel the texture and smell of the raw wood. Zumthor sees interiors as large instruments which collect sound, amplify it and spread it further. His wooden architecture is composed of massive blocks of wood as big as a house, made by regularly hewn layers (Linz, 2009).

Peter Zumthor, Thermal Baths, Vals, Switzerland, 1996

The thermal baths in Vals (Figure 3) are based on the concept of the original experience of bathing, cleansing and relaxation, and being in contact with rock and water. Heavy boulders and pools of water are intertwined in continuous space. It is possible, among the dark and serene colors, to hear only the sound of the water and to feel the strength of the stones. One experiences a cave, while the atmosphere is almost spiritual. Everything is subordinate to the act of swimming and/or one's own sensuality. The monolithic stone mass of the bath in Vals seems to have been excavated rather than built to house the necessary functions. Its monumental interiors are filled with silence and light. It has an antique sense of calm and peace, where contemporary connotations are unessential (Bertoni, 2002).

Figure 2. Peter Zumthor: Swiss pavilion Sound Box World Expo Hanover, 2000. (Source: Linz, 2009:274)

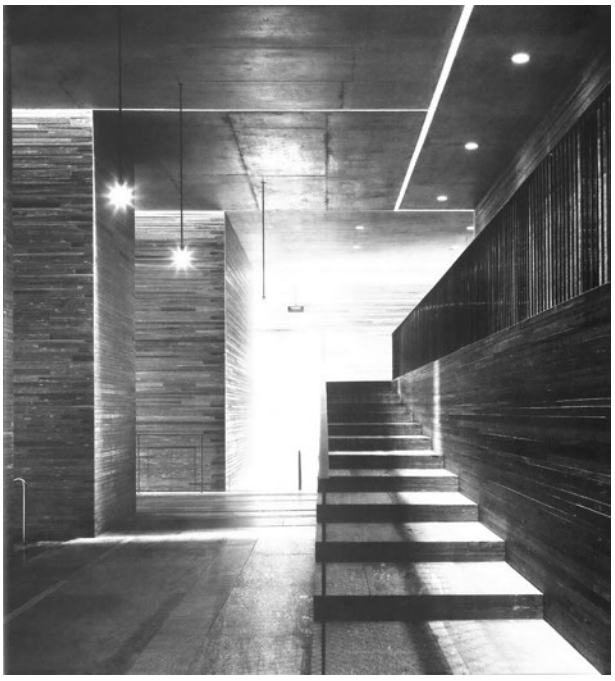

Figure 3. Peter Zumthor Thermal Baths, Vals, Switzerland, 1996. (Source: Bertoni, 2002:159)

Peter Zumthor, Bruder klaus field Chapel, Mechernich, Germany, 2007

The Bruder Klaus Chapel (Figure 4) stands in a field at Mechernich in Germany and tells the story of local farmers who wanted to honour their 15th century patron Saint Bruder Klaus. The object was created by stacking layers of concrete to the desired shape on the inside, then burning the wooden form from the inside in order to obtain a particular

structure and the color of concrete. With no installation, and only two openings to the outside world, like the Pantheon, the atmosphere inside the chapel changes as the daylight changes. Rain and sunlight share the building. The interior space is lined by black charred surfaces; it is lit from above and open to the sky. Mystical silence in space is experienced by light, essentiality, simplicity, perfection, total composure, reflection, patience. Lastly one's experience is awareness of oneself. This reminds us of the well-known thought by Ludwig Wittgenstein that working in philosophy is just like working in architecture: both mean more as a working on oneself.

Figure 4. Peter Zumthor–Bruder klaus field Chapel, Mechernich, Germany, 2007. (Source: http://www.vanityfair.com/style/features/2001/07/peter-zumthor-architect-buildings)

CONCLUSION

Architecture continues to have a great human task in mediating between the world and ourselves by providing a horizon of understanding our existential condition and constructing settings for dignified life.

For us, at present, minimalism is contained in architecture as well as in our life. It is a way of thinking, experience acquired throughout life – searching for the essence and discarding the superfluous. It is an experience of man's living space, which searches for the purity, transparency, harmony and simplicity of life itself. Triumph over the senses is to create what the senses cannot hear – our own truth.

Buildings work in conjunction with other design innovations, social media through mobile devices and wearable technologies are just a few of the ways architecture can work to help its inhabitants improve their own potential. As architecture increasingly engages with its inhabitants in real time, it will become possible to personalize experience to suit individual needs and goals. And the more personalized architecture becomes, it engages with inhabitants in entirely new ways and becomes an active player in their experience. Maybe the reason why minimalism has become the sign of our time is its endeavor to make the world a better place.

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A HISTORICAL PROLEGOMENON OF THE LEGAL FRAMEWORK AND URBAN LAND POLICY IN SERBIA AS A BASIS FOR URBAN DEVELOPMENT

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The key objective of this paper is to provide an overview of the historical context and development of construction land and its relations to urban development in Serbia. The paper discusses global developmental contexts, legal frameworks and changes of the Serbian urban land policy from the end of the 19th century until today. We emphasize the delay of reforms in Serbian urban land policy as a consequence of the complexities of legal framework, especially under the conditions of the economic and societal transformation (after 2000). The paper presents the original results of the historical changes of the legal system in the field of urban land policy and its connection with the system of spatial/urban planning. Also, we provide recommendations for the future urban land policy, which include further transformations of the legal framework in the post-socialist/transitional period. There is a long lasting need for readjusting the current planning and urban land policy in Serbia, as well as for introducing new urban land policy tools.

Key words: **historical context, legal framework, urban land policy, urban planning, Serbia.**

INTRODUCTION

Urban construction land is a limited natural, social, economic, and public good. Urban land as a public good is subject of the government intervention and control (land registers, urban/spatial plans, legal and tax instruments, the market price of land), sometimes and repression (the expropriation, land grabbing[2], etc.). Generally, land is one of the most important sources of wealth and social prestige in many societies (among property, land rents/revenues, consumer goods, socio-cultural values, social status, power, etc., see e.g. Weber, 2014), as well as an important economic and social advantage and can be the cause of social conflicts. According to prolegomena, the study of space (including urban land) has become the key concept for understanding many socio-economic, political and other processes.

The urban land policy is an important element of the state economic policy, it is significant for the implementation of spatial and urban plans, as well as for social, economic and overall development of cities. Land policy represents an important precondition for the development and quality management of cites and settlements, all with the objective of improving life quality of their citizens.

The main objective of land policy is social and economic maximization of land use effects in accordance with sustainable development policy. It should be based on the principles of economic efficiency, social responsibility, cultural values, equity and sharing the public benefits.

The historical context and the current transition processes have caused the changes of urban land policy in Serbia (re-acquiring of the land property rights by the conversion of the right to use and lease, privatization and restitution). According to the UN-Habitat (2015), the lack of urban land policies and clear regulations can lead to uncoordinated city growth and the increase in illegal and informal settlements, while excessive regulations can lead to division of urban land-use into exclusive residential, commercial, or industrial areas.

This paper offers a systematized historical overview of the legal frameworks of urban land policy, their tools and key effects, as well as an analysis of the coherency related to different policies (economic, social, urban), especially in the post-socialist transitional period in Serbia. The analysis includes following parts: 1) the historical review

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[2] As an issue of large-scale land acquisitions: buying or leasing large parts of land by (inter)national investors (companies or individuals) and government.

of the legal regulation frameworks of the urban land development and spatial/urban planning system in Serbia, 2) the critical analysis of the current state of the urban land policy and its effects in urban development in Serbia), and 3) recommendations for a new urban land policy in Serbia.

Theoretical background

Land policy is a part of the national policy instrument, which includes the goals of economic development, social justice and equality, and political stability (Enemark, 2005), as well as security and allocation of different property rights and leases, land-use and land management, access to land, etc. Also, urban land policy includes different principles, rules, methods, measures and tools, especially important for the sustainable urban development and governance (i.e. regulation of the property rights, land transfers and transactions, land values, land-use, land/real estate markets, land development & management, land administration, prevention of land speculation, etc.). The urban land policy can be applied if adopted in different sector policies which are consistent within their-self and with each other (Karakurt, 2009).

The literature on urban land policy and the role of the construction land in urban planning transformations in transitional countries indicates important role of legal frameworks changes based on some general legal theories (e.g. classical natural law theory, classical legal positivism, legal realism, legalism and others; see Gams, 1979; Lilić, 2002), theory of property, i.e. theory of appropriation, theory of ownership, theory of entitlement, theory of first appropriation/ "possession" (Hann, 2007), as well as theory of polyrational land policy (Davy, 2012; 2014), and others. Doherty (2008) indicated that propertarianism "reduced all human rights to rights of property, beginning with the natural right of self-ownership". Contrary to natural law theory, Tucker (1897) indicated that there is not any inherent right of property. Property is one social convention which may appear in many forms and which is based on the principle of equal liberty. Otherwise, other forms and principles can lead to a deficit, conflict, and manipulation. Tucker argued that "in the case of land the supply of which is so limited that all cannot hold it in unlimited quantities". Also, this is opposite to the so-called "absentee ownership" for land. According to Veblen and Levy (1997), absentee ownership is the main controlling interest in the theory, economy, sociology, and urban life. Davy (2014) further explores "polyrational" theory that explains the connection of multi-scale planning and land policy. This theory is based on the multiple interrelations between the land-use and the ownership relationships to land. Moss (2014), indicates the growing role of international regulation of resources (urban land) at the local level.

Urban land development is important part of theoretical background for transformations of the urban development, especially in post-socialist/transition society (Slaev and Nikiforov, 2013; Tsenkova, 2012; Hirt, 2007, Zeković *et al.,* 2015a). Bertaud and Renaud (1997) indicate that the suppressed urban land market started to "bloom" after 1989, as the new housing preferences and consumption developed and the market for urban development land emerged. Land consumption for housing, economic growth, employment, population growth and transportation create serious pressures in urban areas (Nuissl *et al.,* 2009). Different policies and instruments try to prevent excessive land consumption and impact assessment of land-use changes in urban areas, as well as different types of spatial governance for (peri-urban) territorial cohesion (Ravetz and Loibl, 2011). Begović (2005) and Knaap (1998) concluded that land markets are imperfect and subject to government interventions. Land values and land-use are determined by the interaction of supply and demand (Harvey and Jowsey, 2004). Needham (2000) stated that land policy can be used to support land-use planning, and can restrict the land supply on some locations.

Urban land governance requires clear legal frameworks, efficient political, managerial and administrative processes, and guidelines for decision-making with participation of many stakeholders who have different priorities in land-use development. Hartmann and Needham (2012) find that planning approaches are rooted in the activities of making, implementation and enforcing for property rights over land, i.e. 'planning by law and property rights'.

Methodological approach

In analysis we applied *a historical and contextually appropriate approach,* which includes the comprehensive analysis and in-depth analysis of the long-term historical changes of the national legislative framework of urban land policy and urban policy in Serbia, and their impacts on spatial/urban planning. This approach is based on the discourse analysis and critical law analysis related to urban land policies, and on the connections of urban land policies with the changes of legal framework of urban development in Serbia.

THE HISTORICAL CONTEXT OF CONSTRUCTION LAND POLICY IN SERBIA

The historical development of legal construction in Serbia spans from the ancient and medieval times, over the 19th and early 20th century capitalism to the socialist and post-socialist period. According to Ando (2010), Roman emperor Justinian introduced the *Codex Iustinianus* (528–534 AD) as a large codified program which came into force in 529 in the Balkan region. Roman law includes both land and property ownership. It has a universal character which was maintained, with some modifications, during the Middle Ages until the present, and it was in use in the Eastern Roman Empire (Byzantine Empire from 330–1453, including Serbia). The laws were based upon local regulations *(mos regionis* – "regional tradition", "law of the land") as the sources of legal and social stability. The development of medieval legislation in Serbia was under the strong influence of the Roman law of Eastern Roman Empire. By adopting the King Dušan's Code in 1349 legal regulations were introduced, including property rights.

The essence of the current European *acquis communautaire* is the implementation of a principle of legality (French *principe de legalite*), the concept of a legal state (German *Rechtsstaat)* and *rule of law* within the two legal systems – the European continental law and the Anglo-Saxon common law (van Gerven, 2008), as well as their hybrids (Figure 1).

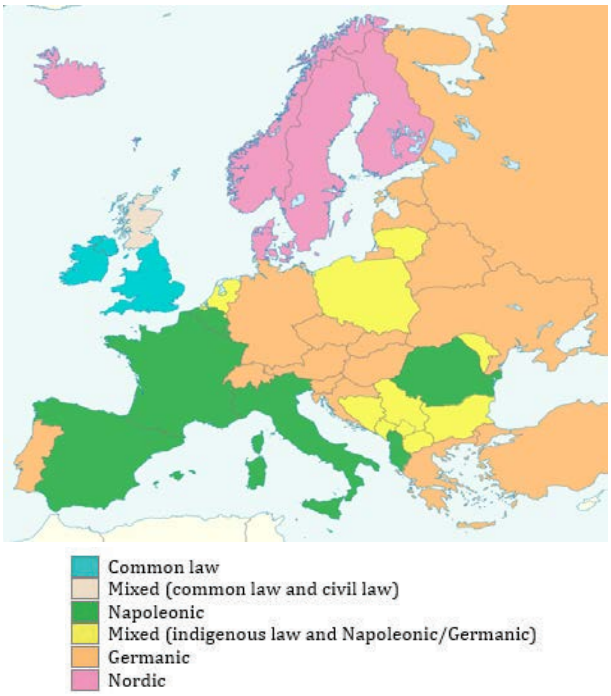

Figure 1: Legal systems in Europe (Source: https://commons.wikimedia.org/wiki/File:Legal_systems_in_Europe.svg)

Both systems have adopted numerous institutes of Roman private law, with amendments and addendums, particularly regarding the real property law, law on contractual relations and civil law. Post-socialist countries, including Serbia, have created a new framework for regulating a myriad of different interests in construction land development. Due to variable interests and the change in the social and economic context, there is a stronger interdependence between construction land development and the urban area. There is a discrepancy between legal and real property elements of urban development, especially in the insufficiently formed post-socialist system. There is a constant conflict between the regulated and actual matter of things, between private and public property and different interests, a conflict between economic interests and social requirements, strong battles (with shares, finance and capital, especially on the real estate market; see: Scott and Storper, 2015, Harvey, 2012), followed by conflicts in the political/government arena.

In accord with the results realized within the German-Serbian cooperation project *Strengthening of Local Land Management in Serbia* (Müller *et al*., 2015), the development of construction land is determined by the framework and the influence of three different historical contexts (Zeković *et al.,* 2016), in which different political and socio-economic systems dominated. Contemplatively, **the first context** was formed from the mid–19th century to World War II, and included the economic order based on *capitalism* and the *development of civil society*, in an undeveloped agricultural country. The **second context** includes the period after World War II up to 2000, which is characterized by an *authenthic development of a socialist system*, in three phases: **a)** ***Phase of the administrative-centralist system and post-war restoration*** **(1946–1950), b)** ***Phase of the authenthic socialist system of self-management (1950–1990),*** with a stage of associated labor and consensus economics (1974–1990), **c)** ***Phase of the breakup of Yugoslavia and the collapse of the socialist system (1990–2000).*** The **third context** *(*after the democratic changes in 2000*)* includes ***the post-socialist transition*** *of the society and economy within the capitalist system of neoliberal discourse.* In *Table 1* we present a very brief historical overview of the urban land policies and urban planning development (UPD) contexts in Serbia, with a preliminary review of Belgrade case. We analysed in more detail only the third context – the post-socialist transitional period after 2000.

Post-socialist transitional context (from 2000 until today)

Following the democratic changes in 2000, in the post-socialist transitional development environment, a new institutional framework was created based on capitalist system (of the neoliberal discourse). Since 2003, legislation regarding construction land has been merged with spatial-urban planning legislation and developed in a post-socialist context. Under the motto of codification, a mechanical unification of legal matters of urban and spatial planning, construction land and building structures into one law (Pajović, 2005) with 25 by-laws was carried out (the Planning and Construction Act, 2003). A radical alteration of the system of land disposal by municipalities and towns was implemented – private property of other lands for construction was allowed, by-passing the then valid Constitution of 1990. The Constitution of 2006 prescribed that construction land could be in private hands, and facilitated this transfer. The Law allowed the sale and transfer of rights of access for unbuilt land. The right of long-term lease of state-owned land for 99 years was introduced instead of the permanent right to land access.

The new Planning and Construction Act (PCA) was passed in 2009, with amendments and addendums (2010–2014). According to the PCA, there can be all forms of property over construction land which is on the market (construction land in public property as well). The government plays an important role in adopting frequent amendments and addendums to laws, with aspirations to create urban planning and other legislation that will allow subsidies to investors in the field of construction land, a fast and efficient approach to cheap and attractive locations, as well as a fast issuance of building permits. The regulation of construction land has undergone the biggest change, and practice has shown that the greatest difficulties appeared in that segment. The PCA, which is not *sui generis* for the privatization of construction land, especially before the restitution (*Act on property restitution and compensation, 2011*), regulates the conversion of access rights to nationalized built land into property rights with a fee or without it (Nedovic-Budic *et al.,* 2012). For the first time after 1958, the law facilitated that urban construction land can be in private ownership. Natural and legal persons founded by the state, region or municipality are allowed to convert access rights to urban construction land into public property rights, without a fee. It is possible to convert access rights into the right of private property for the category of previous proprietors, their legal heirs and persons having gained rights from them under

prescribed conditions. Persons who have the right of lease on other state-owned construction land are allowed to remain lessees. It also predicted that companies on state-owned construction land that hold access rights, and which hold this status due to privatization of enterprises or bankruptcy, can convert their access right into right of property by paying the market value of the land minus the costs of acquisition, where the Serbian government prescribes the fee based on the conversion. Problems in law implementation indicate that for the codification of these three legal matters the right conditions have not been met yet. Legal provisions on the conversion of construction land with a fee have been contested by a decision of the Constitutional Court and repealed (2013). The right of property over public-owned construction land belongs to Serbia, province or unit of local self-government. With the introduction of the integral real estate cadastre system (in 1992 and 2009), land registry books and other systems of recording property are not valid anymore. By adopting the amendments and addendums on the PCA (2014), the controversial provisions on the conversion of access rights to construction land into right of property were excluded, with a fee, and for this field, the adoption of a special law is predicted. The *Act on converting the land-use right into the right of property over construction land with a fee* was adopted in 2015. All construction land in public ownership can be subject to the conversion procedure, unless designated for public use or subject to restitution claim.

GENERAL TRENDS IN CURRENT CONSTRUCTION LAND DEVELOPMENT IN SERBIA

Construction land market in Serbia is underdeveloped, some regulatory mechanisms and institutions are missing, and appropriate models of financing land development are lacking as well (Zeković, 2008). The case of Serbia's incomplete reforms illustrates the challenges of land policy development in a post-socialist societal transition. The stipulation of the PCA may have even worsened the situation by introducing the stipulations that provide conversion of land-use rights and leaseholds on urban (construction) land into property right. In Serbia, there is a lack of transparency and stability on the real estate market and urban land market, as well as a lack of the established approaches, criteria and methods for the property evaluations in accordance with reliable market and planning data on property values. The urban land regulation in Serbia indicates the type of regulatory/legal framework and governance which much more supports an administrative than a market approach.

A number of factors contributed to a drastic decline in real-estate values (as the consequence of global economic and financial crisis), followed by their subsequent erratic, weak and slow recovery. Both system and practice cannot cope with the challenges of key contextual factors, viz., transition processes, global economic and financial crisis, growing economic uncertainties and risks, Serbian candidacy for the EU membership, policy of attracting FDI, spreading of 'the real-estate bubble', conversion of the housing boom, real-estate boom and urban land bubble into urban doom (urban sprawl), etc. The causes of the 'real-estate bubble' and 'land bubble' growth in cities are numerous, as well as its consequences.

Both the characteristics of Serbia's urban land policy, the delay in reforms and land development management illustrate the complexities following the reshaping of institutional framework under the conditions of economic and other uncertainties of societal transition in the post-socialist period. The current Serbian land management framework does not reflect the requisite changes, the need for market regulation, and the enormous increase in urban land prices, although efficiency land governance is vital for improving urban planning. The negative implications of the prolonged crisis on the new urban development policy and urban land tools can postpone the establishment and application of new planning and urban land instruments.

A lack of equipped urban construction land for green-field investments, housing, business and industry, along with neglecting brown-fields has also contributed to the crisis. The lack of urban land policies and clear regulations can lead to an uncoordinated city growth and the increase in illegal/irregular and informal settlements, while excessive regulations (such as strict zoning) can lead to division of urban land-use into exclusive residential, commercial, or industrial areas, which may result in urban sprawl and low density urban expansion.

Construction land management takes place in the absence of a real land market, market institutions and mechanisms, with relatively complicated administrative procedures. In the post-socialist period, financing and construction land instruments have not changed significantly in comparison with the previous period. According to World Bank (2004), the prices of construction land in Serbia were extremely high compared to the price of agricultural land (the value of urban construction land is 1,000 times higher than the price of agricultural land). Various actors capitalize the increased urban land value (as a result of the public investments into infrastructure) without land taxation. Due to the significant reduction of investments, local public revenues based on land development fees are reduced. The reduction of local budgetary revenues and a need for new capital infrastructure and the readjustment of construction land have been exceeded by credit indebtedness of the local governments/ municipalities. The lack of taxation or capture of the increased value of construction land (as a result of social investment) is one of the main challenges of the crisis in local public finances.

From the point of construction land equipping in the cities of Serbia, it can be assessed that there are different challenges to overcome the inefficiencies of the existing solutions, as follows: the impact of the global crisis and the collapse of real estate markets; delay in the reform of local public utilities and local public companies and their compliance with the construction land policies and tools; high expectations from the European funds in financing urban infrastructure; uncertainty in the programming of the urban land instruments due to the unpredictable dynamics of the realization of the investment (e.g. land development fee), etc.

The main downsides of the existing system of construction land are: inefficient land-use, weaknesses of the information system**,** urban sprawl, construction and investment

Table 1: A brief historical overview and context of the urban land policies and urban planning development (UPD) in Serbia, and Belgrade

Context / Phase	Characteristics	Key regulations in urban land policy and UPD	Key points of UPD in Serbian cities and Belgrade
I - Phase from mid–19th century to WW II			
19th century	- Undeveloped agricultural economy based on the capitalist system - Initial development of civil society - "Serbia is the only country in Europe without public debt" *(New York Times,* 22 July, 1876)	- *Serbian Civil Code* (1844) foresaw the registration of property in the legatee books - Three parallel and different systems of legal records on the rights to real-estate, owners and legal status of land: *1) The system of land registry books, 2) System of title deads, 3) Cadastre of property (only land cadastre)* - In 1855, land books were established in some areas - First laws regulating the urban legal matter (urban planning and land use): *Expropriation act* (1865), *Public buildings act* (1865), *Act on settlements* (1866), and *Act on the regulation of Belgrade* (1867)	- The period of reconstruction of Serbian towns (1867-1901) - First Urban plan of Belgrade ("Plan varoši u šancu") by E. Josimović (1867); Plan of Belgrade, 1878 - "Had Serbia and Belgrade (then razed to the ground) not stood in the way of the Turkish conquest of Europe, Vienna, Munich and Marseilles would most certainly look the same today" *New York Times* (22 July, 1876)
From 1900 until 1941		- Cadastre of land ownership in Yugoslavia (1929) - *Construction Act* in Kingdom of Yugoslavia, 1931 (regulation of cities, building regulation, technical rules, land parcelling, expropriation, land regulation) - *General guidelines for writing the regulations for the implementation of the Regulation plan,* 1932	- Plan of Belgrade, 1903 and 1910; Master plan of Belgrade, 1912 and 1923; General regulation plan, 1927 and 1939 - Le Corbusier (1911): "Belgrade – ridiculous capital, worse even: dirty, and disorganized, in the most beautiful place in the world"
II - Authentic development of the socialist system			
1. Phase of administrative-socialist system (1946–1950)	- System based on state ownership, with strong societal control by the communist party - Centralization of the administrative-socialist system, etatization	- *Ordinance regarding the registration of state-owned real estate property rights* (1947) - *Basic regulations on design and construction* (1948) - *Basic regulation on general urban planning* (1949) - *Act on agricultural reform, confiscation, nationalization, expropriation*, etc. - Post-war restoration	- MUP of Belgrade (1948) by N. Dobrović (new city on the left side of river Sava: New Belgrade) - MUP of Belgrade, 1950 - Domination of state ownership
2. Phase of authentic socialist system of self-management (1950–1990)	- FPRY Constitution (1963) introduced self-management in all "social-political communities". Reforms 1964–1967: measures to reduce the state role in economy; *market socialism* - Construction land passed into state property, later - social collective property	- *Federal regulation on land cadastre* (1953) - Courts responsible for the land registry book - *Act on nationalization of rentals and construction land, nationalizing built and non-built construction land in urban areas and urban settlements in FPRY* (1958) and principle *superficies solo cedit* was broken - *Act on urban and regional spatial planning in Serbia* (1961) determined the legal terminology and legal nature of these plans - *Act on transfer of land and buildings* (1965) forbids transfer of socially-owned construction land - SFRY laws on construction land in urban areas and settlements with an urban character (1968)	- Bottom up UP&G with "exotic" social ownership - Land nationalization influenced the organization of cities - Architects guilty for "superficial understanding of modern urban planning" (Le Corbusier, 1955) - MUP of Belgrade, 1972 - *Housing relations act* (1966, 1968) and the *Act on ownership of parts of building* (1965) envisaged the provision of socially owned apartments - Serbian laws on construction land 1969, 1971, 1972, 1973, 1974
2.1. Phase of associated labour and consensus economics (1974–1990)	- *SFRY Constitution* (1974) introduced a concept of associated labor, consensus economics, self-management arrangements and social agreements - In the 1980s Yugoslavia was a middle-developed industrial country	- *Constitution act* (1974) introduced social planning of socio-political communities (till the end 1980s All the republics brought in spatial plans (except Serbia) and this meant the beginning of the constitution of the future states and SFRY disintegration - Laws on construction land (1975–1986), land were given by public competition to state/social enterprises for use - Cadastre of real estate was introduced in Serbia (1983)	- *Planning and spatial organization acts* (1974, 1985 and 1989) triggered the weakening of state control in the urban system - Le Corbusier's concept of urban development according to the Athens Charter (1933) was applied, as it was compatible with the socialist system and urban planning (New Belgrade)
3. The break-up of SFRY andcollapse of the socialist system (1990–2000)	- The collapse of SFRY after the 1990s conflicts led to the formation of new states - *Serbian Constitution* (1990)	- The collapse of the Yugoslavia in the 1990s as consequence of complex international circumstances and political and armed conflict - *Act on construction land* (1995*), Act on building structures* (1995), *Planning and spatial development Act* (1995), *Act on spatial plan of the Republic of Serbi*a (1996) - part of the ambient for FDI	- *Amendments to MUP of Belgrade* (1990s): regulate adding extra rooftop floors, and legalization - *Act on construction land* (1995): construction land can be public, private or state-owned, with the right of access or long-term lease
III - Post-socialist transitional context			
from 2000 onwards	- New institutional framework based on the capitalist system of neoliberal discourse - Radical change of the system of land transfer by municipalities and towns	- *Planning and construction act* (PCA) 2003 - Private property is allowed on construction land - Selling and transfer of rights to use undeveloped land - PCA (2009) regulates conversion of access rights to use built land into property rights, without or with a fee - *Act on converting the land-use right into the right on property of construction land with a fee* (2015)	- MUP (2003) with amendments 2006-2014 - The right to long-term lease of state land for 99 years introduced - PCA: construction land may be in all forms of ownership and on the market - All construction land in public ownership can be subject to the conversion procedure

limitations due to uncertainty in the upcoming privatization process of one part of building land, a decrease in local revenues from urban land, deficit of equipped locations, evaluation of the land market values and other problems (Zeković, 2009).

RECOMMENDATIONS FOR THE FUTURE

The urban land policy includes the introduction of regulatory mechanisms, restructured institutions, new ways of financing land development, and market-based instruments of land policy. The new urban land policy includes the adaptation of the traditional urban policy and urban land policy, as well as introduction of more innovative and flexible urban land policy tools. Traditional planning tools and urban land management tools are: zoning/land regulations, urban growth boundaries, infrastructure investments, green belts, and the urban land tools with price mechanisms – land development fees, property taxes, land tenure, expropriation, etc.

In accordance with Zeković *et al.* (2015b), there is a need for alternative, adoptive or complimentary approaches to current 'command-and control' regulation. Common law, public and private agreements, and market-based tools as contemporary regulations provide development of the hybrid 'smart regulation' approach. We suggests the research and creation of guidelines for the possible introduction of more innovative and flexible urban land policy tools, and their harmonization with the urban and other regulations, viz.: 1) *Urban rezoning,* 2) *Tradable development rights, trading density for benefits – density bonus policy* (Purchase of Development Rights – PDR, or Transfer of Development Rights – TDR). Cities have used the density bonus as a policy when rezoning has been applied as a tool to capture the increased land value (Moore, 2013; Baxamusa, 2008), 3) *Infrastructure finance,* 4) *Regulatory arangements of the Public-Private-Partnerships (PPP).* PPP includes different types of legal acts/tools **-** community development agreements, community benefits agreements, planning agreements**,** negotiation, covenants, and easements, models of the concessions of public goods; 5) *Introduction of the financial instruments* (municipal and governmental bonds, financial derivatives – different Credit Default Swaps, etc.), *6) Reinvestment,* 6*) Land value capture tax* (as effects of the public investment), 7) *Implosive and inclusive zoning* as a complementary tool in revitalization of brown-fields, 8) *Land tenure,* as a form of participation of the private land owner in strategic projects that provide income to the owner (Mittal, 2014).

In the future the following can be expected: a) Further development of regulations related to the legal nature and character of spatial and urban planning, and their coordination with the regulation of urban land instruments and construction land management; b) Harmonization of construction land development and the urban land instruments with the reform of local public utilities and the process of privatizing public utilities; c) Regulatory compliance of the urban planning in relation to: 1) a medium-term construction land program, 2) a medium-term program for the development of municipal utilities in accordance with the public utility companies and with infrastructure projects, 3) projection of medium-term local budgets ; d) Alternatively, the establishment of new fiscal and para-fiscal instruments (e.g. introduction of land value capture tax, transformation of the land development fee into impact fee), or a hybrid approach (a mixture of fiscal and para-fiscal instruments); e) Innovation of the statistical data base for urban construction land at the central and local level; f) A way of articulating urban land management (re-parcelling/ readjustment/ re-plotting) with a new potential tool – the urban rezoning; g) Financing the construction of infrastructure/ common utilities**,** and finally h) The introduction of the UN Habitat guidelines on urban and territorial planning (2015) and the GTLN land tools (see Zeković *et al.,* 2015b), etc.

CONCLUSIONS

In Serbia, there has been a prolonged delay in the adoption of legal framework for the urban land policy during the post-socialist period. The current legal framework of the urban land system does not reflect the required political changes, the need for market regulation, and others (Nedovic-Budic *et al.*, 2012). Initial steps have been undertaken in the area of the urban land policy reforms in Serbia. Current system and practice are not sufficiently harmonized with main transformation processes and changes. Great number of basic, conceptual issues hasn't been solved. It shows the need to design reforms in this area, with regard to implementation of sustainable spatial/urban development, planning and governance, and further adjustments of the legal framework.

A comprehensive analysis of the legal frameworks on urban land policy and spatial/urban planning has shown that it is necessary to introduce: 1) a clear national urban land policy with reformed instruments and tools, and 2) an improved urban planning and urban governance. Also, we suggest implementation of those recommendations for the future urban (land) development in Serbia.

There is still no taxation of land rent, therefore urgent reform of system and policy of construction land is required, based on the market and planning mechanisms and instruments (adaptation of the traditional urban land tools and introduction of more innovative urban land policy tools). The results should support the creation of opportunities for market-oriented, encouraged and development-oriented land policy that would promote implementation of sustainable urban development.

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THE SPATIAL PLANNING, PROTECTION AND MANAGEMENT OF WORLD HERITAGE IN SERBIA

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The paper indicates the importance of spatial planning as a specific instrument for the protection and management of World Heritage sites in Serbia. The paper analyses the obligations set forth in the international and national documents and legislation relevant for spatial planning, on the one hand, and World Heritage protection, on the other hand. The notion, criteria, method of zoning, systems and approaches to the management of sites inscribed on the World Heritage List are shown through the concept of World Heritage. The paper also emphasizes the importance of adopting management plans for all World Heritage sites and their incorporation into the national legislation and planning documents, primarily into the special purpose area spatial plans. It also gives examples of special purpose spatial plans in order to consider the treatment of World Heritage in these documents, and to make proposals for improving the spatial planning and the existing protection and management of the World Heritage sites in Serbia.

Key words: **spatial planning, World Heritage, management plan, Serbia.**

INTRODUCTION

World Heritage Sites are places that are inscribed on UNESCO's World Heritage List based on the Convention concerning the Protection of World Cultural and Natural Heritage (1972). The 2016 List contains 1,052 sites (814 World Cultural sites, 203 World Natural sites, and 35 mixed properties) in 165 countries, out of which 5 sites are in Serbia–Stari Ras and Sopoćani, Studenica Monastery, Gamzigrad-Romuliana, Palace of Galerius, Stećci Medieval Tombstones Graveyards and the Medieval Monuments of Kosovo (Dečani Monastery as well as Patriarchate of Peć and Gračanica Monastery and the Church of Our Lady of Ljeviška in Prizren, as an extension of the Dečani Monastery site), which are also inscribed on UNESCO's List of World Heritage in Danger (http://whc.unesco.org/en/list, accessed: 3rd Dec 2016).

According to the Law on Planning and Construction of the Republic of Serbia (2009-2014), the protection, development and improvement of heritage is a mandatory segment of all spatial plans. The Law requires a special regime of organization, development, use and protection of space and the adoption of special purpose area spatial plans for the sites that are of special importance because of their cultural and historical or ambience values, also including the sites that are inscribed on the List of World Heritage Sites. This paper analyses the international and national documents and legislation relevant for the spatial planning of World Heritage sites, as well as the existing special purpose area spatial plans. The aim of the paper is to indicate the importance and role of adopting management plans and special purpose area spatial plans and their mutual harmonization, as well as to propose the possibilities for improving the spatial planning and protection and management of these sites.

CONCEPT OF WORLD HERITAGE

World Heritage Concept and Site Selection Criteria

According to the Convention concerning the Protection of World Cultural and Natural Heritage, the general goal is to identify cultural heritage of Outstanding Universal Value and ensure its protection, conservation and presentation in the spirit of sustainable development and transmission to future generations. The sites considered to be of "Outstanding Universal Value" are those which meet at least one of the ten selection criteria of the World Heritage List, as well as conditions of authenticity and integrity and the requirement for the existence of adequate protection and management (UNESCO WHC, 2015).

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The basic criteria for the selection of World Heritage sites are: (i) to represent a masterpiece of human creative genius, which should be interpreted as an outstanding example (or the height) of a style that developed within a culture, along with a high intellectual or symbolic contribution and a high level of artistic, technical or technological skills; (ii) to exhibit an important interchange of human values over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design; (iii) to bear a unique or at least exceptional testimony to a cultural tradition or civilization that exists or has disappeared; (iv) to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history; (v) to be an outstanding example of a traditional human settlement, land-use, or sea-use representing a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change; (vi) to be directly or tangibly associated with events or living traditions, with ideas or with beliefs, with artistic and literary works of outstanding universal significance; (vii) to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance; the criteria (viii), (ix) and (x) primarily deal with determining the Outstanding Universal Value – outstanding examples representing earth's history, significant on-going ecological and biological processes in the evolution and development of different ecosystems, as well as the most important and significant natural habitats[2] (ICOMOS, 2008).

The fulfilment of the condition of authenticity implies the acceptability of sources of information, the main aspect for the justification of Outstanding Universal Value, as being credible and truthful. Depending on the type of cultural heritage, the authenticity is expressed through the truthfulness of attributes comprising materials, form, function and history, as well as a series of non-material features. In contrast to authenticity, integrity is defined as a measure of the wholeness and intactness of the natural and/or cultural heritage and its attributes (UNESCO, 2015).

World Heritage Management

The systems for managing World Heritage sites have been developed for the purpose of a more efficient protection of cultural heritage for the present and future generations. The nine common components of these systems include: three elements – the legal framework, institutional framework and resources (human, financial and intellectual); three processes – planning, implementation and monitoring; and three results – outcomes, outputs and improvements to the management system (UNESCO, ICCROM, ICOMOS and IUCN, 2013). The World Heritage site management systems vary from country to country and from site to site. In the majority of cases, different bodies can be involved in the management of cultural heritage and its buffer zones, as well as in the decision-making process (Figure 1).

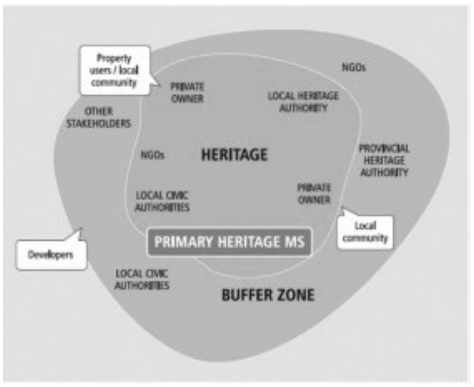

Figure 1. Management scenario
(Source: Managing Cultural World Heritage, World Heritage Resource Manual, UNESCO, ICCROM, ICOMOS and IUCN, 2013, Figure 7, p. 57)

Basically, management systems are developed depending on the approach applied to management, which can be (Business Plan for the Rehabilitation of Intangible Cultural Heritage, 2014): (i) the conventional approach – considers cultural heritage as an object of protection, namely, the focus is on the protection of its material component, whereby the responsibility for the protection and management is on the cultural heritage protection institutions and on professionals, while the local community is not included; (ii) the value-based approach – directed to the protection of the value of the heritage (historical, aesthetic, symbolic, social, cultural, scientific, etc.), and not only material heritage, whereby the heritage management includes different stakeholders, also including the local communities; and (iii) the living heritage approach – focused on people and the local community, whereby the main goal is to preserve and protect the material and non-material elements of heritage, while the decisions are made by consensus based on certain participation criteria.

World Heritage Site Zoning

The buffer zones were not clearly defined at the beginning of implementing the Convention concerning the Protection of World Cultural and Natural Heritage. Their importance and role were not completely considered either. It took a certain amount of time to notice their numerous benefits, staring from the precisely established and legally regulated buffer zones that, besides complementing the protection and management of Outstanding Universal Value of World Heritage, also contribute to and promote the activities within them that can bring benefits both to the heritage and to the local community (UNESCO, 2009). The most efficient way to establish buffer zones is when this is done simultaneously with the nomination, or perhaps prior to the nomination of a heritage site for inscription on the World Heritage List. Here, perhaps, the role of local communities is the most visible, whereby the defining of

[2] Explanation of criteria: criterion (II) is to a great extent used for artistic or technological achievements based on the movement and merger of different influences; criterion (III) is often used for archaeological sites, and lately also for cultural landscapes; criterion (IV) is easy to interpret, thus very popular and widely used – it was used for the evaluation of as many as 80% of the sites; criterion (V) is the least used criterion, mainly for larger units like historical cities or mixed properties; criterion (VI) has been much discussed, probably because it introduces the dimension of intangible in the context of tangible heritage (the World Heritage Committee considers that this criterion should preferably be used in conjunction with other criteria); criterion (VII) has been previously used for the evaluation of natural heritage, while today many mixed properties are also listed under this criterion (ICOMOS, 2008).

protection measures would not be recognized as a constraint on the development, but would reveal the possibilities within which the World Heritage site could be included in the protection in the most suitable way and within the framework of sustainable development of the community (*World Heritage and Buffer Zones*, UNESCO 2009). The buffer zones manage the preservation of the site in many senses: they preserve site authenticity, and the visual and any other integrity in the built or natural environment, but also offer the possibility to the local community to adopt the management plan according to the requests of the site.

The size, perimeter and potential for large number of buffer zones depends on the type of heritage inscribed on the World Heritage List, as well as on the scale of the site, the management possibilities and the constraints resulting from the management experience and lack of zoning in the Serbian conservation practices. The zoning with different protection regimes could be efficient if there was adequate national legislation, because the boundaries of areas that protect the heritage from adverse impacts (for example traffic infrastructure) are not always the same within the area from which the visual corridors are protected. However, if the buffer zone is too large, managing it can be difficult, since more stakeholders are involved (Kesić and Ristić, 2012).

Management plan for World Heritage sites

The management plan represents a relatively new tool for determining and creating an appropriate strategy and for setting the objectives and activities, as well as for creating an implementation structure for managing cultural heritage sites in an efficient and sustainable way. The management plan should explain how to maintain Outstanding Universal Value through protection and conservation. It should also practically demonstrate effective measures for achieving on-ground conservation outcomes (Management Planning of the UNESCO World Heritage Sites, 2016).

For World Heritage sites, the spatial planning is an important and – according to the Operational Guidelines – an obligatory segment of legal and institutional frameworks. An integrated approach to the spatial planning, protection and management of cultural heritage is also very important. The link between the spatial planning and protection/ management of cultural heritage is regulated by laws pertaining to the field of planning or to the field of cultural heritage. This link is not the same in all state members of the World Heritage Convention. According to the Management Planning of the UNESCO World Heritage Sites, 2016, the analysis encompassed 6 countries: Italy, Slovenia, Croatia, Bosnia & Herzegovina, Montenegro and Greece. There are examples from surrounding countries, such as Montenegro, where the Law on Protection of Cultural Heritage (2010) prescribes an obligation for all spatial plans to be harmonized with the management plan that is mandatory for the cultural heritage inscribed on or nominated for the World Heritage List. For example, the Management Plan of the Natural and Cultural–Historical Region of Kotor was adopted in 2011.

In Serbia, the notion of a "management plan" is not present in current regulations, thus the already prepared management plans have not been verified through legal procedure, nor have they been adopted. For the nomination of the Dečani monastery, and two years later for three other monuments in the territory of Kosovo and Metohija, the traditional management of the sites – in terms of the traditional monastic way of life – was highlighted, in addition to the other legislation. The management plans for three serial sites, i.e. three graveyards included in the nomination file Stećci were mandatory parts of the nomination file, although these plans were not prepared in the best possible way. Management plans have been recently prepared for the following: the Spatial Cultural and Historical Unit of the Senje Coal Mine[3] (2013) and the Archaeological Site Justiniana Prima[4] (2014), both within the Ljubljana Process II; the Stećci Monumental Medieval Tombstones; the Mramorje Archaeological Sites in Perucac and Rastiste (Municipality of Bajina Bašta); and the ancient Greek cemetery in the village of Hrta (Municipality of Prijepolje) - 2013, for the purpose of nomination to the World Heritage List. The model of management plan for Gamzigrad–Romuliana is under preparation.

SPATIAL PLANNING AS AN INSTRUMENT FOR THE PROTECTION AND MANAGEMENT OF WORLD HERITAGE SITES

A review of international and national legislation relevant for spatial planning

The supranational level of planning is of strategic character, and the Council of Europe and the European Union are concerned with cooperation in the field of spatial planning. From the aspect of protecting cultural heritage, the international documents[5] relevant for spatial planning highlight (Dobričić, 2012): the management of spatial development based on sustainable development, as well as the wise management and protection of cultural heritage; integrating the protection of natural and cultural heritage into spatial development (COE, 1999); the importance of close cooperation between spatial planning and sectorial policies; the importance of a spatial development policy that should contribute to the integrated management of cultural heritage; encouraging the development of sustainable forms of tourism (COE, 2000); inclusion of the cultural dimension in sustainable development in addition to the social, economic and environmental dimensions (COE, 2003); development of cultural routes and networks; heritage as a vital cultural identity, and the protection and promotion of the diversity of cultural expressions (COE, 2007); the importance of the plan-based directing of activities in space that can have negative consequences for the cultural heritage (urbanization, mass tourism, etc.) (COE, 2011); etc.

[3] The Senje Coal Mine is not included in the World Heritage List.

[4] Justiniana Prima is included in the Tentative List together with the following sites: Đerdap National Park, The Deliblato Sands Special Natural Reserve, Mt. Šara National Park, The Tara National Park with the Drina River Canyon, The Đavolja Varoš (Devil's Town) Natural Landmark, Fortified Manasija Monastery, Negotinske Pivnice, Smederevo Fortress, Historical place of Bač and its Surroundings and Frontiers of the Roman Empire (WHS FRE).

[5] European Spatial Development Perspective (1999), Guiding Principles for Sustainable Spatial Development of the European Continent (2000), Ljubljana declaration on the territorial dimension of sustainable development (2003) and Territorial Agenda of the European Union (2007 and 2011).

The documents mentioned represent a framework for the national planning documents and policies (Živanović and Đorđević, 2005).

In a normative-legal sense, the levels and types of spatial plans are defined in the current Serbian *Law on Planning and Construction* and corresponding bylaws. In this sense, special purpose area spatial plans, which are the theme of this paper, are a type of spatial plans in Serbia that are adopted by the Government of Serbia or Assembly of an Autonomous Province (if the area is entirely located in the territory of the autonomous province). In addition to abovementioned, the Law also prescribes their mandatory content, whereby the protection, development and improvement of cultural heritage sites is a mandatory segment of all types of spatial plans, while the principles of spatial organization specifically relate to the need for the protection of cultural and historical heritage. According to the *Rule Book on Content, Manner and Procedure of Developing Spatial and Urban Planning Documents* (2015), the special purpose area spatial plans are drawn up for areas of intangible cultural properties of outstanding significance and they particularly contain rules for the arrangement, development and use of the area in narrower and wider zone of protection of cultural heritage according to the determined regime of protection. The concept of World Heritage is not present in the *Law on Cultural Heritage* (1994-2011), neither is the method of zoning determined, except for the protected surroundings of intangible cultural property which have the same protection as cultural property. Furthermore, the concept of a management plan, as well as the concept of cultural landscape in accordance with the *European Landscape Convention* (COE, 2000a), is not present in the mentioned Law either.

Special purpose area spatial plans for the World Heritage sites in Serbia

Special purpose area spatial plans are considered as specific instruments for managing World Heritage sites, as well as for achieving the goals of protection and sustainable development of World Heritage sites through their implementation. Unlike other types of spatial plans that equally consider the basic components of spatial development (natural resources, infrastructure, network of settlements, etc.), these components are determined in special purpose area spatial plans by the basic function/special purpose (Perišić, 1985), in this case by the protection and sustainable development of World Heritage sites, as well as other purposes complementary to the main purpose (sustainable tourism development, protection of natural heritage and landscape, etc.). At the same time, their implementation implies an integrated approach, i.e. an equal consideration of all three dimensions of sustainable development: economic, social and environmental, as well as three factors/activities, space, communication (Stojkov, 2000).

According to national laws and the obligations from international documents, the binding content of these spatial plans is prescribed, which implies the determination of: the current status and objectives; the concept of spatial development of the area and its special purpose functions; the boundaries of special purpose units and sub-units; the distribution of activities and land use; protection measures; the development and improvement of cultural heritage sites; and measures and instruments for the realization of spatial plans (Law on Planning and Construction, 2009-2014. As for the protection measures, they are efficient only when specified in the spatial plan for the area to which cultural heritage gives an irreplaceable and outstanding appearance (Brguljan, 1985).

Concerning the sites inscribed on the World Heritage List in Serbia (Figure 2), the special purpose area spatial plans that have been adopted so far include spatial plans for the special purpose area of the archaeological sites of Romuliana and Old Ras with Sopoćani, while the plans for the Studenica Monastery and for the Medieval Monuments in Kosovo have not been developed. It should be mentioned that the Studenica Monastery is indirectly encompassed by the Spatial Plan for the Special Purpose Area of Golija Nature Park (2009), which is neither adequate nor appropriate to the importance of this site[6]. It would be necessary to adopt

[6] The Studenica Monastery is the endowment of Stefan Nemanja, a founder of the medieval Serbian state. It was built in the period between 1200 and 1300 in Studenica, in the Municipality of Kraljevo. It is the biggest and the richest Orthodox monastery in Serbia, and its two main monuments, the Church of Our Lady, built of white marble, and the King's Church, safeguard a priceless collection of Byzantine paintings from the 13th and 14th centuries.

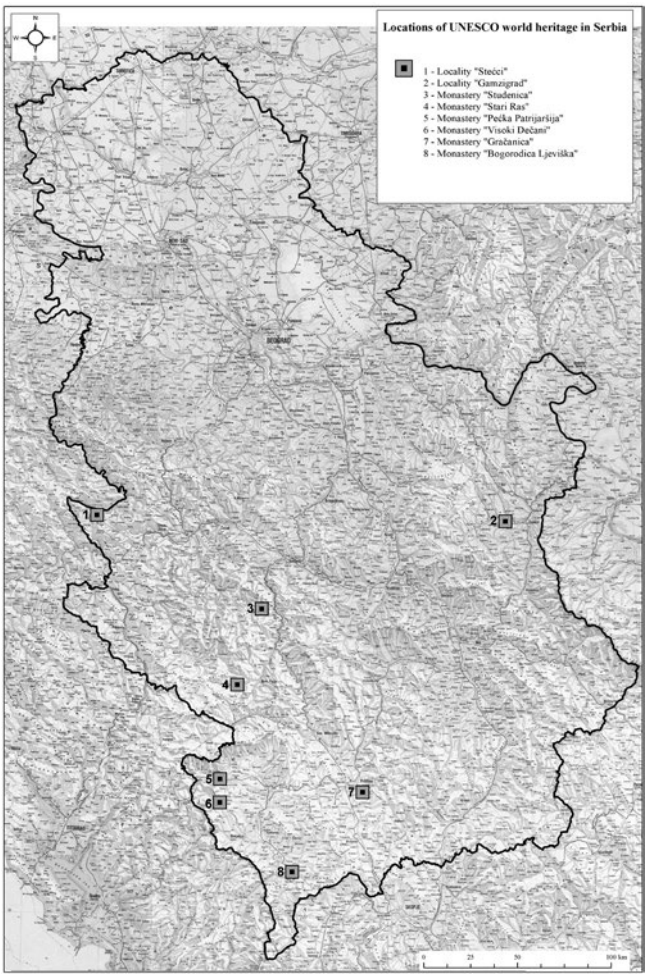

Figure 2. Locations of UNESCO world heritage in Serbia (Source: authors, 2016)

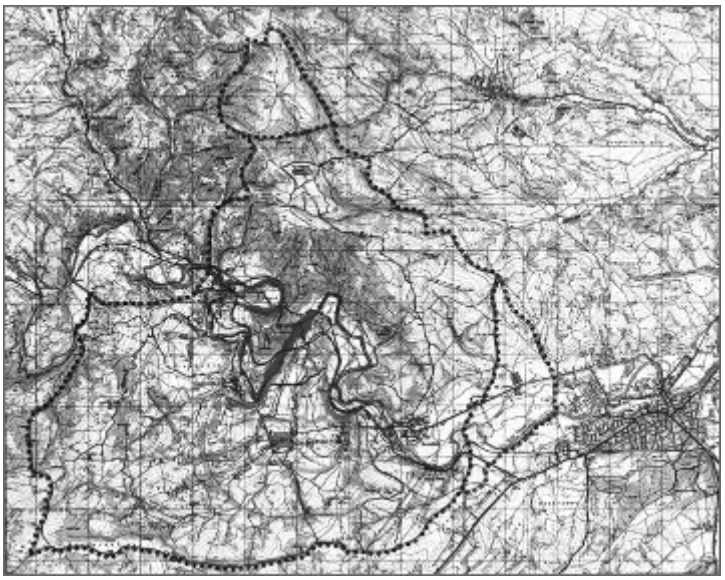

Figure 3. Reference map 1. Cultural heritage and natural heritage
(Source: The Spatial Plan for the Special Purpose Area of the Archaeological Site Romuliana-Gamzigrad, Institute of Architecture and Urban & Spatial Planning of Serbia - IAUS, 2004)

a separate special purpose area spatial plan for this site, in which a dominating special purpose would be the protection and sustainable development of the Studenica Monastery (Dobričić, 2012).

An example of good practice in the field of spatial planning[7] is the Spatial Plan for the Special Purpose Area of the Archaeological Site of Felix Romuliana – Gamzigrad[8] (2004). At the time of the Plan's preparation, this archaeological site was on Serbia's Tentative List for inscription on the World Heritage List. This site was inscribed on the World Heritage List in 2007 as "Gamzigrad - Romuliana, Palace of Galerius". The study "Measures for the Protection of Historic Buildings and an Overview of the Recorded Archaeological Sites" was prepared by the Cultural Heritage Preservation Institute of the Republic of Serbia for the needs of this spatial plan (Dobričić, 2012). In this spatial plan in which a new methodology[9] was applied, the area of the archaeological site Felix Romuliana – Gamzigrad (Figure 3) is differentiated into five zones, also including the following zones of protection: a zone with degree I of protection encompassing the area surrounding the fortified imperial palace Felix Romuliana, the memorial complex on Magura Hill and another 16 smaller archaeological sites; a zone with the transitional regime of degree II.1 of protection encompassing a continuous narrow belt of land surrounding the zone with degree I of protection, extending to a visible radius of about 1,500 m from the geometrical centre of the fortified imperial palace; a zone with the transitional regime of degree II.2 of protection encompassing the area extending to the visible radius of 3,000 m around the zone with the transitional regime of degree II.1 of protection; a zone with degree III of protection encompassing the other areas of the archaeological site outside the zone with the transitional regime of degree II.1 of protection, as well as in between the areas with degree II.2 of protection; and a protection zone encompassing the entire planning area outside the archaeological site. At the same time, the criteria and requirements for and regimes of protection, development and use of the area of archaeological site have been specified for each zone of protection individually. Considering that zoning was not envisaged by the Law on Cultural Heritage and the mentioned study, and actually, that only the protection of surroundings of intangible cultural properties was envisaged, the zones and regimes of protection were determined by this spatial plan.

The Spatial Plan for the Special Purpose Area of the Spatial Cultural and Historical Unit of Old Ras and Sopoćani (2012), which is the site that is linked to the foundation of the first Serbian state (Figure 4), has been drawn up for the cultural

[7] The authors of this paper have professional references related to the theme of the paper, out of which the most important are: coordination in the drawing up of the Plan for the Special Purpose Area of the Archaeological Site of Felix Romuliana – Gamzigrad (2001-2004); professional monitoring of the Spatial Plan for the Special Purpose Area of the Spatial Cultural and Historical Unit of Stari Ras and Sopoćani (2009-2012); work in the UNESCO-MaB Coordination Committee of the Government for the Protection and Development of the Area of Golija-Studenica (2002-2004); participation in the ICOMOS National Committee of Serbia (since 2010); membership in the Presidency of the Conservation Society of Serbia (since 2016); preparation of the Dečani Monastery file for inscription on the World Heritage List (in 1994 and 2002); writing of the First UNESCO-v Periodic Report on the Implementation of the Convention Concerning the Protection of the World Cultural and Natural Heritage and Sate of Conservation of Stari Ras with Sopoćani and Studenica Monastery; participation in a number of activities of the ICOMOS National Committee of Serbia (from 2000 to date); authorship of the exhibition entitled "World Heritage in Yugoslavia", held on the occasion of the World Press Freedom Day (2004); etc.

[8] Gamzigrad-Romuliana, the Roman palace and memorial complex, built in the 3rd century in Gamzigrad, in the Municipality of Zaječar. The Felix Romuliana palace was named after the mother of Emperor Caius Valerius Galerius Maximianus and built based on his idea. It belongs to a particular category of monuments of Roman palatial architecture linked exclusively to the period of the tetrarchy. The site consists of fortifications, the palace in the north-western part of the complex, basilicas, temples, hot baths, memorial complex, and a tetrapylon. The group of buildings is also unique in its intertwining of ceremonial and memorial functions.

[9] This methodology was conceived in the Institute of Architecture and Urban & Spatial Planning of Serbia, Belgrade, as the Spatial Plan Developer.

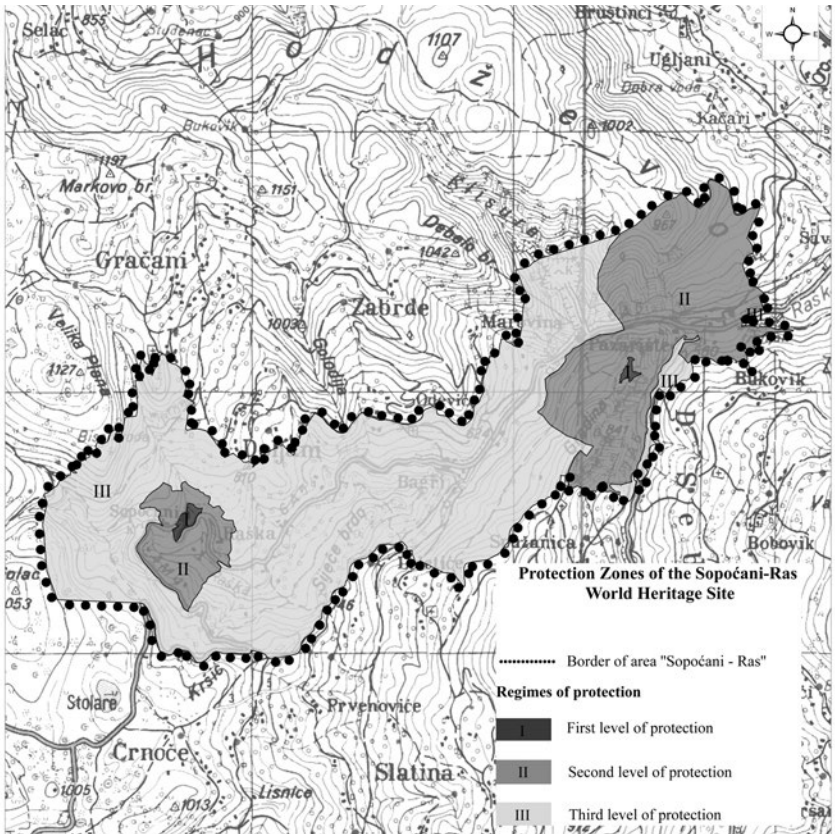

Figure 4. Protection Zones for the Sopoćani-Ras World Heritage Site
(Source: Spatial Plan for the Special Purpose Area of the Spatial Cultural-Historical Unit of Stari Ras and Sopoćani with modification[11], Institute of Transportation - CIP, 2012)

area of outstanding historical and cultural importance. Given that this area is exposed to dynamic demographic movements and economic activities and to the extension of settlements (building areas) and illegal construction, it was necessary to determine the spatial relationships between these activities and the cultural, historical and other heritage with the aim to determine the long-term basis for its protection and sustainable development. Studies entitled "Retrospective Inventory Project" (Cultural Heritage Preservation Institute of the Republic of Serbia - 2009), "The Ras-Sopoćani Landscape of Outstanding Features" (Institute for Nature Conservation of Serbia - 2010), and others, were used in developing the Spatial Plan. As with the previous spatial plan, and due to the lack of zoning in the legislation of Serbia, the protection zones and regimes for the World Heritage sites were determined by this spatial plan.

The Spatial Plan defines the protection zones of the World Heritage site and its surroundings in three different regimes for two units – encompassing the special purpose area of Stari Ras and Sopoćani World Heritage site[10] in which the zones with degrees I, II and III of protection of the cultural heritage site and its surroundings are defined by protection regimes; and the spatial purpose area of the World Heritage site of Đurđevi Stupovi - Petrova Crkva (Peter's Church)[12] in which the zones with degrees I, II and III of protection of the cultural heritage site and its surroundings are defined by protection regimes (Figure 5). Thus, three planning zones were formed according to the degree of protection: a zone of cultural heritage (degree I of protection) encompassing the area in which the protected cultural heritage is situated, also including its rehabilitation and use; the protected immediate surroundings of the cultural heritage site (degree II of protection), which primarily safeguard the integrity of the cultural heritage; and the area in which the landscape is protected (degree III of protection), which encompasses the greatest part of the protection zones and which can be

[10] The most important monuments within the unit of Stari Ras with Sopoćani include: Sopoćani Monastry, Đurđevi Stupovi Monastery, Petrova crkva (Peter's Church) and the remains of the Ras and Gradina fortresses.
The Sopoćani Monastery in the Municipality of Novi Pazar, the endowment of King Uroš I, was built in the beginning of the second half of the 13th century. The mural in the Church of the Holy Trinity in Sopoćani is one of the most impressive fresco ensembles in Byzantine painting, painted in the second half of the 13th century. The masterpiece is the culmination of a classic style in which harmony and beauty are its main characteristics.

[11] Figure 4 and 5 maps were adapted to the needs of this paper based on the Thematic Map I, II and III degree of protection of cultural heritage Sopoćani and Ras, Spatial Plan for the Special Purpose Area of the Spatial Cultural-Historical Unit of Stari Ras and Sopoćani, Institute of Transportation - CIP, 2012.

[12] Đurđevi Stupovi in Vrbolozi in the Municipality of Novi Pazar, the endowment of Great Mayor Stefan Nemanja, was built in the eighth decade of the 12th century. Petrova crkva (Peter's Church) in Novi Pazar in the Municipality of Novi Pazar is one of the oldest medieval religious monuments in Serbia. Historical sources do not provide data on the time when it was built, but it was already mentioned as an episcopal seat in the 10th century. This temple has a special importance for Serbian history because key events from the life of Stefan Nemanja are linked to it (his baptism, church council against the Bogumil heresy and transfer of power to his son Stefan).

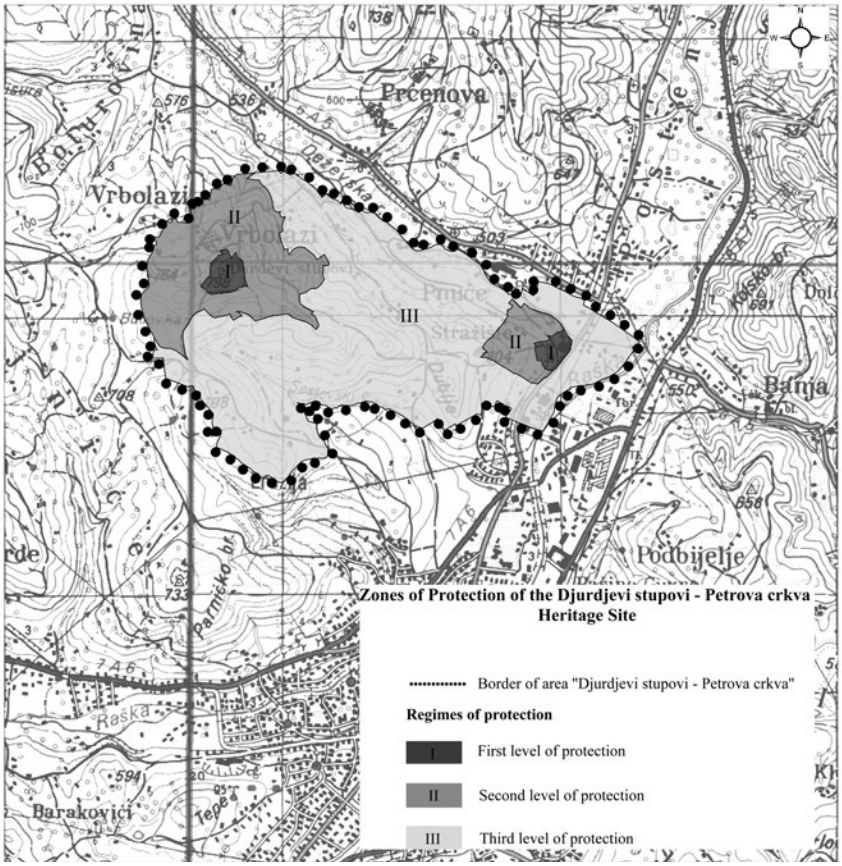

Figure 5. Zones of Protection of the Đurđevi stupovi–Petrova crkva World Heritage Site
(Source: Spatial Plan for the Spatial Purpose Area of the Spatial Cultural-Historical Unit of Stari Ras and Sopoćani with modification, Institute of Transportation - CIP, 2012)

used for settlement structures with low-rise buildings or buildings of the same height, with a small floor area ratio and plot coverage, plenty of green space and large open spaces. The Spatial Plan determines the protection regimes of degrees I, II and III of protection and establishes the obligation for the Cultural Heritage Preservation Institute of the Republic of Serbia to develop a management plan for this site.

In spite of the fact that Stari Ras with Sopoćani does not occupy a large area in the context of sites inscribed on the World Heritage List, it should be mentioned that a completely opposing opinion became current recently, even in professional circles, that the unit should include only the Sopoćani Monastery. The lack of understanding the concept of World Heritage and the lack of knowledge about the tools for achieving a balanced heritage conservation and controlling the development of the city, namely the improvement of lives of the people living in the World Heritage site and the exclusivity in the approach to protection of only one monument whilst neglecting its surroundings, are only some of the reasons for the emergence of such proposals in the public arena (Kesić and Ristić, 2015). Considering the abovementioned, it can be said that protection zones are not sufficient if the spatial plan is not adequately implemented, which is conditioned by the World Heritage management system that has not yet been sufficiently developed in Serbia.

CONCLUDING CONSIDERATIONS

Starting from the obligations set forth in the international documents relevant for spatial planning and protection of World Heritage sites, as well as from the previous practice in drawing up the special purpose area spatial plans, some of the possibilities for improving the spatial planning and protection and management of World Heritage sites in Serbia can be considered. The first possibility relates to the improvement of the legal basis for the protection of World Heritage sites in Serbia by harmonizing the national legislation with the relevant international documents. In the field of the protection of World Heritage sites, it is necessary first and foremost to develop the Law on Cultural Heritage, thus making the work in the field of protecting cultural heritage easier. This seems particularly important because of the fact that the current Law on Cultural Heritage of 1994 is outdated, primarily in terms of its harmonization with international standards and documents relating to the protection and management of cultural heritage. The new Law on Cultural Heritage should envisage the obligation to develop a World Heritage management plan, as well as the obligation to mutually harmonize spatial and management plans. This is of special importance given that the World Heritage management system in Serbia has not yet been sufficiently developed, and we should strive for its improvement. At the same time, the concept of the cultural landscape being in accordance with the European Landscape Convention is also lacking in the legislation of Serbia, which is of special importance for identifying the character of

the cultural landscape for World Heritage sites and other cultural heritage, but also of importance for determining the method of zoning.

The other possibility relates to the undertaking of activities for more efficient planning and protection of World Heritage sites. In the field of protecting cultural heritage, the adoption of a national strategy seems to be a priority, but also having management plans for all sites inscribed on the World Heritage List (Dobričić, 2012). In addition to abovementioned, it is also necessary to use more resources from foreign funds and other EU funds for the purpose of rehabilitating and affirming these sites, as well as to consider them as drivers of cultural, tourism, economic and other activities. These sites can bring substantial resources both to themselves and to the local economy from a well-conceived management plan that takes into account the principles of sustainable tourism. Coordination with other sectors, for example tourism and agriculture on the ground of planning and managing the World Heritage sites imposes itself as mandatory.

In order to increase the efficiency of World Heritage protection and planning, it is necessary to adopt special purpose area spatial plans for all sites included in the World Heritage List that would be aligned with the management plans, also with a pronounced spatial dimension of protection and development in the spatial plan. Both documents should be of equal importance for managing the sites included in the World Heritage List. Thus, a greater cooperation between cultural institutions and spatial planning imposes itself as mandatory, both through developing the management plans and through developing special purpose area spatial plans. Concerning the cooperation between these institutions, it is necessary to intensify communication that "does not only mean providing the information, but also listening to others and making efforts to understand them", considering that often the "conservators remain in their own world" (Jokilehto, 2013).

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INTERIOR-EXTERIOR CONNECTION IN ARCHITECTURAL DESIGN BASED ON THE INCORPORATION OF SPATIAL IN BETWEEN LAYERS. *STUDY OF FOUR ARCHITECTURAL PROJECTS*

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Different spatial layers in the architectural structure of a building can create particular spatial relations and an architectural space that cannot be defined as an inner space or as an outer space, but one which has the characteristics of both. This space, which can be called "in between space", appears as the result of a specific design concept in which the architectural composition is created by gradual insertion of volumes one inside another, like a box that is placed inside a box, inside of which is placed another smaller box and so on. The incorporation of various layers in the spatial arrangement of volumes in certain architectural compositions can be conceived as a possible approach in connecting the interior and exterior. This kind of conceptual design distinguishes itself from the common approach by its specific architecture that offers richness, variety, complexity and unique perception of space, thereby increasing its value. The paper investigates this particular concept through the analysis of four residential houses (Villa Le Lac by Le Corbusier, Solar House by Oswald Mathias Ungers, House N by Sou Fujimoto and Guerrero House by Alberto Campo Baeza), and it strives to find out the concept's use and advantages, all with the aim of opening up new possibilities in the design of buildings and enriching the design process.

Key words: **"in between" space, interior/exterior connection, spatial layers in architecture, spatial relations in architectural design.**

INTRODUCTION

Discussion about *space* is a complex subject, and it seems that architects, of all people, have the most difficulties when it comes to defining this term. Many scientific disciplines such as mathematics, philosophy, psychology have been investigating the problem of space for centuries. Thoughts about space can be traced back to Ancient times.

In architecture, space is the key element, "the core of architecture" (Dursun, 2009:028:1). Organisation of space is the central task of every architectural design. Spatial structure is one of the most important factors affecting the quality of the living environment. Architects, as creators of space, have a great responsibility to those for whom they design – the users of that space, because their design can have a great influence on the lifestyle of the inhabitants. According to Lawson (2001:8) "space creates settings which organize our lives, activities and relationships". In order to design, it is necessary to think and make detailed research about the space that will be occupied by its future users. The architect has to know how to perceive, observe and give geometrical form to something that exists in the client's imagination, which can be very demanding and challenging, having in mind that the perception of space is individual and that each individual experiences space in their own way. As Christian Norberg-Schulz (a Norwegian architect, educator and architectural theorist, 1926-2000) says: "We do not perceive the world that is identical and common to all of us ... but we see different worlds, which are the product of our special motivation and past experience" (Norberg-Šulc, 2006:16).

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Sigfried Giedion (a Bohemian-born Swiss historian and architectural critic, 1888-1968), one of the most important theoreticians who deal with the concept of space in architecture, puts the problem of space in the centre of the development of modern architecture. In his book *Space, Time and Architecture*, he distinguishes three spatial concepts that follow the development of architecture. His opinion is that the first concept of space, associated with the architecture of Egypt, Sumer and Greeks, was made by playing with volumes. In this concept, the interior space is completely ignored. The second concept, in the time frame from the Roman Pantheon to the end of the 18th century, has hollowed inward space as its primary characteristic. The third concept is some kind of a mixture of both of these, and it deals with the relationship and interaction between inner and outer space (Giedion, 2012).

The division of space into *interior* and *exterior* is common in architecture. To complete an architectural composition, it is necessary to deal with both inner and outer space, and to make a good connection between them. In the conventional design approach, the relationship between inside and outside is given very strictly. The borders between interior and exterior are clear and noticeable and the fields of inside and outside are very well defined. One can be either in a facility or out of it (Figure 1, left). Having only two opposites, inside and outside, can be compared to having only two colours, black and white. What if the range between the colours is enriched? There are many shades of grey that connect these two colours. Metaphorically speaking, the link from outside to inside and vice versa can be filled with many different shades of grey, i.e. with many other spaces that are between the outside and inside space (Figure 1, right). These spatial arrangements that are between cannot be defined either as inside or as outside space and can be called "in between" space. They relate to the architectural space that can be considered both as inner and outer at the same time. This idea of the organisation of space in architecture can be further related to a particular architectural design approach or concept which is symbolically identified here as the "box within a box" concept – the concept in which the space is considered as a mutual interplay of different spatial arrangements. It is a concept whereby the way from the inside to the outside is more complex and expressed through many spatial levels which can metaphorically be described as boxes placed one inside another (Figure 2, left).

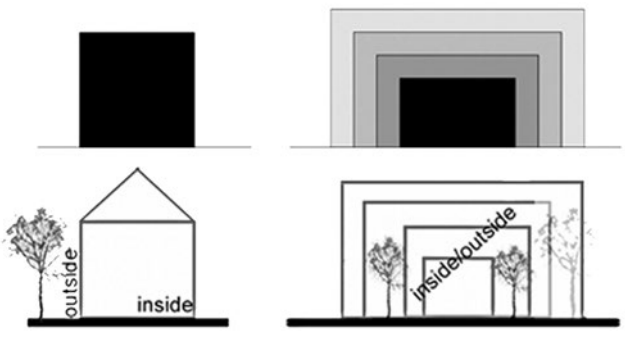

Figure 1. Schematic representation of space relations between inside and outside (common approach - to the left, more spatial relations incorporated between inside and outside - to the right) (Source: authors)

Oswald Mathias Ungers (a German architect and architectural theorist, 1926-2007), studied this idea as a theme for some of his projects (Neue stadt, Cologne, 1961-1964, unrealized project; Schloss Morsbroich Museum in Leverkusen, 1976-1984; Deutsches Architekturmuseum, Frankfurt, 1979-1984; Hotel Berlin, Lutzowplatz, Berlin, 1977, unrealized; Regional library of Baden, Karlsruhe, 1980-1984 (Ungers, 1998; DAM, 1985)). He makes a parallel between this concept and Russian dolls, which is quite a good illustration (Figure 2, right). For him, the *theme* is one of the most important elements in architecture – the key characteristic in the conceptual design of any construction that tends to have different values from the basic design, and the *space inside the space theme* stands out as a possibility.

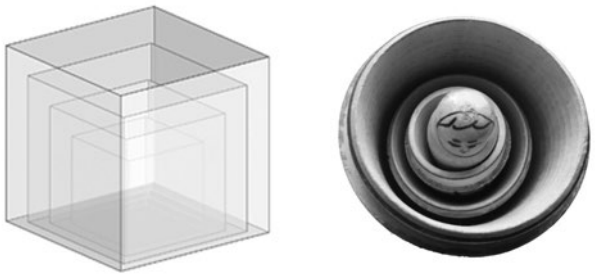

Figure 2. Box in the box in the box (left); Image of Russian dolls (right) (Source: authors)

This study deals with the concept of architectural design expressed through the spatial incorporation of volumes and the idea of in between space. A perception of space, different from the common perception, leads to the organisation of buildings through various spatial levels, which can offer many advantages. The paper investigates this specific concept by analysing four architectural projects. The study itself focuses on residential houses, but can also be extended to a larger scale, for example to multi story and public buildings, residential complexes and urban structures, which could be the subject of future investigations. During the research, each project was first analysed independently and then all the projects were put together by means of comparative analysis, in order to find their similarities and mutual elements, set aside their differences, and compare the concepts using the same criteria. This was done in order to reach a specific conclusion which could be helpful in defining one definite idea applicable in architectural design.

ANALYSIS

The four projects chosen for the research are (Figure 3): **Villa Le Lac** by Le Corbusier and Pierre Jeanneret constructed in 1923/1924, **Solar House** by Oswald Mathias Ungers designed for a competition in 1979, **House N** by Sou Fujimoto constructed in 2008 and **Guerrero House** by Alberto Campo Baeza constructed in 2005. The projects are located in different parts of the world, and designed by different architects in different periods of time, but their concepts are based on the same key element – the element of incorporating space. The main connection between them is their similar approach to the design, the same theme interpreted in different ways and with different goals, and in

between space as a leitmotif that plays a major role in their structural concepts.

The study bases its analysis on the typology, compositional arrangement and existing contextual criterion. Generally, the incorporation of space in architectural design can be observed from various aspects: from the phenomenal point of view as a phenomenon that contains the characteristics of continuity ("an object that continues to turn up inside another object describes a sequence which could theoretically carry on indefinitely, a continual process that is no longer intelligible in logical terms" (Ungers, 1982:57)); from the conceptual point of view as a clear matrix pattern for the organisation of buildings, squares, cities etc.; from the sculptural point of view as an artistic work with a particular theme; or from the psychological, or geometrical point of view etc.

Each of these projects is organised as an architectural composition that comprises a certain number of volumes, which vary from project to project depending on the particular concept: in Villa Le Lac two, in Solar House four, in House N three, in Guerrero House two volumes. The volumes function as shells or as layers that overlap each other in order to create a complete architectural entirety. They are inserted one inside another, like a box inside a box inside a box and so on. These boxes can be conceived as different houses placed one inside another, because each of them contains certain functions. They create different spaces that work together as related parts which make up a whole. Each project is characterised by its own layers (Figure 4): Villa Le Lac – central house and green room; Solar House – stone house (central), glass house, greenery house and nature house; House N – central house space, house space and garden space; Guerrero House – central house space and front/back garden. In each project the central volume is noticeable, which is at the same time the central part of the composition, the most inner shell and the most important one. Other shells wrap around the central one and broaden its functional possibilities. All of the shells work together to create one complex structure. Observed at the individual level, the volumes have no major significance, but in mutual relationship, they create a meaningful composition that has a particular purpose.

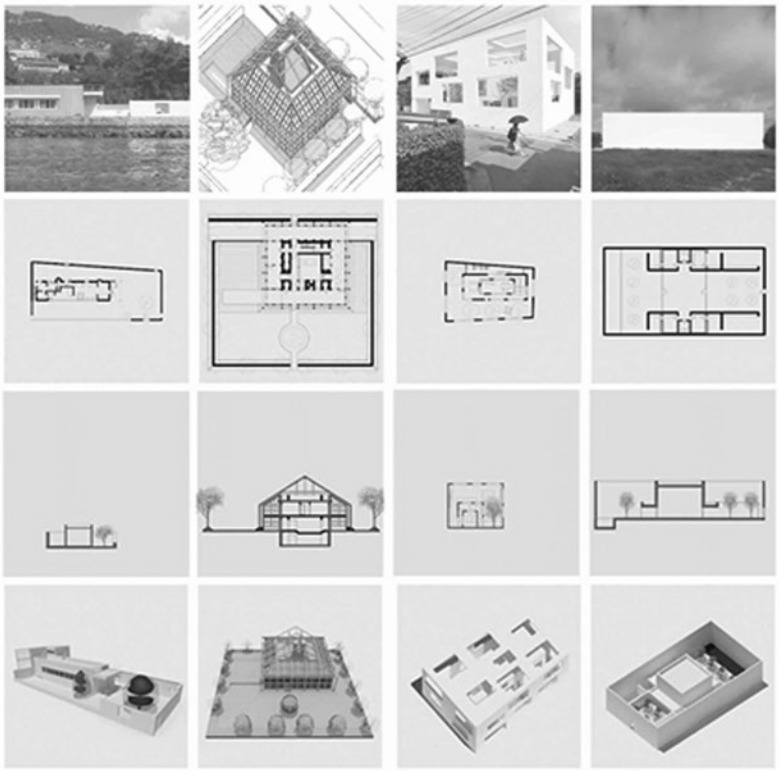

Figure 3. Photos, layouts, sections and 3D models of Villa Le Lac, Solar House, House N and Guerrero House (from left to right) (Source: authors)

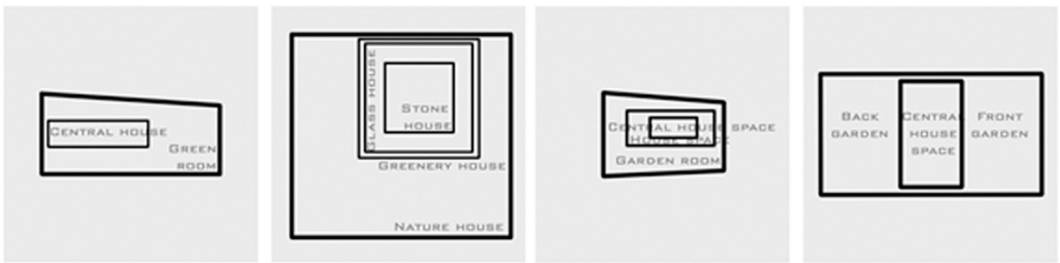

Figure 4. Sketch of different shells and spaces created within them (Villa Le Lac, Solar House, House N, Guerrero house) (Source: authors)

In order to better understand the concept, the projects have been decomposed into their component parts. The drawings in Figure 5 left present the schemes of how the different volumes overlap in each project. Although the number of volumes varies, the principle of the arrangement of the composition is always the same. In these architectural compositions, the membranes (shells) can be conceived as the main constructive elements that create the structure, the skeleton. Those membranes are circular and enclose the space placed inside them. The space inside is actually empty, a void, that searches for its purpose. The purpose of the emptiness is given through its use, which is organised through the creation of another space inside it. The membranes work as a body. They limit and constrain the space, and define its gravity fields, creating a void which should have certain functions. There are many possibilities, because the void is not observed as being nothing, but rather as being something, as being the part of the architecture placed in between. Decomposition of the layers that create the composition, shown as the scheme of body and voids, helps to better understand the structural arrangements (Figure 5, right). The composition is created by mutual shifts of different bodies and voids, which create separations and at the same time transitions between spaces from the inside to the outside and vice versa.

Contextual conditions such as the location and climate are of great importance in the development of the projects. This concept is actually a tool between the pre-existing contextual conditions at the site and the final desired goal to be achieved by the architecture. The existing contexts and aims of each project are briefly presented in the following paragraphs:

Villa Le Lac is located on the shore of Lake Geneva in Switzerland, surrounded by the perfect natural landscape, in an area with a moderate/mountain climate. The main idea of applying the concept of incorporation in this project is based on the limitation of the landscape and its adjustment to the human scale. "Landscape, omnipresent on all sides, omnipotent, becomes tiring. In conditions like this, when there is beautiful nature everywhere, it is not possible to see it anymore. The landscape has a need to be restricted, to be dimensioned through one radical decision" (Le Corbusier, 2004: 22-23). According to the author, in this case, it was necessary to close the horizons by constructing walls and to open them only at a few strategic points, which means creating a shell around the house that nests the house inside a "box" and creates a layer of in between space.

Solar House is located in the calm residential settlement of Melkerei, in Landstuhl in Germany, also in an area of moderate climatic conditions. Here, the concept is based on the idea of energy efficiency, so the theme of incorporation as the idea of wrapping protective shells around the living space, in order to achieve the thermal comfort of the central core, fits perfectly (like layers of clothes). The author introduces the concept of incorporation of spatial layers into the design consciously as a principle in order to create a prototype for a house that is able to satisfy the energy consumption needs. "The theme of the house within the house corresponds to a room protected by more than one shell, or, put another way, several spatial shells that surround a space set at the centre" (Ungers, 1982:59).

House N is located in a typical Japanese residential area within the high density city of Oita in Japan, again with a moderate climate. The chaotic environment, with many

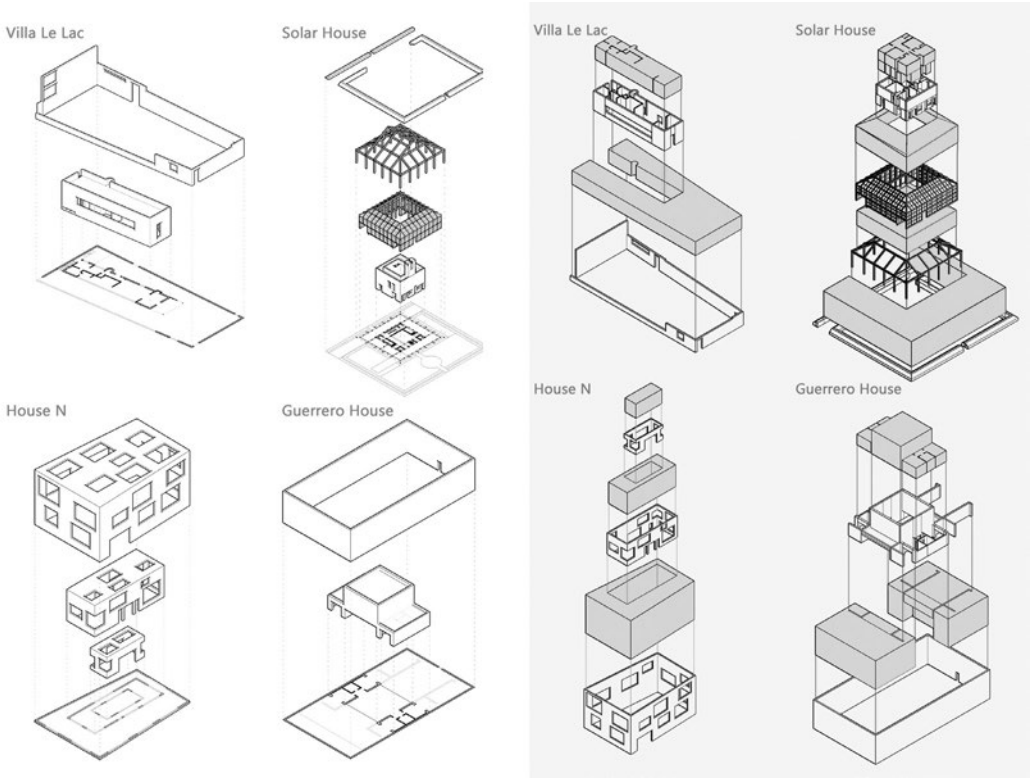

Figure 5. Axonometric view of decomposed architectural compositions - overlapping of different layers (left); Study of body and void (right) (Source: authors)

narrow streets and a large number of houses, caused the idea of space gradation from public (city, streets) to strictly private (centre of the house). The aim can be recognised as the will to differentiate the living space from busy everyday life, but at the same time to make it a part of the same everyday life, namely, to create private space inside the human "jungle", but not to remove the sense of being part of the "jungle". The architect clearly explains why this concept has been applied: "I have always had doubts about streets and houses being separated by a single wall, and wondered that a gradation of rich domain accompanied by various senses of distance between streets and houses might be a possibility, such as: a place inside the house that is fairly near the street; a place that is a bit far from the street, and a place far off the street, in secure privacy" (ArchDaily, 2011).

Guerrero House has a slightly different context than the other three projects. It is situated in the southwest part of Spain, in Cadiz, a city on the coast of the Atlantic Ocean, with a typical Mediterranean climate. Such climatic conditions result in the kind of architecture more oriented towards open space, but at the same time, because of the strong sun and high temperatures, architecture that needs to be protected and shaded. On the basis of the contextual conditions and the comprehension of architecture as an artistic expression, the concept of incorporation in this project is applied with the aim to create an architectural composition full of light and shade, or as the architect said: "the construction of luminous shadow" (Campo Baeza, 2005).

The important elements that greatly influence the architectural design of the projects are shown in Table 1.

DISCUSSION

The issue of the relation between the interior and exterior is unavoidable in every architectural project. What characterises the idea of space incorporation is the number of interrelations and gradation of the spatial layers, which make it suitable and applicable in architectural design, especially when it comes to connecting inner and outer space. In order to create a good and continuous link between those spaces, it is often necessary to find a compromise. The concept of incorporating spatial layers, i.e. the introduction of mutual relations, stands out as one of

Table 1. Overview of the main characteristics of the projects

Project	Design/construction year	Location	Location context	Climate	Conceptual idea	Number of layers	Layers	Level of transparency between composition and surrounding area
Villa Le Lac	1923/ 1924	Lake Geneva, Switzerland	- lake shore -surrounded by the perfect natural landscape	moderate/ mountain	to limit the omnipresent nature and to adjust it to a human scale	2	- central house - green room	semi-transparent
Solar House	1979	Melkerei, Landstuhl, Germany	- calm residential settlement	moderate	idea of energy efficiency (to create a room protected by more than one shell)	4	- stone house (central) - glass house - greenery house - nature house	semi-transparent
House N	2008	Oita, Japan	- high density neighbourhood - typical Japanese residential area in the city	moderate	space gradation from public (city, streets) to strictly private	3	- central house space - house space - garden space	semi-transparent
Guerrero House	2005	Cadiz, Spain	- periphery of the city on the coast of the Atlantic Ocean - large area of flat land surrounded by local flora	Mediterranean	the construction of luminous shadow	2	- central house space - front/back garden	non-transparent

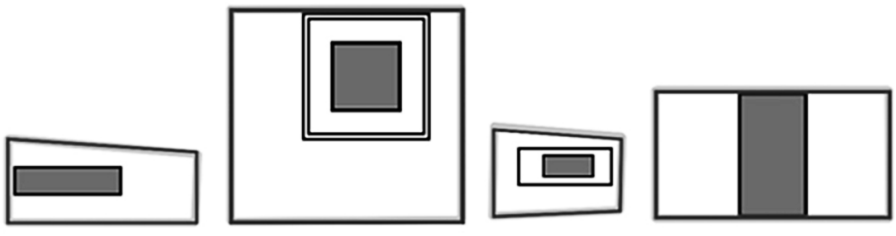

Figure 6. Schematic representation of central space and borders in Villa Le Lac, Solar House, House N and Guerrero House (Source: authors)

the possible solutions. The concept that has its roots in the earliest history of humankind, recognised as a part of urban planning and architecture through the centuries[2], although in most cases incorporated unconsciously, can become conscious element in projects, like in these four residential houses.

In the four examples, different motives and goals, as well as different contextual conditions (location, climate), use the same approach to architectural design independently, but with variations that create totally different architectural structures, indicating the possibility of diversity of the theme of incorporation. In the project of Villa Le Lac the main idea is to limit the powerful nature that is present everywhere around it and, if not adjusted to the human scale, can disturb the inhabitants. Here, in between space functions as a filter between people and nature. On the other hand, the theme of incorporation in Solar House has a totally different purpose. Striving to create a house which is energy efficient, in between spaces again have the role of filters, but now the filters are between heat and cold. In the project for House N the accent is placed on the gradual switch of volumes which lead from public to private space. The space is conceived more deeply and receives the characteristics of diversity and richness. Guerrero House develops itself in the framework of the climatic conditions presented at its site. It understands architecture as a means of artistic expression. Here, the concept of incorporation can be conceived as a tool that transforms architecture into a sculptural game that plays with light and dark – the sun and the shade. This comparison can outline key words that express the possible use of in between space, such as: limitation of omnipresent nature, energy efficient membranes, gradual gradation between city and home, the game of light and shadow.

What is noticeable at first glance of the study is that the house is not figured as an independent element, but always as a part of a larger architectural composition that comprises both internal and external spaces, and functions as a unique structure. The composition is defined with two main elements, which are its central part (the core) and external border. The central core is the main part of the composition, the most inner space that is always characterised as a real interior, i.e. the part that is very private and used the most. The external border is the line that defines the area of use and represents a division from the urban environment. It defines the total space of the architectural composition and separates the private from the public i.e. the urban environment (real outside space). Actually, in some way, it defines the users' field of gravity. Figure 6 schematically shows the position of the central core and external border in each single architectural composition. By looking at these schemes, it is also possible to make a parallel between the organisation of the building and the organisation of the city where, in most cases, there is a historical nucleus on one side, and the city wall, which in mediaeval time served to separate the city from the countryside and today separates the central zone from periphery, on the other.

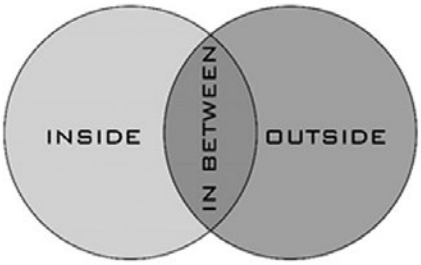

Figure 7. In between space as an intersection of the inside and outside fields of gravity – schematic presentation (Source: authors)

Between the central core and external borders the space is organised through different structural layers that operate between the inside and outside. The composition develops itself through layers (volumes) which are incorporated in gradual switch from the surrounding environment to the central part of the house. Volumes are inserted one inside another. One volume is an integral part of another and together they create the complete compositional structure. The layers between the outside environment and the central core combine the characteristics of both the interior and exterior and therefore cannot be precisely defined. They create the space that is in between, and that can, depending on the point of observation, be inside or outside (Figure 7). In between deals with different gravity fields and acts in

[2] Starting from the Egyptian pyramids, ancient planned towns, and even settlements from the earliest civilisations, Greek temples etc., through medieval fortifications to modern villas, contemporary residential buildings, museums, etc., it is possible to follow the theme of space incorporation or space wrapping. This theme (concept), has probably been applied unconsciously and with different aims: in some of the cases the application has arisen for the purpose of fortification (for example in the Settlement of Akhetaton - Tell el-Amarna, built in the first half of the 14th century BC as a village for workers, where various elements interweave in the composition and form each other – blocks inserted inside fortified walls, homes inserted inside blocks); in pyramids it maybe tends to hide the tomb and keep it in a secure position, perfectly suitable for the resurrection of the soul (the pyramids were built as sculptured tombs for Pharaohs, with many symbolic meanings. The real tomb, the room where pharaohs were buried, was usually to be found in the centre of the pyramid, from where, it was believed, the soul of the dead would easily rise up, through the top of the pyramid, to the sky, which resulted in the architectural form that includes elements of incorporation, one space inside another.); in temples it maybe has the purpose to indicate the level of sanctity and to emphasise the importance of the holy space (the most holy space is in the heart of the building, like for example in Temple C in Selinunte, an ancient Greek city in Sicily, where the space of the temple rises up on the uplifted plateau of the consecrated area, surrounded by a colonnade, where in the innermost nucleus can be found the cell and sanctuary); in some cases it has operated over the course of time and more or less by chance (for example the church Severinskirche in Cologne where five different layouts of five superimposed churches can be recognised that were built one on top of the other, over the course of the centuries, in succession, where elements of each still exist and can be distinguished (Ungers, 1982)). Generally observed, any urban town or city surrounded by a city wall, which defines its territory and separates it from the countryside, is an object within an object. Inside the city wall are buildings, arranged within squares, which is another object inside an object. Buildings can have courts, as smaller spaces ascribed inside, and so on, and the idea of incorporation can be continued to smaller spatial units. The same example, but observed in an opposite way, is the gradual growth of a city. Throughout history, towns have usually been formed around crossroads or market places as their central nucleus, with a church and town hall. Streets are set around a central nucleus, in perfect cases as concentric rings, in which residential blocks are set. As the city grows, the number of rings increases and the city zones expand which can, in theory, go to infinity.

the game of spatial overlapping and correlations, the game between interior and exterior. Its presence gives specific character to the object, whose structure becomes more complex and richer. The architectural design here is not only about creating the house, but about creating a lifestyle. The concept expresses the characteristics of changeability and flexibility and the house blends with its users and follows their actual needs. So, on this basis, a platform for discussion can be established based on the characteristics of changeability and flexibility, and also gradualness and the level of privacy and the level of transparency, which are all related to the contextual conditions.

The area of use inside the architectural composition changes its size depending on the actual conditions. The house can gradually increase or decrease, depending on the weather conditions. The growth of the house is followed by the expansion of the field of gravity of its inhabitants. During the winter season, when the weather is cold, the house is framed inside the smallest cell – the central core. As the weather gets better, the house expands its volume, step by step. The house is never the same. It always transforms and adapts, and in this way it becomes a dynamic structure that lives together with people. Figure 8 shows some schemes of possible expansions in all four projects. The possible expansions vary from project to project, depending on the number of layers incorporated. Changeability due to the weather conditions is most evident in the project of Solar House, and then in the projects of Villa Le Lac and House N, while it can be noticed in the project of Guerrero House, but it does not have such great importance due to its hot climate. The Mediterranean climate allows the house to be used equally for almost the whole year. Here, the central core can even be used in the opposite way, as protection from excessive sun. Anyway, the exterior space can be considered as an expansion of the interior space, whereby the expansion is realized in a gradual way through spatial layers.

Gradualness can be observed better throughout the transformation of the house based on the level of privacy. There is always the most private part of the composition, which is the central core on one side, and the public space which is the urban environment on the other side. There is no sharp border between these two opposites. The line that separates private from public gradually vanishes and the link in between is established step by step, through various spatial layers of different degrees of privacy. One can have a sense of living in the city/countryside, but at the same time can feel his own private oasis. The gradation of privacy

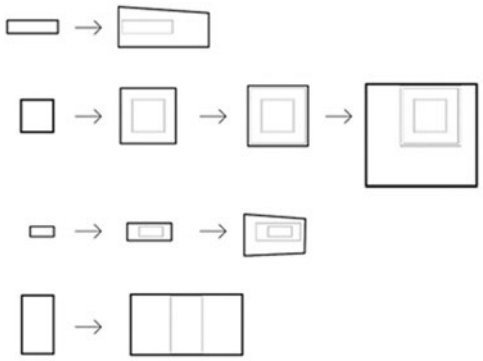

Figure 8. Schemes that show expansion of the houses (Villa Le Lac, Solar House, House N, Guerrero House) (Source: authors)

is most apparent in the project of House N, but the same element circulates through all four projects (Figure 9).

The existence of an external border is always present as a physical element that defines the total volume of an architectural composition. It has the role of separating the gravity space of the inhabitants from the external urban environment. In a way it creates an enclosure inside which the composition develops. Although it is always present, the enclosure differs depending on the degree of its transparency. Villa Le Lac allows the surrounding landscape to penetrate inside the open space of its green garden through the openings in the external wall, and even further, through the large running windows to the central space of the house. The wall is interrupted by clearly specified spots. Openings bring part of the landscape to the composition, making nature a part of it. By inserting the surrounding environment, a unique relationship is created between the location and its nature. Solar House is semi-transparent. The central core is massive and made of solid materials. It is a real, traditional house that hides inside other layers and conserves its privacy. Each layer, going from the centre to the streets, becomes more transparent (solid layer, glass layer, wooden skeleton, plants and trees). These layers work as membranes that do not totally block the views to the surrounding area, but provide a certain dose of privacy. House N gives the impression of simultaneous closeness and openness. Its shells work like strong armour that closes and strictly limit the volumes in all three directions. Perforated parts allow, on the other hand, the nature to come inside the defined area. Rain, snow, sun, wind, clouds, the sky ... all these elements become part of everyday life inside the boxes. Guerrero House has a totally opposite approach. It

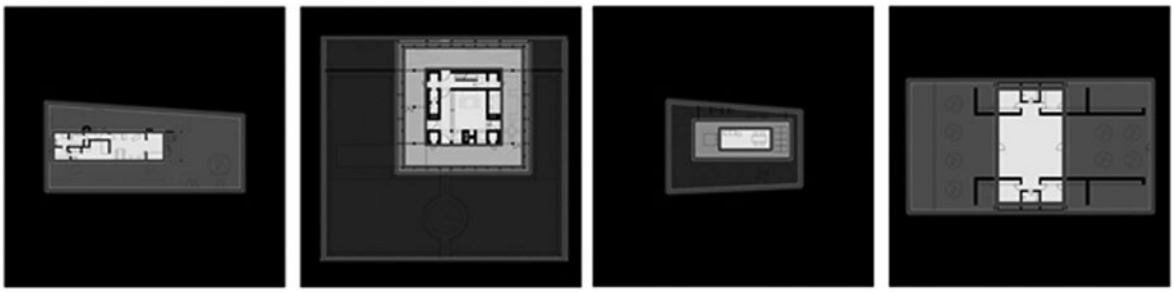

Figure 9. Schematic representation of the level of privacy in Villa Le Lac, Solar House, House N and Guerrero House. Changes go from the most private central core (white) to the public urban surroundings (black) (Source: authors)

completely closes itself from the surrounding area by high solid walls with only one small door opening as an entrance to the inside area. The only link with the surroundings is the sky; it is open in a vertical direction, through the z-axis. This introvert design has the purpose of providing conditions which will satisfy the main idea – to create the game of light and shade. The sun throws the rays from above, big walls create the shadows, and the performance can start. The architecture takes on the characteristics of a theatre and becomes an active participant. So, here, the concept of incorporation has a more poetic and artistic character.

The concept of incorporation in the spatial arrangement of the architectural composition that has been studied throughout four different cases of residential house projects is used as the main basis for the development of all of these projects. Although they have the same approach to the design concept, the goals and direction for further developing these projects are extremely different. What is common is the fact that layered space is used as an element that makes the connection between the interior and exterior, a connection that is specific and based on gradation and mutual interrelations. The different aims applied in the projects indicate the characteristic of diversity. While Villa Le Lac strives to limit the omnipresent nature and to adjust it to the human scale, Guerrero House hides itself from the surrounding environment and is only open to the sky and sun. Solar House has a strong task to be energy efficient and it uses layers as its clothes, to save as much energy as possible. On the other hand, House N deals with the relations between public and private and tends to soften the strong contrast in their connection. The layers of incorporation are used as filters between the house and nature, warm and cold, the city and the house, the light and dark. And these are just some of the possibilities.

CONCLUSION

This research on the topic of space in architecture that cannot be defined either as inside space or as outside space, but as architectural space that can be at the same time considered as inner and outer, has the main goal of elaborating the specific concept of understanding the "in between" space in architecture, which introduces a principle of design different from the conventional one, a principle of layered space. The design always tends to find something new. A conventional house is designed in a way in which outer and inner space are clearly defined. On the other hand, this approach offers different perspectives and perceptions. It strives to open up new possibilities in architectural design related to setting up a different lifestyle for the inhabitants, a lifestyle that is more versatile for them, and also to encourage new perceptions in architecture. The study tries to emphasize the value of layered space and its interplay and relationship between indoor and outdoor. The concept of spatial incorporation appears to be a very good tool in connecting external and internal space. It offers many interrelations which operate between these two opposite sides. Their relation is not as sharp as it is in usual architectural design. The outside space is rather observed as an extension of the inside space. Clear borders do not exist anymore. Spaces switch gradually, making the architectural composition more unified and unique.

Apart from the projects analysed here, which are chosen as representative, there are many other in the field of housing that deal with a similar concept. Many of them can be found in Japanese architecture, like those from Toyo Ito (White U, White O), Suppose Design Office (House in Buzen), Takeshi Hosaka (Inside Out), Shigeru Ban (Naked House), Kazuyo Sejima and Ryue Nishizawa (Moriyama House) etc. Japanese architecture is very specific and in most cases influenced by the lack of construction space, which can, though not always, be one of the reasons for the application of layered space. Also, this kind of architecture can be widely found in areas with a Mediterranean warm climate, where the exterior is used almost as much as the interior. Guerrero House is not the only project by Alberto Campo Baeza based on this concept. This architect has designed other buildings in a similar way, more oriented towards introvert design, such are Gaspar House, Moliner House, Cala House etc.

This paper is just a part of larger investigations into in between space in architecture. Further studies will deal with the same problem, but on a larger scale. Future possibilities include similar studies, first on larger buildings/residential complexes and then on the scale of urban structures. Investigations into different levels can give a better overview and more comprehensive conclusions on the topic.

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PERFUMED HISTORIC BUILDINGS: ISSUES OF AUTHENTICITY

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Contemporary historical preservation practice includes olfactory preservation as an experimental method of architectural preservation. The implementation of manufactured scents in historic buildings raises important issues of authenticity. This paper focuses on three important issues in the relation between olfactory preservation and authenticity: the importance of phenomenology in memory evocation; the relative character of the authenticity concept; and the significance of social values in historic preservation. This requires a critical examination of charters, documents and theoretical interpretations which reflect a broader concept of authenticity. The paper discusses certain articles of the Venice Charter, the Nara Document on Authenticity, as well as the sense of smell in architectural experience through critical analysis of the theories of John Ruskin, Viollet-le-Duc, Roger Scruton and Juhani Pallasmaa and their concepts of authenticity. Authenticity issues are illustrated by the examples of olfactory preservation: olfactory reconstruction of Philip Johnson's Glass House; interior restoration and olfactory reconstruction of the Arts Club in Mayfair, London; and the creation process of the perfume brand Arquiste, a meaningful example which relocates the olfactory reconstruction context. These critical analyses raise the question of scent in historic buildings as a value in itself.

Key words: **olfactory preservation, authenticity, value, manufactured scents.**

INTRODUCTION

In the contemporary historical preservation practice the importance of senses is increasingly taking into account evoking memories and associations in historic spaces. As an experimental method of architectural preservation, the olfactory method raises numerous questions related to the authenticity of historic buildings. Manufactured scents, as new elements in historic buildings, change the experience of the entire building in a seemingly invisible, yet a comprehensive way, emphasizing its elements as well as its identity. The paper discusses how the implementation of manufactured scents in historic buildings affects certain aspects of authenticity and, therefore, current interpretations of authenticity and architectural experience. It attempts to answer questions such as: Why is it important to consider the implementation of manufactured scents in preservation projects, as well as its relation to the authenticity concept? What are the most significant aspects of olfactory preservation which have to be considered so as not to undermine the authenticity of historic buildings?

The paper critically examines the international charters and documents on authenticity (the Venice Charter, the Nara Document on Authenticity), as well as theories (John Ruskin, Viollet-le-Duc, Roger Scruton and Juhani Pallasmaa) which reflect on interpretations of the broader concept of authenticity. There are three important issues arising from the relationship between the analysis of the aspects of olfactory preservation and interpretations of the concept of authenticity: the importance of phenomenology for the evocation of a memory, the relative character of the authenticity concept, and the significance of social values in historic preservation. These observed issues are analyzed primarily through the articles of the Nara Document on Authenticity (Lemaire and Stovel, 1994), one of the most influential documents in modern practice of historical preservation.

The aim of this paper is to point out the key positions in the interpretation of authenticity that are exclusive to or affirmative of this kind of experimental preservation and propose guidelines for new interpretations that would include scents as a source for the assessment of authenticity. Also, it is through the olfactory reconstruction that projects show positive and negative aspects of this preservation, as well as the applied principles that undermine or confirm the authenticity of the historic building. Proposals for the interpretation of authenticity amendments should take into account the methodology of olfactory preservation

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practice. The opening of this debate is of great importance for architectural conservation practice, but also for reconsideration and improvement of relevant charters, documents and theoretical views.

ISSUES OF AUTHENTICITY: THE NARA DOCUMENT ON AUTHENTICITY

In view of previous interpretations, charters and documents aimed at a comprehensive and precise definition of authenticity, due to the various issues that have explored the complexity of the context of authenticity, it is impossible to determine it fully and finally. The Nara Document on Authenticity has made the largest contribution to the interpretations of authenticity. The importance of defining and understanding the discourse of authenticity for the cultural heritage value is explained in Article 10 of the Nara Document on Authenticity: "The understanding of authenticity plays a fundamental role in all scientific studies of the cultural heritage, in conservation and restoration planning, as well as within the inscription procedures used for the World Heritage Convention and other cultural heritage inventories." (Lemaire and Stovel, 1994: 47).

The focus of the paper is the relative character of authenticity, the relation between the notion of authenticity and value with the emphasis on social value and raising the question of comprehension of a scent as a value in itself. These aspects of authenticity are primarily associated with the methodology of olfactory preservation practice.

Authenticity as a relative concept

Although the beginning of the Venice Charter states that it is important for future generations that the historical monuments convey "the full richness of their authenticity" (ICOMOS, 1964), current criteria and ranges of preservation are being expanded and the definition of authenticity has consequently become more flexible. According to the later INTBAU Venice Declaration (INTBAU, 2006), authenticity should not require absolute preservation of the original condition, but should reflect the complexity of the change in time, as well as the present moment. The Nara Document on Authenticity (1994) specifies that authenticity is not an absolute but rather a relative concept. At the Nara conference, Natalia Dushkina illustrated recommendations for assessment methods of the sources of authenticity evaluation. According to Dushkina, when examining each property individually, one can easily determine authenticity, which cannot be said of simultaneous testing of components (Dushkina, 1994: 310). In that case, testing does not have relative character, and a partial loss of authenticity in each property is possible, and consequently, the dissonance of the whole.

Authenticity and/as a value

At the Nara conference, an important issue was resolved – whether authenticity is a value in itself. Some speakers supported the previous definition originating from the Venice Charter, e.g. Dushkina said that "authenticity is a value category of culture" (ibid.), arguing that material and non-material sources for authenticity evaluation are actually *carriers* of the monument's authenticity and that they can be brought into direct relation with it. This claim could be interpreted as if authenticity is equalized with the value, but the Nara Document on Authenticity contributed to the Venice Charter by solving numerous crucial issues of the authenticity concept, among others, defining that authenticity is not a value in itself, but that it is a key factor in determining the value. The Nara Document on Authenticity provides a list of sources for the evaluation of authenticity, whose analysis is important for assessing and preserving authenticity when implementing manufactured scents in historic buildings, which will be discussed further in the paper.

After the Nara conference, numerous meetings followed in order to review the Nara Document on Authenticity, the expansion of the meaning and the usage of the concept of authenticity in contemporary analysis and conservation practice. At the symposium in San Antonio in March 1996, the relation between authenticity and history, materials, identity and social values was discussed, in order to affirm the special cultural character of a certain region. An extension of the context of authenticity has been discussed under the conviction that "authenticity is a concept much larger than material integrity" (Declaration of San Antonio, 1996). The Declaration of San Antonio tried to redefine the sources for authenticity evaluation so as to include and reflect their real value, context, identity, integrity, use and function. However, the attempt of the Declaration of San Antonio to directly connect to the Nara Document on authenticity failed because it did not include the extension of *evidence* of authenticity. Besides authenticity sources defined in Article 13 of the Nara Document on Authenticity (form and design, materials and substance, use and function, traditions and techniques, location and setting, and spirit and feeling), the revision of the World Heritage Operational Guidelines (2005) in Article 82 included other internal and external factors (UNESCO World Heritage Centre, 2005: 21). In these terms, social value for evaluation and preservation of authenticity, which has been ignored in the past, could be brought into direct connection with olfactory preservation, as the value which reflects and preserves the identity of the building, its function and its spirit.

Besides the defined material aspects of authenticity, Marc Crunelle's argument – that space should be considered as a sense-stimulating environment, not as an emptiness – leads to options for defining scent as one of the sources for evaluation of authenticity, because now it is possible to document it (Crunelle, 2002: 1–6). The invention of Roman Kaiser from the mid–1970s called Headspace made it possible to archive scent from any space and later produce any artificial scent with identical characteristics. If scent were considered a source for the assessment of authenticity, fragrant preservation and authenticity would be brought into direct connection, and the issue of their relation could be resolved more accurately.

AUTHENTICITY CONCEPT IN ARCHITECTURAL EXPERIENCE

Truthfulness in architectural experience

The concept of truth can be contemplated universally, and parallels can be made between the discovery of truth by

reason and through senses. According to Parmenides[2], real truth can be perceived only by pure reason (*logos*). He claimed that it could be unveiled only to gods, and that it could never be revealed to humans through their senses. Given the fact that contemporary theory of preservation does not exclude the role of the senses in the concept of authenticity, this attitude towards the concept of truth could not be finally accepted. As Martin Heidegger claimed, the modern quest for the truth requires careful and systematic research in order to reach the truth, and the choice of sources of information significantly affect the results (Jokilehto, 2008: 24).

The concept of authenticity is defined through the notion of *truthfulness* in Article 9 of the Nara Document on Authenticity: "*Conservation of cultural heritage in all its forms and historical periods is rooted in the values attributed to the heritage. Our ability to understand these values depends, in part, on the degree to which information sources about these values may be understood as credible or* ***truthful****. Knowledge and understanding of these sources of information, in relation to original and subsequent characteristics of the cultural heritage, and their meaning, is a requisite basis for assessing all aspects of authenticity.*" (Nara Document on Authenticity, 1994: 46).

When discussing historical preservation or the concept of authenticity in restoration, it is important to refer to John Ruskin's theory, particularly to his concept of 'truth' explained in *The Seven Lamps of Architecture* (Ruskin, 1849). Ruskin's *theory* of 'truth' in architecture has influenced the contemporary international doctrines and charters on preservation (the Venice Charter, the Nara Document on Authenticity). Ruskin's interpretation of authenticity is significantly different from the attitude of his contemporary, an architect and a theoretician Viollet-le-Duc, which can be illustrated by their theories of restoration. Ruskin is an explicit opponent of restoration, and he identifies the notion of *restoration* with the demolition of the building (ibid.: 25–56). Unlike Viollet-le-Duc, Ruskin propagated stylistic authenticity in restoration. According to Ruskin (ibid.), in the modern era, everything should be accepted only in its own spirit. The question remains whether he excluded the *present* in the assessment of truthfulness or he equalized the spirit of the building with the spirit of the time in which it was built. Viollet-le-Duc was an opponent of stylistic unity in restoration and propagated restoration according to 'special circumstances' (Hearn, 1990: 272–273). According to Viollet-le-Duc (1866: 14): "To restore an edifice means neither to maintain it, nor to repair it, nor to rebuild it; it means to reestablish it in a finished state, which may in fact never have actually existed at any *given moment* (*moment donné*).". His negation of "any given moment" is, in fact, the key to his definition, which many theorists interpreted wrongly, that is, as the propagation of creating a "stylistic unity". To Viollet-le-Duc, it is more important for someone to be acquainted with the 'temperament' of the building than with shapes, styles and schools that building originates, because, as he claims: "...it is essential above all things that he should make it live" (Hearn, 1990: 272–273). As Viollet-le-Duc stated, the best way to preserve a building and make it 'live' is to find an appropriate use for it, so that there will be no occasion to make any more changes (Hearn, 1990). In determination of the spirit of the building or its 'temperament' he also takes into account its contemporary spirit, or the present, unlike Ruskin, who sees the value of the building only in its aging.

Ruskin's romantic attitude towards authenticity or *truth* in architecture is similar to contemporary phenomenological theories of architectural experience, but he points out that the truth does have an impact on pleasure, or it can otherwise lead to confusion in architectural experience (Ruskin, 1849). Regarding the implementation of manufactured scents in historical preservation projects, it could not be concluded from Ruskin's and Viollet-le-Duc's restoration theories that their attitudes towards authenticity exclude certain type of olfactory preservation. On the contrary, Viollet-le-Duc argues the existence of sensory memory stating that the perfume is a powerful tool to evoke memories of places, events and people. (Viollet-le-Duc, 1863: 72). It can be concluded that the inclusion of the aspect of smell, and the spirit of the place as a source for evaluation of authenticity increases the accuracy of the evaluation of authenticity and its preservation during restoration, because authenticity includes all transformations of the building until the restoration time, involving its function, for which scent is a valid 'proof'.

Metaphysical and phenomenological concept of authenticity

Contemporary attitudes towards fragrance aesthetics are significantly changing, as it is obvious from the examples of olfactory preservation in practice. Although some interpretations of authenticity completely deny phenomenology, it is definitely one of the important aspects in olfactory preservation analysis and practice. In the Nara Document on Authenticity (1994), the topic of *genius loci*, spirit of the place, is included in the definition of authenticity for the first time. Olfactory preservation as a method of experimental preservation emphasizes the importance of the sense of smell in preservation. Article 13 of the Nara Document on Authenticity is particularly important as it states that sources of authenticity may be material (use and functions, techniques, location and environment), and non-material (tradition, spirit and feeling) (ibid.: 47). However, in modern theory of architectural aesthetics there are divided opinions on the importance of the sense of smell in aesthetic experience, depending on whether architectural experience is estimated from the metaphysical or phenomenological point of view.

The meaning of the sense of fragrance in aesthetic experience can be presented through opposing theories of Juhani Pallasmaa and Roger Scruton. Scruton's theory is based on the notion of 'pleasure' in architecture, making a strict difference between intellectual and sensual pleasures (Scruton, 1979). By making the distinction between intellectual and sensual pleasures, Scruton (ibid.: 113) almost excludes the role of the senses in architectural experience (pleasure), because according to him, it always requires attention. Scruton (ibid.: 114) explains that a certain object is contemplated with the senses of vision and hearing, while

[2] Parmenides, the early Greek philosopher, was born in 520 BC, when Darius, King of Persia, started building Persepolis.

the senses of smell and taste are associated with an object, but also directly with the experience that comes from it, so it is impossible to make the necessary distance for cognitive evaluation (attention). According to Scruton (1979), the senses of vision and hearing are therefore forms of objective contemplation that trigger evaluation, while senses of smell and taste are forms of subjective contemplation and trigger reaction. Therefore, it can be concluded that architectural experience relies primarily on the present, or the perception of the beholder. But, does aesthetic experience belong entirely to the present (*moment donné*)? Scruton's theory that architectural experience requires exclusive attention is questionable, because, according to Pallasmaa, images of memory and imagination intertwine in the present (Pallasmaa, 2005: 67). Pallasmaa, as a representative of the phenomenological attitude in architecture, argues that architecture mediates between us and the world through the senses. As Pallasmaa claims, scent is important for evoking places "long neglected in our memory" (ibid.: 54). Thus, perception, memory and imagination are inextricably intertwined, and scent is exactly the element that triggers memory and imagination connecting them with what is perceived. According to Pallasmaa: "The nose makes the eyes remember". (ibid.).

If theories of Pallasmaa and Scruton refer to authenticity, the differences, advantages and disadvantages of their broader view of the concept of authenticity can be noticed. Scruton (1979: 114) claims that *values* are the most important for making a difference between sensory and aesthetic pleasure. Scruton explains the importance of values in a broader context, but he also emphasizes intellectual assessment or *attention* in architectural experience. In assessing these sources, according to Scruton (1979), values are more important than preferences, not only because we justify our actions through them, but also because we perceive the world through values. Scruton neglected the spirit of place and feelings as sources for the authenticity assessment, because according to him, authenticity can be estimated only intellectually. However, sources for the authenticity evaluation have certain characteristics that cannot be fully experienced and assessed without engaging the senses, and taking the preferences into account. Also, as previously mentioned, authenticity is relative, not absolute, as could be interpreted in Scruton's theory. Unlike Scruton, in Pallasmaa's interpretation of the architectural experience, the spirit of place and feelings are in focus, but the question is whether his concept of authenticity neglects other sources of information defined in charters. It seems that preservation of the spirit of place and feelings is crucial for establishing the connection between building's parts from different periods, as well as for the continuity of use value, which Viollet-le-Duc declared as the most important in restoration. Also, by stating that imagination and memory have influence on perception, Pallasmaa's definition involved the *past* which is evoked by the very sense of smell.

OLFACTORY PRESERVATION PRACTICE AND AUTHENTICITY

Projects that are analyzed are attempts at reviving a 'given moment' through sensory experience, and they are selected as relevant examples because of their process of analyzing the sources of authenticity, manufactured scents implementation, as well as values preserved through olfactory reconstruction.

Authenticity as a relative concept is illustrated through the examination and evaluation of the authenticity sources in olfactory reconstruction of Philip Johnson's Glass House which is a relative process. In the olfactory reconstruction during restoration of the interior of the Arts Club in London, the identity of the club and its social value, which is its greatest value, were successfully preserved. In this project, the scent is a new element that creates a connection between the old and new parts of the building. These examples show the importance of the social value in the historic preservation and represent a 'synthesis' of time and place in the memory of visitors, while the third project – the process of creating the perfume brand Arquiste – relocates the context of olfactory reconstruction of historic buildings. In this project, imagination is more important than perception, because the experience of historical sites and spaces, whose scents have been reconstructed, depends entirely on the personal associations with scents.

'Truthfulness' of a 'given moment' in olfactory reconstruction

Pallasmaa illustrates the importance of scent for space memory evocation with Le Corbusier's photo of the Villa Stein – de Monzie interior (Pallasmaa, 2005: 55–56). This photo illustrates that precise 'given moment'. Other than the 'given moment', Corbusier's sketches and photos project vivid images of the building. 'Truthfulness' of a 'given moment' is brought into question with photo showing the fish and the electric fan on the kitchen table, where an intense smell could be anticipated (Figure 1). The doubt remains whether it is a captured moment in the building's life or a scene made for photo shooting.

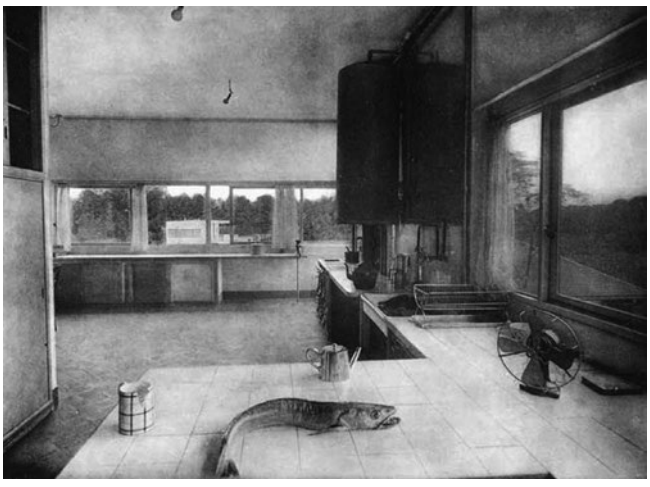

Figure 1. Kitchen in Villa Stein – de Monzie (Source: Till, 2009)

When we talk about the 'revival' of a 'given moment' through scents, in some cases, scents could put the sense of vision as secondary. Carlos Huber, an architect who specialized in historical preservation and a perfumer, claimed that

"smell is a time capsule" (World Monuments Fund, 2012: 8), which could mean that the smell reminds us of some spaces and events that might look completely different than the current ones, but because they are so intense and vivid in our memory, we can link them with the fragrance of the current space/place. The creation of the perfume brand Arquiste, done by Carlos Huber in cooperation with perfumers Yann Vasnier and Rodrigo Flores-Roux, displaces the context of olfactory reconstruction. Having previously conducted a thorough analysis, Huber made a collection of perfumes, using authentic sources, as a collection of different scents that recreate certain place and time, a historical place from the World Monuments Fund's[3] list[4] (ibid.: 2–6). Huber presented his perfume Arquiste at the "Scent Dinner" organized in the form of a dinner inspired by perfume's scent-alike ingredients (Figure 2). In the Arquiste project there is no direct connection with the historic space to which the scent once belonged, so the evocation of the place depends entirely on personal associations with scents, and the experience of history is personal, intimate and subjective. Going back to time when the reconstructed scent existed, the guests of "Scent Dinner" create their own spaces of memory and imagination. This is, perhaps, more authentic evocation of historical places than if the guests experienced them only visually, through photos or videos. The concept of the perfume brand Arquiste illustrates the only possible, metaphorical way of reviving *moment donné*, that is, through the guests' contemplation.

[3] World Monuments Fund is an independent organization, headquartered in New York City.

[4] Historical places: Catherine Palace, Tsarskoje Selo in Russia; WMF Jewish heritage sites in Italy; the central historic district of Mexico City, built atop the ruins of Tenochtitlan, the fourteenth-century capital of the Aztec empire; the central historic district of Mexico City, where the 'Royal' appellative of Jesús María is located; Potager du Roi and the Orangerie at Versailles, France El Escorial, San Lorenzo de El Escorial, Spain.

Figure 2. Page one of Scent Diner booklet (Source: Courtesy of World Monuments Fund, New York)

Authenticity as a relative concept in olfactory preservation practice

Similarly to the definition in the Nara Document on Authenticity, David Lowenthal also states that "authenticity in practice is never absolute, always relative" (Lowenthal, 1994: 123). Thus, every olfactory preservation project should develop its own method of research and analysis, evaluation of authenticity sources, their relation to the implemented scent, as well as the concept of scents' implementation. The most significant aspects of authenticity in the olfactory preservation practice are: spirit of the place, design, form and function. Spirit of the place is associated with the building's function, and the way of scent implementation (olfactory installations, or some other methods, such as cleaning, etc.). In the case of olfactory installations, besides design and materialization, their position in the building is also important, in order to achieve the intensity and to link the scent with visual experience. Recommendations for the method of authenticity sources evaluation by Dushkina (1994: 310), is to apply the examination of authenticity sources that is not simultaneous.

The olfactory preservation project which raises questions of scents' implementation in historic buildings is olfactory reconstruction of Philip Johnson's Glass House created by Jorge Otero-Pailos and Rosendo Mateu (Figure 3). As a successful preservation project, this olfactory reconstruction has been created after previous analysis and examination of house documentation. However, because of the lack of documentation, as authors said, "...the house appears distorted into an odorless image of a glass house." (Otero-Pailos, 2008: 40) (Figure 4). Therefore, it was necessary to undertake a more detailed analysis of the history of the house and its architectural concept that are important for its fragrance aesthetic. During the analysis, the following information were revealed: the architect's intention associated with smell, ventilation and air cleaning concept, social characteristics of people who have stayed in the house (members of the elite), etc. To preserve and experience the interior scent in its rich authenticity, all olfactory elements must be estimated separately. It means that it is necessary to consider all aspects that have historically affected the olfactory aesthetics of the house, until the present time. This way, a certain "synthesis of time and place" could be achieved. However, absolute synthesis of time and place

Figure 3. Philip Johnson Glass House interior (Source: Courtesy of Richard Schulman/www.schulmanphotography.com)

Figure 4. Philip Johnson Glass House interior
(Source: Courtesy of Richard Schulman/www.schulmanphotography.com)

does not exist, as Viollet-le-Duc (1866: 14) said in his interpretation of time in restoration, where he, actually, contests "any given moment". Time is not a constant that determines authenticity, though it affects its creation and modification. In Phillip Johnson's Glass House time has influenced the modification of the scent, so the analysis revealed three characteristic phases[5] by which olfactory reconstruction is divided (Otero-Pailos, 2008: 40).

Evaluation of authenticity sources in olfactory reconstruction of Philip Johnson's Glass House could be considered as a relative process. In this project, the sources for authenticity evaluation, such as the architect's intention, use and function, historical and social aspects are equally significant for the reconstruction of smell, and they must be analyzed separately and in detail. The focus was on the fragrance of tobacco smoke, as well as smell of wood and luxurious perfumes of that time. According to Otero-Pailos (2008), these smells have left physical traces in the house interior, as they at the same time reveal the profiles of users as well as the usage of space. This olfactory reconstruction emphasizes the preservation of the social value of the house, as well as the continuity of its function. As a result of each source analyzed separately, the authenticity of the Glass House is preserved.

Social value preservation in olfactory reconstruction practice

A successful example of olfactory preservation, with the focus on social value, is the interior restoration of the Arts Club building in Mayfair, London, one of the most popular members clubs until today (Figure 5). This club has a great legacy and significance – it was founded in 1863 at its current location – since 1896 (Rogers, 1920: 1). It was established as an elite members club, aimed at social intercourse of famous artists, architects, writers and scholars of the time. The intellectual elite, with an aperitif, tea or champagne and cigarettes, organized literary and poetry evenings and social gatherings in the Arts Club rooms (Figure 6 and 7). Social gatherings in the club lasted the whole day, and thematic desks were spontaneously organized by interest groups ("The Academy table", "The Architects' (Bricklayers) table", "The Bridge table", etc.) (Rogers, 1920: 38). For this reason, the Arts Club is of the utmost social, as well as cultural, historical and aesthetic value. The Arts Club building is in the Victorian style and it was completely renovated in 2012, in the Art Deco style by David D'Almada, maintaining its spirit (Figure 8). The Arts Club olfactory reconstruction is characterized with detailed research of scent elements in order to create a perfume

[5] First phase: the year of 1949, when the house was built, the second phase: 1949–1969, the third phase: from 1969, until today.

Figure 5. Art exhibition in The Arts Club sitting room
(Source: Courtesy of Kate Elliott/http://www.kateelliottphotography.co.uk/)

Figure 6. The Arts Club sitting room by day
(Source: Courtesy of Kate Elliott/http://www.kateelliottphotography.co.uk/)

Figure 7. The Arts Club sitting room at night
(Source: Courtesy of Red hot society PR Ricardo Garcia / www.redhot-society.com)

Figure 8. The Arts Club stairs
(Source: Courtesy of Red hot society PR Ricardo Garcia/ www.redhot-society.com)

that reflects the history of the building, preserves and determines its identity and, at the same time, represents contemporary olfactory brand of the club. Designing the scent was a complex task because in the renovated building there were several different functions (restaurants, a library, night club and a hotel). New manufactured scent was able to establish harmony and balance between different functions of the building. Club identity is exploratory, adventurous, bohemian, but also elitist, so scent notes include the scent of musk, spices, chamomile, mimosas, fine leather and sea air (Designing a Signature Scent, 2015). These olfactory notes reminiscent of the scent of old manuscripts mixed with cigar smoke, fine leather and precious woods evoke a sense of discovery and new knowledge, but also of comfort and peace. Manufactured fragrance in the Arts Club's renovated spaces evokes positive memories and emotions and creates a sense of intimacy and connection.

The implementation of manufactured scents in the Arts Club affirmed its sophisticated and elitist spirit and preserved the continuity of its use and function, as well as cultural, aesthetic and social value of the club. The Arts Club olfactory reconstruction evokes historical club memory, which could be completely evoked only by scents, because of its main (social) value. Luxury perfumes of the club's members, fragrance of artifacts that were used, as well as odor of cigarettes and drinks evoke memories of the space usage. The interior restoration project preserved continuity of the function, but other functions were also added, so scent is a new element that creates a connection between all parts of the building. In this olfactory preservation project authenticity sources such as forms and design, purpose and functions, the spirit of place and sense are properly evaluated and preserved.

DISCUSSION: PROPOSALS FOR THE INCLUSION OF SCENT IN AUTHENTICITY INTERPRETATION/S

Previous charters and documents gradually opened the way to the implicit inclusion of fragrance in evaluation of authenticity sources, by adding *spirit and emotions*, *other internal and external factors* in the Nara Document on Authenticity, as well as by the attempt to redefine sources, to include and reflect its *true value, context, identity, integrity,* and *use and function*, as it was defined in the Declaration of San Antonio. The importance of social value and identity for the authenticity concept and possibility of expanding the list of authenticity sources were also discussed at a symposium in San Antonio, where the Declaration of San Antonio was adopted. The insistence on social value is becoming increasingly relevant in historical preservation, and it is opening a possibility to define a scent as a value itself, as an indicator of social class and habits of people who have lived/ stayed at the building.

There are cases when scent is not a valid source for assessing authenticity, depending on whether it is in ephemeral or permanent and repetitive relation to a building. Dushkina proposed methods for effective evaluation of authenticity sources – evaluating components individually, which ought to be taken into account when producing adequate characteristics of manufactured scent which confirms the identity of the object. The relevance of the photos that show the previous 'life' of the building and its scents should be brought into question before olfactory reconstruction. A moment captured in a photo can often be 'projected' and it could illustrate the intention of the architect. Photo should not be a single proof in this case – it should be compared with written and other sources.

By analyzing properties of fragrance aesthetics and successful examples of olfactory reconstruction, an additional question emerges: could scent be a historic building's value in itself? If manufactured scent becomes a separate element of a historic building, it will become a new source for authenticity evaluation. And if scent becomes a source for authenticity evaluation, olfactory preservation and authenticity will be brought in direct relation, so the issues of authenticity could be accurately resolved. Crunelle has given a proposal for the affirmation of the importance of scent in architecture, arguing that it is now possible to define scent as a source for authenticity evaluation, because it now may be documented and archived. Charters, documents and theories about authenticity are not exclusive about the importance of the senses in authenticity evaluation – the spirit of place and feelings are defined as equally relevant authenticity sources, as well as material aspects, because they are in a direct relation with memory which could be powerfully evoked by the sense of smell. If the scent of a historical object is not perceived as a separate value, it could be a part of the social value of the building. New manufactured scent, besides preservation of social values and identity of the building, could also contribute to the artistic value of the building.

CONCLUSION

There are numerous significant factors for authenticity preservation through olfactory reconstruction, such as the relation between the scent element properties and the function, materialization, social history of the building, implementation concept of the manufactured scent, etc. However, the paper is focused on three important issues that have been discussed at international symposiums: the importance of phenomenology for the evocation of memory, the relative character of authenticity and the significance

of social values in historic preservation. Through the analysis of these problems, new questions appear, such as *truthfulness* of a 'given moment', relative process authenticity sources evaluation, as well as possible definitions of scent as an authenticity source. The deliberation of theories, international charters and documents on authenticity, as well as contemporary practice of olfactory reconstruction, lead to a conclusion that olfactory preservation and authenticity should be directly related, although authenticity interpretations are not entirely exclusive to such experimental methods of preservation. Some newly opened issues remain for further research, such as, whether the implementation of manufactured scents in historic buildings undermines the authenticity of the *contemporary* 'given moment'? Analysis and research of these issues are important for the revision of documents and charters which are crucial for architectural preservation.

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A COMPARATIVE ANALYSIS OF ARCHITECTS' VIEWS ON WOOD CONSTRUCTION

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Even though wood is locally a traditional material, it is rarely used in architecture in Bosnia and Herzegovina, which is why the constructed buildings have poor ecological properties. The main objective of the research is to determine the views of architects on sustainability principles in architecture, contemporary products and wood construction systems. An online questionnaire was used to collect responses by architects from Bosnia and Herzegovina, Serbia and Austria. The research results confirm the hypothesis that architects in Bosnia and Herzegovina, and in Serbia alike, do not have sufficient knowledge on the principles of sustainable architecture, contemporary products and wood construction systems, which is why they do not use wood in their projects. The results of a comparative analysis suggest that there is a cause-and-effect connection between the architects' views and the volume (scope) of the use of wood, and that the use of wood in constructing buildings in Austria is not only a result of better technical and technological equipment but also of the different views held by the architects. The value of the research results is that they point to the fact that by improving architects' knowledge we may improve architectural sustainability by using wood to a greater extent.

Key words: **sustainable architecture, ecological properties of buildings, contemporary timber products, architects' views, advanced training.**

INTRODUCTION

The term sustainable architecture derives from the term sustainable development. There is no official definition of sustainable development, and the definition given in 1987 by the World Commission on Environment and Development, the so-called Brundtland Commission, in its report titled *Our Common Future* is the one most widely used. It states that sustainable development strives to meet current needs without jeopardizing the possibility of meeting the future ones (UN, 1987). Just as there is no official definition of sustainable development so may numerous definitions be found in the literature on sustainable architecture, as well as very close terms such as sustainable, green, energy efficient, ecological, bioclimatic and so on. Knudstrup and others claim that architects rarely use the term sustainable, but they say for architecture that it is environmental, ecological, low energy, green, bioclimatic, solar and so forth, and that different terms point to different principles of this architecture (Knudstrup *et al.*, 2009). In the book *A Green Vitruvius. Principles and Practice of Sustainable Architectural Design* the authors list the terms used: environmentally friendly, environmentally conscious, energy conscious, sustainable, green, or simply green architecture, and conclude that there is no internationally accepted definition of green architecture (Fitzgerald *et al.,* 2008). Woolley, *et al.* conclude that there are many shades of green, as many terms are used in that regard (green, sustainable, environmental, ecological), and their shades depend on the context and audience they are intended for (Woolley *et al*., 2006). Depending on the way one looks at it and how the term sustainability in architecture is defined, certain fields get priority. For a building to be assessed as green, four groups of reference points must be observed: reduction of energy for use, reduction of external pollution and harm on the living environment, reduction of embodied energy and resource draining, and reduction of internal pollution and harm on health (ibid.).

With its characteristics, wood meets all the defined principles relating to sustainable architecture: use of local materials and (re)sources, use of materials from renewable sources, low energy materials and nontoxic materials (ibid.). Many authors stress the importance of wood as a material with minor effects on its users and the living environment, and they claim that wood is one of the best materials in nearly all situations (Bokalders and Block, 2010). Wood derives from a renewable source**,** i.e. forest, and after usage it may be processed into another product, or it may be used as a source of energy in the

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process of pyrolysis or ordinary combustion. As a building material, wood has a unique characteristic that is of great importance for the preservation of the living environment, namely that it reduces the amount of harmful CO_2 in the atmosphere by absorbing significant amounts of CO_2 during its growth, about 2 t CO_2 per 1 m^3 of wood (Kitek Kuzman and Vratuša, 2011). Wood production and processing also requires less production of energy than any other building material. Hence, for example, aluminium requires large quantities of energy for its production, 515,700 MJ/m^3, steel requires 167,648 MJ/m^3, cement requires 6,378 MJ/m^3, brick requires 4,956 MJ/m^3, and concrete 2,551 MJ/m^3 (Kirby, 2008), glass requires 151,200 MJ/m^3, plastic 93,620 MJ/m^3, while sawn timber only requires 165 MJ/m^3, wood chipboards 4,400 MJ/m^3, and laminated timber 2,530 MJ/m^3 (Kitek Kuzman and Vratuša, 2011).

The design and construction of sustainable architecture using wood is the practice of many countries, a practice based on its traditional use, but also upon applying the modern technologies of wood and timber processing and the production of new elements and products. Hence, cross-laminated timbers (CLT panels) can be used to build not only interfloor constructions (mezzanine lofts) and walls, but also whole premises. New systems enable greater freedom in design, and also in constructing several-storey buildings. Owing to the properties of CLT panels, an eight-storey building was constructed in London (Kujundžić, 2014).

The idea of sustainable architecture is not recognized enough in Bosnia and Herzegovina, so the same is not systemically used in the process of designing and constructing buildings. As for the materialization of houses, the several-century long traditional and local materials (in Bosnia and Herzegovina a local material is wood) are not sufficiently used (Truhelka, 1901; Redžić, 1974; Findrik, 1994; Arnautović-Aksić, 2009; etc.). In 2010 only 13,479 m^2 of prefabricated houses were built in Bosnia and Herzegovina, which is not even 1% of the total number of family houses (BHAS, 2011). In Austria the percentage of family houses constructed of wood is high, with a total of 35.7% (Kitek Kuzman, 2010). Prior to the war that broke out in 1991 in Bosnia and Herzegovina, 250,000 m^2 of prefabricated houses were manufactured (Iličić, 2011).

Architects in Bosnia and Herzegovina are not sufficiently aware of the significance of the use of wood for the ecological propriety of architecture, or for the overall sustainable development of Bosnia and Herzegovina. While the significance of the use of wood is increasing worldwide, in Bosnia and Herzegovina buildings are constructed in the same way as twenty years ago, and with each day the number of buildings with poor ecological performances is growing.

REVIEW OF PREVIOUS RESEARCH

The ecological performance of residential buildings in terms of the materials used was subject to the research of the author for the needs of the ongoing doctoral dissertation *The Application of wood in the residential architecture of Bosnia and Herzegovina from the viewpoint of the environmental safety of buildings*. One result of the research points to the scientific finding that family houses built of easy panel elements or by the mass use of CLT panels have far better ecological properties compared to the buildings that are currently being mass-constructed in Bosnia and Herzegovina with reinforced concrete and bricks. The research results prove that only the use of wood as the underlying material for construction may significantly improve the ecological properties of a building.

During the research, after exploring the characteristics of existing family houses, the author evaluated selected houses. The reference house (T) constitutes a typical family house in Bosnia and Herzegovina constructed between 1991 and 2014. Two of its variants were also evaluated – one built using easy wooden prefabricated panels (Tp), and the other using CLT panels (Tc). The evaluation was carried out using the *eco2soft* software from the Austrian Institute for Building Biology and Ecology (IBO, 2011). The evaluation results are given in Table 1 and Figures 1 and 2. The total ecological assessment of houses was illustrated by the ecological indicator OI3: Data on the consumption of energy from renewable sources (PENTR), as well as ecological indicator values – global warming potential (GWP) and acidification potential (AP) – give additional information on the ecological performance of houses.

Table 1. Results of the ecological evaluation of houses T, Tp and TC

House	Assessment	PENTR MJ	GWP $kgCO_2eq.$	AP $kgSO_2eq.$
	BG3	per m^2 of reference surface (OI3)		
T	270	3.426,00	234,57	0,874
TP	189	2.806,00	-23,88	0,745
TC	186	824,20	-118,40	0,804

The research results suggest that houses in which wood was used as the underlying material for structural elements, marked as Tp and Tc, have far better ecological characteristics than houses built in classical mass (Figures 1, 2).

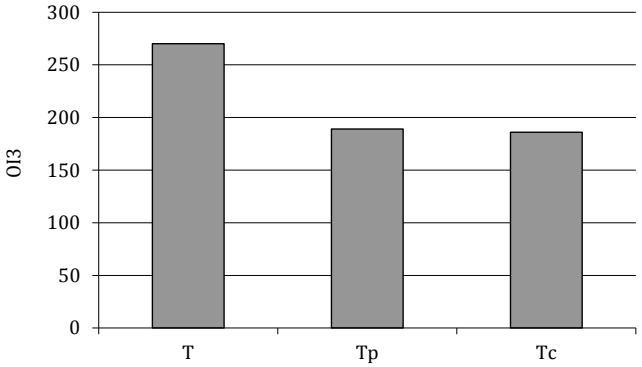

Figure 1. Results of the ecological evaluation of houses T, TP and TC (Source: author)

Wood, the impact of which on the ecological propriety of houses in Bosnia and Herzegovina has been proved in previous research, is not sufficiently used to have a greater impact, even though all the necessary prerequisites are there – raw materials (forest), a tradition of wood construction, and wood processing capacities. Due to the fact that there are good conditions for using wood, the question now

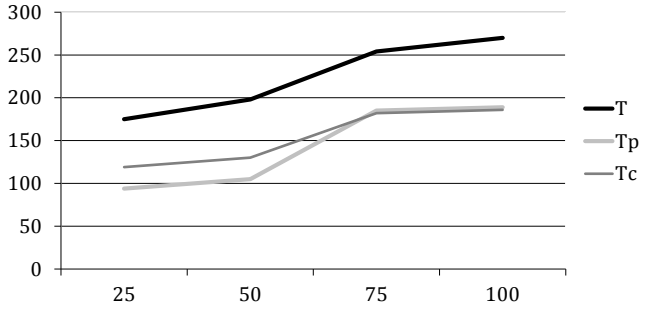

Figure 2. Results of the ecological evaluation of houses after 25, 50, 75 and 100 years (Source: author)

relates to the role of architects and their responsibility for the situation we have today. Architects and planners have an important role in achieving sustainable architecture, and they must, according to Bokalders and Block (2010), think holistically and have good basis in all aspects of sustainability, a wide and integrated approach, and a good understanding of different parts relevant for the sustainability of the whole building.

The attitude of architects on the use of wood in architecture has not been subject to more comprehensive research. Sanela Klarić conducted research related to the topic when she carried out a survey on employees in urbanism departments in certain municipalities of Bosnia and Herzegovina with respect to their knowledge of the principles, laws, regulations and standards of clean technologies and green construction, and the levels of requirements for building sustainable buildings, as well as the need for informal education in the institutions of Bosnia and Herzegovina. The survey results suggest that the level of knowledge on the subject matter is low and that the knowledge is only theoretical. The results also show that they did not have any investors with requirements for building low energy or passive buildings. Accordingly, she concluded that it is necessary to organize education on the application of clean technologies in construction that would be intended for civil servants, but also other participants in the construction process – investors, construction companies, etc. (Klarić, 2015).

A study on the use of wood as the material for building family houses in Slovenia was conducted in 2006 by Manja Kitek Kuzman and Jasna Hrovatin (2007). Through a survey intended for potential investors they asked for their views on the use of wood as a building material. The survey results showed that 60% of investors prefer classical construction, while only 34% respondents prefer wooden fabricated construction. In their view, the main reasons for this are tradition and their unfamiliarity with wood construction (in regard to its duration, stableness, confidence, safety and quality), and only 45% stated that they know what the advantages of wood construction are, such as ecological building, energy safety, fast building and resistance to the effects of earthquakes.

The author conducted the research in order to determine what views architects take on sustainable architecture, their education system, the use of wood in construction and to find out their attitude on wood as a building material, as well as how well they know the wood products market in three different countries: Bosnia and Herzegovina, Serbia and Austria. Two countries of similar social-economic circumstances and scope of the use of wood were selected (Bosnia and Herzegovina and Serbia), in addition to one with significantly greater use of wood in architecture (Austria). The research results point to potential measures, the implementation of which should result in the greater use of wood in architecture, and consequently in the improvement of the ecological performance of houses in Bosnia and Herzegovina.

The main hypothesis is that architects in Bosnia and Herzegovina, as well as in Serbia, have insufficient knowledge on the principles of sustainable architecture, contemporary products and wood construction systems, which is why they rarely use wood in their projects. The difference between the volume of wood used in construction in Bosnia and Herzegovina and Serbia, on the one hand, and in Austria, on the other hand, is not only the result of different technical and technological equipment, but also of the different views of architects.

METHODS

The countries in which the study was conducted are on different levels regarding their economic development, with Austria having the highest GDP and population size (World Bank, 2010). The GDP per capita in Austria is more than ten times higher than that of Bosnia and Herzegovina, and eight times higher than Serbia. Austria differs significantly from the other two countries not only in regard to its economy, but also in regard to its manufacturing and consumption, i.e. its use of wood in construction (UNECE, 2010). An overview of the data relevant for the research is given in Table 2.

It should be pointed out that some sources give only data on woodlands (wooded lands), while others give data on wooded land and forest vegetation in wider terms. Therefore, there are a lot of different data on percentages of woodlands. Austria has the highest percentage of woodlands, at nearly 47%, whereas in Serbia that percentage is the lowest at 31%. There are significant differences among the countries with respect to tree species, so evergreen tree species dominate in Austria, whereas in Serbia, and Bosnia and Herzegovina, deciduous trees are dominant. Forests in Austria are primarily privately owned, while in Serbia, and Bosnia and Herzegovina the forests are mainly publicly (state-) owned.

Data on architects' views across the three countries were collected using an online survey, which took place from June to July 2015. The author of this paper independently (on her own accord) prepared the questions in the survey questionnaire. In Austria ProHolz Styria carried out the same survey, and submitted its results to the author of the paper. The author personally sent the online survey to the members of the Chamber of Engineers (Architects) in Serbia, as well as to a number of architects in Bosnia and Herzegovina. The survey covered a larger number of architects, and 290 responses were collected, 105 in Serbia, 123 in Bosnia and Herzegovina, and 62 in Austria. The survey results were first analyzed separately (individually) per state, and then a comparative analysis was made.

Table 2. Research relevant data: number of citizens, GDP, surface of the country and data relating to forests and wood products

Indicator	B&H	Serbia	Austria
Population*	3.835.258	7.291.436	8.363.404
GDP (US billion $)*	16,85	39,46	389.679
GDP/ per capita $*	4.780,0	6.423,3	51.131,0
Surface (km^2)	51,197	88,361	83,855
Forest area (% of land area)	42,7	31	46,8
Forest area (km^2)	21,85	27,13	38,87
Growing stock (million m^3)	209,78	271,41	1075,27
Growing stock (m^3/ha)	167,56	176,93	321,64
Publicy owned (%)	81	53	19,46
Private and other (%)	19	47	80,54
Production (million m^3 rwe)	3,09	2,40	41,84
Consumption (milion m^3 rwe)	1,96	3,6	22,11

(Source: World Bank, 2010a; 2010b; 2010c; UNECE, 2010)

The structure of the architects questioned differs significantly. Male respondents prevail in all three countries, and they are clearly dominant in Austria. Austrian architects have the longest years of service, and those in Bosnia and Herzegovina have the least, mostly below 10 years. Experts working in the field of architecture are most common in Austria and make nearly 81% of the Austrian respondents, in Bosnia and Herzegovina they account for only 41.5%.

RESULTS AND DISCUSSION

On the basis of the online survey questionnaire and answers collected in the respective countries, the answers were systematized per state, and then together for all the countries. The results, together with the discussion, were presented textually for groups of questions, and in figures for the most important issues.

Groups of questions referring to the educational system and advanced training

Most of the architects believe that the knowledge on wood construction gained during their higher/university education is not enough. Differences recorded among the countries were only those presented in the form of the percentage of architects giving the aforesaid opinion, thus in Bosnia and Herzegovina it is 81%, in Serbia 73.3% whereas in Austria the percentage is somewhat lower, at 60%.

For further research it would be interesting to compare the curriculums of the higher education institutions in all three countries. Based on the results of that research, steps could be taken to innovate within the curriculums of the higher education institutions. The results with answers are given in Figure 3.

After graduating from school, a lot of architects undergo advanced training, but there is a noteworthy difference between the respondents from EU countries and those that are not from EU countries. In Austria 60% of the architects questioned attended advanced training, whereas 43% of architects in Bosnia and Herzegovina confirmed that they had taken advanced training, and 48% in Serbia. Possible reasons are that in some countries legislation obligates the architects to lifelong education, while this is not the case in other countries.

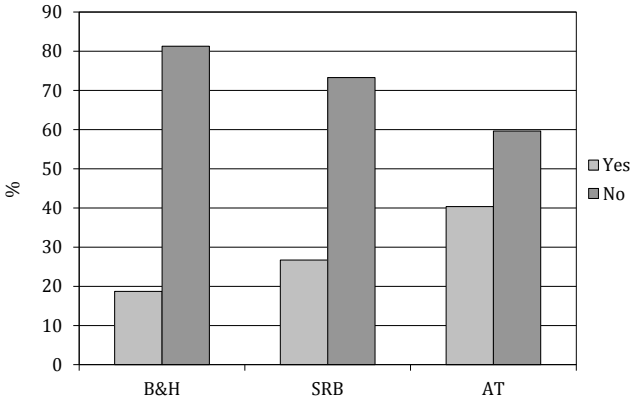

Figure 3. Answers to question no. 1 (Source: author)

Advanced training for architects is an important element in keeping up with modern technology and materials as well as the innovative use of classical materials. The architects took different forms of advanced training such as attending seminars and conferences, reading technical literature and so forth. A high percentage of respondents took advanced individual training in the form of reading technical literature. There is a significantly lower number that attend seminars and conferences.

Group of questions referring to the architects' views

The architects' attitude towards the use of wood can best be illustrated by their answers to the question "would you build your own house with a wood construction?" Most of the architects answered affirmatively, and the only difference recorded was in the percentages of affirmative answers. The highest percentage was in Austria, with 93% of the architects, and the lowest in Bosnia and Herzegovina, accounting for less than 60% of the architects there. The answers indicate that personally they value wood as a building material, and the results with the answers are given in Figure 4.

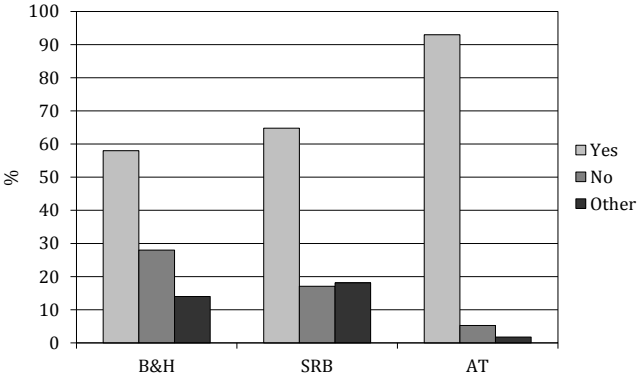

Figure 4. Answers to question no. 8 (Source: author)

In their work with the investor, most of the architects suggest using wood as the building material, the difference being in their percentage of the total number. Nearly 97% of Austrian architects suggest wood to be used as the building material, compared to 57% in Bosnia and Herzegovina. Their work with the investor may affect the use of wood in construction building, so the architects' views and their

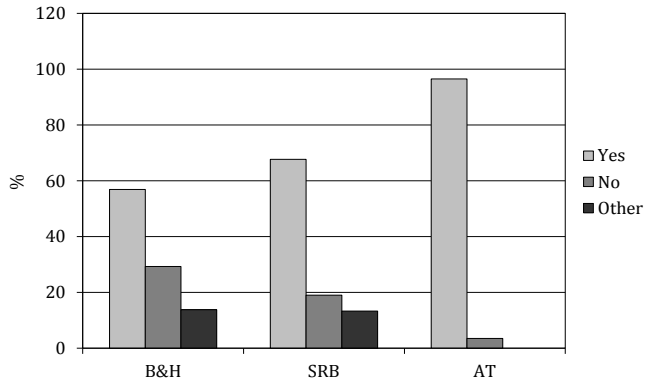

Figure 5. Answers to question no. 4 (Source: author)

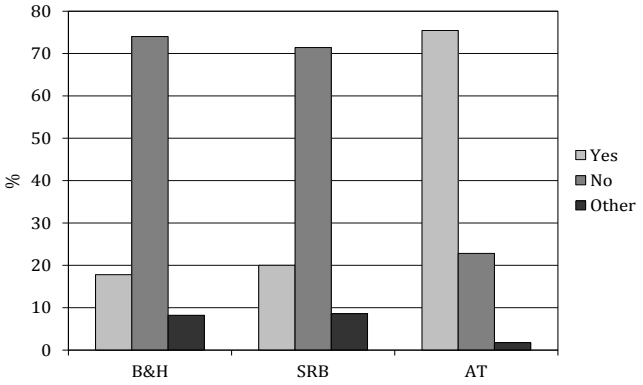

Figure 6. Answers to question no. 9 (Source: author)

efforts in presenting the advantages of wood construction to the investor are of great importance. Unfortunately, the architects' positive views are not always supported by the supply of wood and timber products in the country or by good contractors. The results with the answers are given in Figure 5.

The architects point to the ecological properties of wood as the main reason for suggesting wood as a building material (77-93%), while only in Austria is faster construction almost equally important. The lower price of wood as a building material is of greater importance than fast construction in Bosnia and Herzegovina and Serbia. The significance of the ecological properties of wood construction points to the fact that architects know the building materials and their impact on the environment quite well.

The greatest number of architects who suggest the use of wood for construction are Austrian, more than 85% of them. In Serbia and Bosnia and Herzegovina 74-80% of architects suggest using wood for floors. Suggestions to use wood for front finishing carpentry were ranked second by their importance in Bosnia and Herzegovina, and in Serbia facade coverings were ranked second by their importance. The answers given are the result of the high level of development of the wood processing sector in Austria, which for years now has been supporting and promoting wood construction.

Architects who do not suggest the use of wood as a building material say that the main reason for that is, first and foremost, the prejudice that investors have towards wood construction (Bosnia and Herzegovina, and Austria), and then the problem of finding good contractors in Serbia. In Austria, and Bosnia and Herzegovina higher prices of wood products do not affect the architects' views on recommending wood construction to the investors they work for.

Group of questions referring to the knowledge of wood product markets

Most of the architects are not that familiar with the situation on the market regarding wood products, which certainly results in the fact that wood products are not used enough in their projects. The market for wood products in the country is something only the architects in Austria know well, more than 75% of them. The results with answers are given in Figure 6.

Although over 84% of the architects in Austria know the wood products market quite well, they have problems in finding good contractors.

The architects had the opportunity to contact and cooperate with different companies in their countries, but also abroad. However, having in mind their views that they do not know the market well, it is obvious that those contacts were not sufficient and that there is scope for the promotional activities of wood product manufacturers.

CONCLUSION

The survey results confirmed the hypothesis that architects in Bosnia and Herzegovina, and in Serbia alike, do not have sufficient knowledge on the principles of sustainable architecture, contemporary products and wood construction systems, which is why they rarely use wood in their projects. The difference between the volume of wood used in construction in Bosnia and Herzegovina and Serbia, on the one hand, and in Austria, on the other hand, is not only the result of different technical and technological equipment, but also the fact that there is a cause-and-effect connection between knowledge of contemporary wood construction and use of wood in construction**.**

Based on the findings that during their education architects do not gain enough knowledge on sustainable architecture and the use of contemporary products and wood construction system, measures could be taken in order to organize additional education for them. An example of a country that offers excellently organized professional training is Austria, in which the State finances seminars and conferences. The research recorded a higher level of knowledge and different attitude towards wood and the application of the principles of sustainable architecture in designing buildings and houses for Austria.

To improve the architects' knowledge of sustainable architecture, products and wood construction systems in Bosnia and Herzegovina, and in Serbia alike, the following should be continuously worked on:

1. improvement of the education system, especially higher education, in the field of architecture and civil engineering, with special reference to the modernization of curriculums in the field of sustainable architecture, modern products and wood construction systems;

2. education on the principles of designing ecological architecture, where special attention should be paid to the materials used: use of local materials traditionally used, use of materials from renewable sources, replacement of high-emission materials with low-emission ones, such as wood and wood products, use of innovative constructions for improving the energy performances of existing buildings and so on;
3. establishment of a more intensive international cooperation and exchange/share of technologies, on all levels – chambers of engineers, professional associations, institutions of higher education and individuals.

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