

# AR

2014/1

Arhitektura, raziskave  
*Architecture, Research*



Univerza v Ljubljani  
Fakulteta za arhitekturo  
Ljubljana 2014

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In 2014 our editorial board was further beefed up, and a fresh updating of the magazine is on the horizon. In 2015 the magazine is to become visually more advanced and adapted to new media.

In this issue, we are offering five quite different contributions. First, there is a contribution from three colleagues, **Branislav Folić, Saja Kosanović and Tadej Glažar**, entitled **CONTEMPORARY DEBATES ON THE EDUCATION OF ARCHITECTS – SELECTED EXAMPLES** in which they present an analytical investigation of changes in the field of architectural education. They present the global and local levels of education. The underlying assumption in the paper is that progress is only possible in a dialogue in which all parties are involved. Education is socially responsible work. Working in a design studio or in a seminar is essential as it is there that ideas, architectural practice and generations of students come together. An empirical approach to education also leads to the introduction of green architectural themes (landscape planning).

**Beatriz Tomšič Čerkez**, a prominently active architect, teacher and researcher, continues in harmony with the above. Her article **ARCHITECTURAL EDUCATION AND SCHOOLING: BETWEEN THE SUSTAINABLE DEVELOPMENT AND PERCEPTION OF THE ENVIRONMENT** depicts the fundamental connection between a critical awareness of the common space and an individual living in it. She presents the issues of sustainability and inclusion of the young in the realm of architecture in a polemical manner. She encourages the thinking of secondary school students with graphically clear presentations. She discusses the re-use of public spaces alongside changes in the layout or replacement of structures. The discussion provides a refreshing approach to the issue of the city's image.

A young PhD, **Larisa Brojan**, has dedicated some of the past few years to bales of straw and to furthering the use of straw in architecture. In the article **ADVANTAGES AND DISADVANTAGES OF STRAW-BALE BUILDING** which she wrote together with **Peggi L. Clouston**, she defines the properties of straw bales as a building material. The advantage of straw is its capacity to be simultaneously a construction and insulation material, which eases problems when thermal bridges occur. Social prejudices were the biggest hurdle, and were sensibly overcome by analytical work done by two colleagues. This field of research is neglected and considerably under-explored. I am looking forward to fresh research studies and the results of the promotion of straw-bale construction.

A young researcher **Marta Bujanda Miguel** sheds light on simple vernacular architecture with her paper **VARIETIES OF MAIZE AERIAL DRYING SHEDS ACROSS EUROPE**. Her review of the related solutions is a continuation of the work of our colleague Borut Juvanec. The originality of her contribution is that she relates these structures to the economic impact of the evolution of vernacular architecture. The economy of implementation also depends on the materials selected and the structure's design.

Our colleagues from Spain, namely **Juan Saumell, Luis Antonio Álvarez and José-Carlos Salcedo**, contributed the article **ARCHITECTURAL HERITAGE ON GIS SUPPORT: KNOWLEDGE AND DISSEMINATION** in which they present their research and expert work on digitising heritage and transferring it into GIS. Work in the area of architectural heritage is never finished.

It is a tradition of the first issue that it presents a report on the research programme at the Faculty of Architecture of the University of Ljubljana which is currently being led by our colleague **Vojko Kilar**. The programme has been running since 2013 and will terminate at the end of 2017. The programme's work is fruitful and resounding as colleagues are publishing their contributions' results at world congresses as well as in foreign international magazines. The magazine ends with reports from those congresses. These many reports can be regarded as proof that we are active researchers capable of strengthening our domestic and international connections. Our colleagues are acknowledged experts thanks to their active commitment. Our very active colleague **Borut Juvanec** bears witness to this fact.

**Editor**  
*Doc. dr. Domen Zupančič*

V letu 2014 smo doživeli dodatne okrepitve v uredništvu in na vidiku so nove posodobitve revije. V letu 2015 bo revija postala likovno sodobnejša in prilagojena novim medijem.

V tej številki gostimo pet prispevkov, ki so precej različni. Na prvem mestu je prispevek treh kolegov **Branislav Folić, Saja Kosanović, Tadej Glažar** z naslovom **SODOBNO ARHITEKTURNO IZOBRAŽEVANJE – IZBRANI PRIMERI** predstavljajo analitično raziskavo o spremembah na področju arhitekturnega izobraževanja. Predstavljajo svetovno in lokalno raven izobraževanja. Skupna premisa besedila je, da je napredek možen le v dialogu z vpletenimi. Izobraževanje je družbeno odgovorno delo. Delo v projektnem studiu ali seminarju je ključnega pomena, saj se tu strnejo ideje, arhitekturna praksa in generacije študentov. Empirični pristop izobraževanja vodi tudi k vpeljavi zelenih arhitekturnih tematik (landscape urbanizem).

V tem sozvočju nadaljuje izrazito aktivna arhitektka, pedagoginja in raziskovalka **Beatriz Tomšič Čerkez**. Članek **VZGOJA IN IZOBRAŽEVANJE O ARHITEKTURI: MED TRAJNOSTNIM RAZVOJEM IN ZAZNAVANJEM OKOLJA** opisuje temeljno povezanost med kritičnim zavedanjem skupnega prostora in bivanja posameznika v njem. Kolegica polemično predstavi trajnost in vključevanja mladih v svet arhitekture. Z grafično jasnimi predstavitvami spodbuja razmišljanje dijakov v srednji šoli. Razpravlja še o ponovni uporabi javnih prostorov ob zamenjavi kompozicije ali objektov. Razprava sveže posega na področje t.i. slike o mestu.

Mlada doktorica znanosti **Larisa Brojan** je nekaj zadnjih let namenila balam slame in razvoju potencialov uporabe slame v arhitekturi. V članku **PREDNOSTI IN SLABOSTI UPORABE BAL SLAME PRI GRADNJI** je s **Peggi L. Clouston** opredelila lastnosti bal slame kot gradbenega materiala. Prednost slame je v tem, da je lahko hkrati gradbeni in izolativni material, kar zmanjša težave pri nastanku toplotnih mostov. Največja ovira so družbeni zadržki, ki pa sta jih kolegici z analitičnim delom smiselno zavrnili. Področje je zapostavljeno in mnogo premalo raziskano. Veselim, se novih raziskav in rezultatov pri promociji graditve in gradnje z balami slame.

Mlada raziskovalka **Marta Bujanda Miguel** je s prispevkom **ZNAČILNOSTI KORUZNJAKA IN NJEGOVE RAZLIČICE V EVROPI** osvetlila preprosto vernakularno arhitekturo. S pregledom sorodnih rešitev nadaljuje delo kolega Boruta Juvanca. Njen izvorni prispevek je v tem, da povezuje te objekta z gospodarskim učinkom razvoja vernakularne arhitekture. Ekonomičnost rešitve sloni tudi na izboru gradiv in zasnovi konstrukcije.

Kolegi iz Španije **Juan Saumell, Luis Antonio Álvarez, José-Carlos Salcedo** so s prispevkom **ARHITEKTURNA DEDIŠČINA IN GIS SISTEMI: PRIMER CÁCERES** predstavili njihovo raziskovalno in strokovno delo digitalizacije dediščine in umeščanja v GIS. Delo na področju arhitekturne dediščine ni nikoli končano.

Načelo prve številke je, da v njej predstavimo še poročilo o raziskovalnem programu na UL FA, ki trenutno vodi kolega **Vojko Kilar**. Program teče od 2013 in se bo iztekel konec leta 2017. Delo na programu je plodno in odmevno, saj kolegi objavljajo rezultate prispevkov na svetovnih kongresih ter tudi v tujih mednarodnih revijah. Revijo pa zaključujemo s poročili s kongresov, teh poročil je mnogo in ponovno dokazujemo, da smo aktivni raziskovalci z zmožnostjo krepitve domačih in mednarodnih stikov. Strokovna odmevnost naših kolegov je prepoznavna tudi po aktivni zaposlitvi. To dokazuje aktivni kolega **Borut Juvanec**.

**Urednik**  
*Doc. dr. Domen Zupančič*



**Članki / *Articles***

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**izvleček**

Analitična raziskava o spremembah v arhitekturnem izobraževanju na svetovni in lokalni ravni si prizadeva, da predlaga prilagoditve v skladu z novimi družbenimi razmerami. Da bi ustvarili osnovo za razumevanje in uporabo najnovejših standardov v arhitekturnem izobraževanju, so bili izbrani in analizirani različni primeri objavljenih kritik dosedanjega izobraževalnega procesa.

Najbolj temeljito analizirane teme so povezane s predmetom Projektiranje (projektni studio, seminar), ki je videti kot temelj arhitekturne izobrazbe. Prispevek podaja pregled naslednjih tem: Kritični pregled reform izobraževanja v poznih šestdesetih in zgodnjih sedemdesetih letih XX stoletja; Medsebojna povezanost teorije, prakse in izobraževanja ter pomen arhitekturne raziskave kot nove oblike arhitekturne prakse; Povečanje števila raziskovalnih studiev, seminarjev in projektno izvedbenih delavnic z empiričnim pristopom k izobraževanju arhitektov; Sodelovanje zelenih arhitekturnih tem v kurikulumu; Landscape urbanizem kot sinteza disciplin, ki se pojavljajo na višji stopnji študija.

Ta pregled bi moral odpreti dialog, ki prispeva k reševanju problema obstoječe izobraževalne reforme na regionalni in lokalni ravni. Raziskava ne narekuje končne rešitve, ampak odpira možnost izbire.

**ključne besede**

arhitekturno izobraževanje, predmet Projektiranje, projektni studio, raziskovanje, okolje, landscape urbanizem

**abstract**

*Analytic research on changes in architectural education at global and local level aims to propose adaptation in accordance with new social conditions. In order to create a basis for understanding and applying the latest standards in the architectural education, various examples of published criticism were selected and analyzed.*

*The most analyzed topics are related to the design studios which are seen as the backbone of architectural education. The paper gives an overview of the following topics: Critical review of the educational reforms in the late sixties and early seventies of XX century; Interrelations of theory, practice and education, and importance of architectural research as a new form of practice; Increase in the number of research studios and design-build workshops with an empirical approach to education of architects; Participation of green architecture themes in the curriculum; Landscape urbanism as a synthesis of disciplines that are used in the higher level of study.*

*This review should open a dialogue that contributes to solving the dilemma of existing educational reform at regional and local levels. The research does not lead to a final solution, but it opens the possibility of choice.*

**key words**

*architectural education, studio, research, environment, landscape urbanism*

**Introduction**

Reviewing of the architectural profession is constantly ongoing, especially today in the age of global economic and socio-political crisis. Reduction in the number of investments and projects poses a threat to the profession and necessitates the change of its position within different disciplines. Education of architects has a significant responsibility in repositioning of the profession in the multidisciplinary world of architecture.

Dealing with the issue of architectural education, authors generally reflect on the revolutionary reforms from the past or on individual learning methods in studio and they place architectural studio - the backbone of architectural education in the center of the debate. Back in 1995, in his book *New Trends in Architectural Education - Designing the Design Studio*, Ashraf Salama critically analyzed a traditional studio in which the individuality is dramatized and the importance of socio-political factors is underestimated [Sanoff, 2012]. The struggle with traditional methods of study, which began in the sixties, is again in the focus at the beginning of XXI century. And today, like at Beaux-Arts in the sixties, students are required to prepare a concept at an early stage of design, rather than to have a concept as a result of research and design process [Buchanan, 2012]. Peter Buchanan [2012] considers this approach egoistic,

because it is based on its own values, with minimum regard for the values of others. Even before its defining, Stefani Ledewitz provided the answer to the dominant egoistic approach by identifying recommendations - the aims that have to be pursued in the studio. According to Ledewitz, a student should recognize the key values of designing and realize that his own values may differ from the value system of the contracting authority of the project as well as differentiate the design activities arising from their own value system from the ones that come from the other people [Salama, 1995].

Analyzing the previous period, Kevin Rhowbotham [2012] states that a narrow private world of architecture, typical for the nineteenth century separated from science and practical life, is present even today to a great extent in the practice of architectural education. There is little empirical assessment of problems in architecture present in the new millennium. Rhowbotham [2012] also believes that during their studies, students of architecture are nowadays exposed to a system that is not different from Beaux-Arts from the late nineteenth century. Therefore, it is necessary to reflect again on the reforms of the late sixties and early seventies and on the review of education and profession with regard to politics, society and the environment, and the introduction of various disciplines in

the curriculum. Education of the architects in the given period largely resulted from the formalist mould approach to design, which led to an explosion of radical pedagogies that had until then used the unexplored new teaching methods. By analyzing these events, the parallel can be drawn with what is happening today in architectural education. The answer to the crisis of the profession is given through the shift towards the research, practice and sustainability and the result of their merging can be viewed through a new form of practice of landscape urbanism. As in the sixties of the last century, various approaches and methods in architectural education, especially in the study framework, now create an atmosphere of global laboratory for pedagogical experiments.

### Review of educational reforms at the end of the sixties and beginning of the seventies of XX century

Criticism of traditional studio, most clearly visible through criticism of Beaux-Arts school system, in which the historicism and intuitive method are the backbone, contributed to the identification of negative teaching features and the proposal of new models which would include elements of science and practice as the part of architectural education. In the atmosphere of general changes in the late sixties and early seventies, scientific and research elements were introduced in the curricula of architecture. Architecture began to be interpreted as a sociological discipline. The social and ethical approach in architecture was emphasized. The following are among the schools that implemented radical reforms and introduced new methods of teaching: Unite Pedagogique, which was formed after the decomposition of Beaux-Arts (the most important is UP6), the AA Unit System, characterized by the open market of knowledge, the University of Cape Town, with unusual methods introduced in architectural studio, and the New School of Architecture in Belgrade, with the radical reform that has significantly influenced humanistic approach to architectural education.

### Beaux-Art reform – creation of Unite Pedagogique

At the beginning of the 1960s, Richard Llewellyn Davies described Beaux-Arts as a surreal, closed, shortsighted and self-referential educational institution which was contrary to empirically-based architecture. According to him, even in the nineteenth century, Violet-le-Duc considered that Beaux-Art had created architects whose objective was to design buildings that would primarily make them famous, without complying with all the conditions stipulated by the everyday needs or habits [Rhowbotham, 2012].

Yet in 1965, the reform of Paris Beaux-Arts became certain when the groups A, B and C were formed at the faculty under the influence of the atelier Candilis, Josić, Woods. Due to the increasing number of students and the growing need for space, group C moved from the Beaux-art building to the Grand Palais, where it became a center for the progressive thinking within the school, slowly abandoning traditional studio system of education. New subjects, such as residential architecture, were introduced, while the design topics for the privileged,



Slika 1: Študentski delovni prostor na akademiji Beaux-Arts v Parizu.

[Pawley in Tchumi, 1971: 538]

Slika 2: Stavkovna oglasna deska na akademiji Beaux-Arts v Parizu.

[Pawley in Tchumi, 1971: 556]

Figure 1: A student's working place at Beaux-Arts. [Pawley and Tchumi, 1971: 538]

Figure 2: Beaux-Arts strike board. [Source: Pawley and Tchumi, 1971: 556]

like music lounge and swimming pool in the private club, lost their dominance [Pawley and Tchumi, 1971]. Contemporary architectural and spatial thinking was gaining importance, but not all teachers were ready to replace their old practices with new trends. Differences among teachers, further complicated by severe financial and ethical problems in school and profession, led to controversy at school [Weismehl, 1967]. In April 1966, at one of the Beaux-Arts departments, professors began a strike, demanding "a profound reform of the teaching of architecture and the means necessary for its application" [Weismehl, 1967: 1]. Beaux-Arts students opposed "the emptiness of the educational content and the pedagogical manner where professors are supposed to ensure the production of human beings without critical awareness or knowledge of social and economic realities"[Pawley and Tchumi, 1971: 543]. The following could be found among the numerous slogans and declarations through which the students expressed their dissatisfaction: "...We are against the established order of today, which represents bourgeois culture. It is the means by which the forces of oppression of the ruling class isolate and set apart the artists from the workers by giving them a privileged status. Privilege locks the artist in an invisible prison."; "...creative freedom is real freedom"; "...We want to fight against the domination of education by profession, by means of *Ordre des Architectes* or other corporate bodies. The teaching of architecture should not merely consist of the repetition of 'good practice' until the pupil becomes a carbon copy of the master", etc. [Pawley and Tchumi, 1971: 544-546]. The student revolution did not last long, and its objectives were not fully achieved. The changes were, however, made and the Beaux-Arts as it had existed prior to revolution was brought to an end. The tradition that had lasted since Napoleon the First was interrupted. With the disappearance of school, one of its legacies, the famous Grand Prix de Rome was abolished. At the request of students and professors, the school was reopened, but under the new conditions. In late 1968 *Unite Pedagogique* was established. Beaux-Arts was thus divided into independent schools of architecture that were deployed on several locations in Paris and in the provinces. Each new school got its own number, usually by the order of creation. The most famous of the schools was the UP6, where all the professors who supported the reforms, including Josić and Candilis, the pioneers of these reforms, moved. For a short time the number of the students of UP6 increased significantly [Folic, 2011].

### The AA reform

In 1971, Alvin Boyarsky, acting in his capacity as the president of the Architectural Association, established an open market of knowledge within the architectural school and institutionalized his metaphor of the educational model on the model of "Well-Laid Table", where students are offered a wide range of theoretical positions and methodologies of different directions. That is how the AA stopped supplying society with forms and became a field test of alternative forms of architectural production, and its new task became a critical attitude towards society, believes Boyarsky. Regardless of whether ecology or conceptual art, politics or phenomenology are explored, "pedagogy both

transgressed the limits of professional practice and proclaimed a critical distance from architectural modernism" [Sunwoo, 2012: 24]. Sunwoo further argues that in this way "the AA offers a historical lens that brings into focus a broader shift in architectural education: from a modernist system of professional training that codified the architect's responsibility to design and build for the needs of the society to postmodernist pedagogy that positioned architecture as an intellectual and critical practice" [Sunwoo, 2012: 24].

In the reformed AA school there were no regular tutors, while instead of the traditional curriculum, the school offered a variety of interactive learning models that were shifting to the extent that the differences were the ones to form the core of the curriculum. Boyarsky did not believe in the curriculum or the classic educational content; "tutors were given freedom to set their own agendas and to follow their own interests and manifestoes" [Bottoms, 2010]. Students and teachers mostly used their apartments and houses or nearby offices as workspace. The school became a sort of a meeting point for people and space for discussion, whereas the faculty hall got a special significance. Boyarsky named it "space beneath the chandeliers with a fireplace and a bar, where whiskey and wine are served" [Sunwoo, 2012: 33]. Short-term recruitment of teachers (sometimes for a year), individual differences in the organization of teachers' work and the economic factor, within the perfect functioning of the school, created an atmosphere of "maximum circulation, the search for ideas and their consumption" [Sunwoo, 2012: 33].

One of the main features of the reformed AA school is the Unit system. Boyarsky demanded that the tutors should continuously update their teaching repertoires by architectural provocations, so that students would assume the role of "predatory creatures" and that the educational model would work on the principle of production and consumption. The system is cyclical, self-organized, in addition to being modest and designed to counter any potential obsolescence. The mentors of the AA units were, among others, Elia Zenghelis, Bernard Tschumi, Peter Cook, Dalibor Vesely, Joseph Rykwert and Daniel Libeskind [Bottoms, 2010].

In the first year of study, the school year 1972/1973, students were divided into units of twenty students; each unit was designed and managed by different tutors. Thus, for example, students in the Stefan Szczelkun unit had a task to investigate the relationship between mobility, technology and education. For this purpose, they renewed the London city bus that the school had previously bought and equipped it with audio-visual equipment and furniture. Students tested their project during the two-week tour of the UK architectural schools. [Sunwoo, 2012] In the second example of the AA Unit system, the approach to architecture through the platform of social action is recognized. In the unit which was led by the planner Brian Anson, students had a task to design and lead the campaign for the Scottish education community about the effects of oil rigs in the North Sea [Sunwoo, 2012]; obtained results started an avalanche of reactions, and the entire project was assessed as very successful. Interesting is the work of the Unit from the year 1973, whose

tutors were Gerry Foley and George Kasabov. Their Unit responded to the energy crisis through seminars and research on energy resources, population growth and conservation of materials and energy, on the one hand, and the architectural expression of the above conditions, on the other hand. It can be said that this Unit is one of the forerunners of today's courses in green architecture.

At the end of the first year from the start of the full implementation of the Unit system, in 1974, student work, as a product of a new pedagogical model, was presented at the exhibition for the first time. The school was transformed "from the well defined department store into a supermarket with something of everything" [Sunwoo, 2012: 37]. This opened the AA market as a selling point for architectural public. The institutionalization of the AA Unit system actually defined "fragmentation, specialization and consumerism", which resembles the characterization of postmodernism by Frederic Jameson as "consumption of sheer commodification as a process" [Sunwoo, 2012: 38].

From the early 1970s, Boyarsky used methods that set the school's cultural production to the outskirts of the discipline, and a decade later, the school positioned its coordinates in the center of the field of architectural education. The visionary approach that Boyarsky has made can inspire many and today, when discipline is in crisis, it can serve as a guide to architectural schools in the achievement of their own, at first glance, unrealistic ideas.

### **Cape Town: new pedagogical paradigm**

In the mid-sixties, Roelof Uytendogaardt, acting in his capacity as head of the first year of studio, introduced a new educational method at the University of Cape Town, and thus made a precedent among known pedagogical manners. Uytendogaardt based the basic idea of methodological and pedagogical reform on the thesis that lectures should commence only when the need for theoretical knowledge is discovered in the studio, that is, when the student, with the resulting motivation to learn, asks for it [Buchanan, 2012]. A practical assessment of the concept was done during the three-week work on a camp design on an impersonal location, where students observed their social interactions and learnt about the influence of their physical environment on the insight and importance of those interactions [Buchanan, 2012].

While working and gathering, students themselves sensed various spatial conditions and noticed that the organization and character of physical environment affected the dynamics and quality of discussion and the creation of pleasant or unpleasant feelings. However, leaders of the discussions also noticed differences in the interpretation of interactions, which were the sign that some theoretical material - lectures on mechanics and psychology of observation, which had been prepared in advance, should be introduced. During the continuation of the project, which reflected in the search for the position for the functions of the camp, a debate on architectural parallels, free plan, organization of tribal settlements and the role of religion was spurred, led by the project manager. That was the moment when the need for lectures on history of architecture emerged. The

tent construction having been explained, there was the need for lecture on materials, principles of constructing and constructions, as well as more detailed methods of joining elements for the tent structure. As the project progressed, the need for the lectures on specified fields increased. [Buchanan, 2012]

Uytendogaardt introduced the theoretical curriculum supporting studio work at the time of the reform concerning methodology and pedagogy, which was perceived as unconventional at that moment. However, today the principle is present in a more focused form, which is achieved by detailed structuring of studio projects and provision of links with the theoretical part of the architectural curriculum as well as by introducing thematic seminars.

### **The New School of Architecture in Belgrade**

Triggered by the events in the USA and the European countries, especially in France, the reform at the Faculty of Architecture in Belgrade had been prepared for some time until its culmination led by professor Bogdan Bogdanović in 1971. At the meetings at the Faculty of Architecture, the creation of the New School was proclaimed and its task was to replace the "traditional" one. Students demanded that "they should participate in the life and decisions of the school in practice and not just on paper" [Bogdanović, 1971: 9]. "The New School must always be open to the public and exposed to possible public criticism, and it should be free from all the subjective and imposed criteria and prejudice against ideas and individuals" [Odbor za Novu Školu, 1970: 2]. Reformist ideas, among all, concerned the study of environment and architectural disciplines which had not been involved to that extent or had not even existed in the curriculum. Overall social climate and intensive urban development influenced introduction of the study of urban morphology and theory of the city in the New School curriculum. Space observation through different socio-economic factors became the basis for design of the environment. The New School became a part of social reality; it started dialogue with it and did not represent a reality on its own [Folić, 2012].

Many experts from former Yugoslavia participated in the establishing of the New School. One of them was also Braco Mušič, the architect who, in his text published in *Saopštenje* (Announcement) no. 9 in January 1971, pointed out that the architect of general practice was losing his position in the process of overall formation of the environment and left room for other disciplines that had nothing in common with space organization and creation of form. Mušič considered that "we should not and do not want to perceive an architect and architecture exclusively, and we have to have in mind the whole content of planning, decoration and shaping of the space" [Mušič, 1971: 53].

The beginning of the work of the New School was officially marked in school year 1971/1972. Classical subjects in the curriculum were replaced by themes, courses and extensive courses. The curriculum was "diversified" in a way that students, having completed a certain number of elementary subjects, should choose special courses, design programs and professors to work with. Students decided on their own the direction of their studies and their technical erudition [Bogdanović, 1970].



Slika 3: Primerjava med predavalnico s študentskimi delovnimi mesti v "box-ih / škatlah" in predavalnico pred postavitvijo "box-ov / škatel" (fotografski arhiv časopisa Politika)

Figure 3: Comparison between the students' "box" with working places and the classroom before the "boxes" were set up (Photo archive of the daily newspaper Politika)

Contrary to "the old school", which promoted traditional studio system, at the New School of Architecture in Belgrade each student, regardless of the year of study, had their working place within the "boxes" set up in the Faculty building. There were 15 working places in one "box" (group). These boxes were planned in all bigger classrooms and they were partitioned off with improvised panels (Figure 3a and 3b). Students had the possibility of sharing their experience and gathering information. Each of them had a certain amount of freedom in creating and contemplating within their working place, and the lecturers took turns [Folić, 2012]. Each group had a mentor who "performed teaching within his or her groups and, at the same time, acted as a consultant to other groups in his or her area of expertise." [Paritetna radna grupa za nastavu, 1971]. Professors' engagement was planned as full-time and therefore some professors' work within their specialty, but outside the faculty, was put in jeopardy.

Unexpectedly, the work of the school came to an end in 1974 after the adoption of a compromise curriculum. Besides its short

life, the New School of Architecture in Belgrade represents one of the major aspects which can help in understanding the nature of social and cultural transition in the mentioned period. Within its characteristic approach, the New School was the impetus for change and understanding the relationship of architecture and society through the lens of multidisciplinary. As Boyarsky did it in the AA, Bogdanović also stimulated critical relation of architecture towards the society, and therefore architecture became intellectual and critical practice.

### A shift towards the architectural research

Describing the incompatibility between academic research and real practice during his lecture at Harvard in 1985, Henry Cobb explained that the academic environment separates architecture from vital sources of income, that is, professional work. On the other hand, a practically oriented architect functioning more as an entrepreneur potentially degrades architecture as a discipline and decreases its capacity for establishing successful discourse with other disciplines [Allen, 2012]. The ideal is in the middle. In the complex definition of architectural design, research gains increasing importance. In recent years, many architectural schools around the world have replaced individual theses with the research studio. For example, theses are present in only one third of graduate and master programs of American schools of architecture [Solomon, 2011]. Instead of them, the research studio, research laboratories, the design - built project or the final "advanced" studio have found their place in the curriculum. Solomon indicates that the introduction of research into the design is a transition from the architecture of problem solving to the architecture of intelligent discussion. Mark Wigley points out, "I insist on the fact that architects are primarily intellectuals. Architects are not builders. They are narrators. They don't build solid objects. They make a discourse about objects." [Wigley, 2002: 122]. The definition which determines design as a method of solving problems with various positive answers differs from the general understanding that describes architectural design as a creative act that creates schemes of figures leading to a built form. Architectural design can be described through synthesis of both definitions mentioned: it is a rational technique of problem solving and an intuitive aesthetic act [Salomon, 2011]. The research has its importance in both definitions.

Salomon has identified three various approaches to understanding of projecting and research that have been present since the 90s of the past century. These are: design of research, research as design and research for design.

### The Design of Research

A good example of the approach based on the Design of Research is Project of the City implemented by Rem Koolhaas in Harvard. The project was made of a series of one-year research studios replaced by the individual design theses. The research focused on economics, politics, social conditions as well as problems concerning architectural and urban design, but there was no actual project done. Koolhaas thus showed commitment to research preceding design, because he considered those two components almost adjoined. The results of the research were

neither connected to a specific situation nor to architectural and urban problems. After being published, those results were available to the public and therefore subject to public criticism and open for free use [Salomon, 2011].

This approach is similar to the one from the late 60s of the past century, when curriculum with the emphasis on "design of environment" developed. That was the time when students commenced using social and anthropology studies on users' environment when working on design. The methods of building and design were changing, and the domain of influence of the architectural profession was expanding rapidly. At that period of time, planners, geographers, sociologists and historians commenced dealing with urban morphology with "extensive social research" [Đokić, 2007: 66]. That was the moment when typomorphology emerged under the influence of different theoretical postulates [Đokić, 2007].

### Research as Design

Auburn's Rural studio opened by Samuel Mockbee united the tendency to make an integrated project through a thesis and with the goal set by Koolhaas- creation of research-informational project. Through a series of pedagogic experiments at the studio, students of the third year first do the field research individually, afterwards they define the physical and social factors and cause of poverty at the location (the rural district of Hail in Mississippi), and finally they start working on the design and building of a relatively small installation for a family residence or for some other purpose of a certain institution. Selected students gather once again at the fifth year of their studies to finish the group thesis- the project. Working in small teams made of 3-5 members, students directly collaborate with the members of the society, they make suggestions, design and build the designed.

Salomon [2011] believes that, based on the example of the Rural Studio, it is impossible to perceive whether the thesis represents the mirror of the curriculum or the cause of its innovation. Nonetheless, the mentioned studio has initiated significant debates on the education of architects, especially in the sphere of the manner of treating the connections between the project, place and function. The Rural Studio affirms an educational experiment which leads to creating better connections between social themes and architectural ideas.

### Research for Design

The concept of Research for Design is visible in the programmes of various architectural schools. For example, the program of the AA school of 1997 contained Design Research Laboratory. A year later Sci-Arc started the Design and Research of Metropolis program. The Research Studio was introduced into the UCLA curriculum to replace theses.

At the research studio, the phase of designing is developed after the research of a group of questions and problems that are not architectural in its nature. This means that the information outside the discipline has been included in the process. At the research studio, the research does not precede design and it is not project illustration of the research, but the integral part of

the project. Besides, the research in the studio is not exclusively connected to a specific location, place or socioeconomic group [Salomon, 2011].

Compared to the independent individual designing theses, the research studio is less unique, but its pluralism makes it more realistic, and at the same time this studio is risky, less expressionistic, but experimental at the same time. The concept relies on specific skills, insights and intuition of the individuals that organize and manage tasks. The model of the research studio as the replacement of the individual designing thesis represents a stepping stone from the independent research to the collective knowledge production in the discipline [Salomon, 2011].

### Practice, Field Work and School

The meaning of the practice in the past few years has significantly changed. Experimental design studios of the nineties, such as Steven Holl, Morphosis and Diller + Scofidio have become a major design organization with the projects implemented around the world. Changes in their practice are a symbol of major shifts in the field of positioning academic and professional work of architects [Allen, 2012]. "The habits of mind and ways of working previously associated with experimental practice or the academy have been recontextualized in this new climate of practice... A new model of alternative practice has also emerged and is being reinforced in schools. Based not so much on the critical commentary as on activism, it involves highly pragmatic, hands-on architectural and product designs that can be quickly implemented in places like developing countries and disaster areas" [Allen, 2012: 226].

At the time of pluralism and often difficult identification of the local, practice plays a significant role, since it participates in maintaining the specificity of the different design cultures. Rapidly evolving contemporary technologies have enabled architects to work from distant locations and students to become very mobile. The same books and magazines are used around the world as well as the same software and presentations of the same architects who travel all over the world [Allen, 2012]. "Political philosopher Kwame Anthony Appiah has written about the need to cultivate a cosmopolitan attitude in the face of the global culture today, neither artificially preserving "authentic" local traditions nor mindlessly giving forces of globalism. It takes a closer consideration of the hybridity of contemporary culture that survives the elements of history and tradition and at the same time fully utilizes new technologies and opportunities of the global exchange " [Allen, 2012: 229]. This approach should also be applied in the formulation of architectural practice in education.

In this context, the need to work on the field is recognized and promoted again. "A common complaint of architects hiring graduates, as well as of their teachers, is that too many students today think that having seen a building on the internet means knowing it. Thus, students should visit, explore and write about buildings, urban areas and landscapes, imagine themselves as a plant in a landscape or urban area, thereby strengthening peripheral vision and sense of place or conducting a fast, non-stop verbal description of what is seen" [Buchanan, 2012].

Modern trends in architectural education workshops provide significant space in which students learn and demonstrate new skills to build the elementary objects of different functions. They range in broad terms, from street furniture to simple residential units, especially for vulnerable residents. Comparing the activities of the UP6 students and rural studio with the activities of the students of Faculty of Architecture, the University of Ljubljana can conjure up a connection between socially responsible actions of the students at the end of the sixties of the twentieth century and contemporary tendencies in the education of architects.

In 1969 the students of UP6 were active in the action of building a social center in a commune of Portuguese immigrants (Villeneuve de Garenne). The students built the social center by themselves with the material that had been ordered through the school to be used for exercise. Hubert Tonka, professor of Urban Planning at the time, had some doubts about "the credibility of the great revolutionary struggle that students waged." He describes "the students' action as socially futile as it was performed for the inhabitants of the commune, and not with them. It was politically successful, and it showed pressure on the oppressed, while the immigrants had become aware of the class reality and their position in relation to the capitalist system" [Pawley and Tchumi, 1971: 566]. It can be concluded that the students made

an endeavour to take on the active role of building in overcoming urban problems the city was faced with. Without participation of the very citizens, in collaboration with other city structures and architects, in creating a better urban milieu, no success can be made as far as set goals are concerned. [Folic, 2011]

Nowadays the local community is in most cases involved in similar projects, and the activities associated with them have not only stopped being considered politically incorrect, but are considered as welcome. Directing the efforts towards the design realization and active participation of the community rather than to the architecture alone represents yet another realignment of the architectural profession. Thus, the Rural Studio of Mockbee and Ruth had two goals, to improve the living conditions of the rural population in West Alabama and to provide practical experience to students of architecture. [Allen, 2012]

Although it is not a common occurrence that some of the schools in the region organize activities that are aimed at improving the living environment of communities in other countries, the students of the Faculty of Architecture in Ljubljana participated in the design and construction of school classrooms for Ithuba Skill College in South Africa (Figures 4 and 5). Project development and construction planning were done in Ljubljana throughout the entire 2009/2010 school year. In the winter semester students studied the characteristics of the land, its



Slika 4: Študenti in lokalni delavci pred zaključeno nalogo, 2010. (Andraž Intihar, zasebni arhiv)

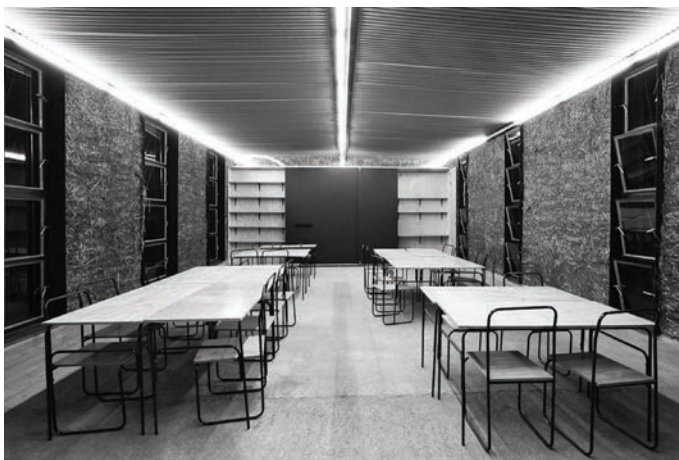
Figure 4: Students and local workers in front of the completed assignment, 2010. (Andraž Intihar, private archive)

history, culture, art and geography, economic and social aspects, and in the summer semester they prepared the project, practical workshops and formed the travel fund. The building process in South Africa itself lasted eight weeks. Twenty students took part in the project, led by four tutors (Vodopivec, Glazar, Planišček and Konstatinović). The building is of a simple design, built out of locally available materials. Practical work in a research studio or a workshop is a form of empirical learning. [Projekt SAIP 2010] Practical work in a research studio or a workshop is a form of empirical learning. The changes that are reflected through the potentiation of research-based practices are particularly evident in the last two decades.

### Sustainability

Starting from the thesis that sustainable development should become the backbone of architectural education, Peter Buchanan suggests introduction of basic courses on evolution and ecology in the curriculum, in addition to the basic study of existing subjects, which would lead to a deeper study of ecology and the history of settlement and further towards providing the minimum content for understanding all forms of environmental design. Students should find a link between climate and diverse cultural adaptation, such as the type of shelter and settlements, and define the effects of climate change on these factors. The key factor is the free flow of materials, resources, energy, food and other goods in a globalized world, from extraction to the consumption of nature [Buchanan, 2012]. The same author further states the need for the introduction of several courses, ranging from psychology and mechanics of perception that would be an information base for theory of aesthetics and reasoning through the introduction to phenomenology, all the way to the psychology of the environment and the psychological urge to bring the order in that environment. Architecture can shape fully human physical settings, relying on the knowledge of the range of depth psychology to the ancient spiritual traditions [Buchanan, 2012].

Some authors involved in architectural education, realizing the irresponsible attitude towards the environment, refer once



Slika 5: Notranjost razreda opremljenega s pohištvo, ki so ga prav tako oblikovali in izdelale študentke in študentje, 2010. (Andraž Intihar, zasebni arhiv)

Figure 5: The interior of the classroom with furniture that was also designed and built by students, 2010. (Andraž Intihar, private archive)

again to the significance of the experimental schools of the late sixties and early seventies. Calls for new reforms in education in line with this involve the introduction of the green topics in the curriculum. Kosanović and Folić propose systematic and chronological introduction of green topics in the architecture school curriculum and precisely define what the topics are. Analyzing more current international programmes, the two authors have recognized the presence of the green aspects of the educational programme, but they also realized significant differences in scope, content and distribution of topics through which this aspect is processed [Kosanović and Folić, 2013]. One thing is certain: the presence of environmental issues in the curriculum of the study of architecture is most evident in the example of the design studio.

### Landscape urbanism

A relatively new concept - landscape urbanism emerged as a response to the marginalization of landscape architecture and today it plays an important role in the understanding and methodology of the design studio. The term was created in 1996, when Charles Waldheim, professor at Harvard and one of the leaders of the movement, wrote that he had coined the term "landscape urbanism" when James Corner had made the phrase "Landscape as Urbanism" [Allen, 2012: 223] in conversation with him.

Landscape Urbanism includes a number of tools that are used in the treatment of empty space between the buildings, roads and infrastructural systems and therefore focus on the public realm, while promoting ecological principles. Through this view, the notion of the landscape has been expanded and it no longer refers just to gardens and parks. The movement was initially based on the theory, but it quickly grew into practice. Conferences and debates are, therefore, in the case of landscape urbanism preceding the examples created; the mutually productive effect represents a compromise between taking care of the real world and academic debate.

The concept of landscape urbanism combines urban planning, infrastructure, architecture, ecology and landscape architecture. The form of landscape urbanism is provisional, subject to constant change, and also contextual, because it relies on the ecology, climate and culture of the local places. The term landscape is offered as a way of looking at the modern city [Corner, 2006: 29]. The dominant use of the landscape as the process of reconstruction, while taking into account the environment and infrastructure, with sensitivity towards the river bank, is noticeable in the improvement within the area of the complex in which the 2012 Olympic Games in London took place. The project on a much smaller scale, which may be discussed under the term of urban landscape, is the regeneration of physical sites around the building complex "Beton hala" in Belgrade. The international competition called Beton Hala Waterfront Center in Belgrade, organized by the city government, attracted many architectural teams. In their solutions, they unified urbanism, infrastructure, riverbanks, reconstruction, rehabilitation, protection of surrounding environment and ecology and landscape architecture.



Schools of architecture accepted the concept of landscape urbanism. Among them are Harvard University and institutions that developed landscape urbanism into special graduate programmes: the University of Illinois at Chicago, the University of Toronto and the AA in London. These are mainly architectural schools that are located near large urban centers where the actions of students in accordance with project tasks are possible and desirable.

### Conclusion

General discussion of what architecture is has led to many different conclusions. From the social point of view, architecture is an integral part of Man's activities. Cities, towns and buildings have always been the result of cultural, social, economic and environmental factors, which require a complex responsibility from architects. In accordance with the changes in the profession during the seventies and eighties of the last century, according to Salama, three concepts arose: the first identifies the human and social needs in the context of the environment, which is affected by social, geo-cultural, climatic, political and economic aspects; the second evaluates the built environment and deals with the adaptations and adjustments; the third involves people that have become an interest group in a particular built environment in the decision-making process [Salama, 1995: 31].

Numerous academic debates have brought to light a deeper interest in the changed role of the architect in the society. "Architects are no longer dominant in areas where they have traditionally been so, but are potentially powerful in other, perhaps unexpected areas. One of the tasks of architectural education is to identify those areas and capacities" [Allen, 2012: 228]. The growing pluralism complicates this task; there is no independent design direction that still dominates schools of architecture, but various directions overlap, offering several possible solutions and multiple points of view, which may create confusion among students. Additional problems are the effects of new technologies and the tensions between the local and the global. The choice is getting wider, while there are fewer differences in the offered. Field work through the student placements contradicts the global generalization by incorporating elements, such as history and tradition, in the design [Allen, 2012].

On the basis of the present debates in the field of architectural education, it can be concluded that there are several different approaches that the authors have used: comparing the current situation to the period of the sixties of the past century, the critique of contemporary studies and comparisons with Beaux Arts, identifying new ways of education, recognition and comparison of new methods to the old ones used in the design studio. There are no specific recommendations for the further development of architectural education, but there are guidelines that open a dialogue on a number of possible approaches. The need for the development of the research studio and for integrating green themes in the design studio is emphasized. Topics dealing with the problem of the environment are once again in focus [Kosanović and Folić, 2013]. In this case, sustainable development should become the backbone of the curriculum.

It is important to note that the new methods used in architectural education should be adapted to local needs and conditions by using a specific research and design task. Therefore, the phrase 'think globally, act locally' could be applied to the architectural education methods. On a higher level of study, the school should offer a variety of topics and methodological approaches from which students may choose a direction according to their own affinities. Although Allen [2012] believes that the overlapping of different directions and a number of possible solutions are confusing to the student, the student becomes aware of the wide range of architectural activity. This creates conditions for the identification of new areas in which architectural profession spans and thus so does education or vice versa. Changes in education are never final and there is no single, in all aspects, right method used in architectural schools.

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VZGOJA IN IZOBRAŽEVANJE O ARHITEKTURI: MED  
TRAJNOSTNIM RAZVOJEM IN ZAZNAVANJEM OKOLJAARCHITECTURAL EDUCATION AND SCHOOLING: BETWEEN THE SUSTAINABLE  
DEVELOPMENT AND PERCEPTION OF THE ENVIRONMENT

## izvleček

Če menimo, da je vloga vgoje in izobraževanja in njunih posledic pri oblikovanju kritične in zavestne uporabnika arhitekture pomembna, bi morali razmisliti o povezavi le-te z avtentičnimi in dejanskimi problemi naše družbe. Eden od njih je zavedanje o značilnostih grajenega okolja. V tem primeru je razvoj izobraževalnih strategij, povezanih s trajnostnim razvojem našega skupnega prostora in okolja postalo temeljno. Naša mesta so v resnici rezultati plastenja časa in prostora, ki delujejo kot enote prostorskih izkušenj v vsakdanjem življenju. Najstarejše stavbe so ikonično referenčne točke in njihova preprosta prisotnost prinaša zbirko edinstvenih pomenov v kolektivnem spominu kulture. Njihovo rušenje v mnogih primerih uničuje podobo mesta in spomin nanj. Ključno vprašanje je, kako razviti ustrezne programe na vseh stopnjah vzgoje in izobraževanja za spodbujanje kritičnega in odgovornega odnosa do skupnega okolja, ki bi zajemal vse vidike, ki oblikujejo koncepte trajnostnega prostorskega razvoja, hkrati pa ohranili svobodo glede na formalne vidike arhitekture.

Ideje, predstavljene v prispevku so podprte z empirično raziskavo o podobi arhitekture in okolja, ki je potekala med srednješolci v Sloveniji. Raziskava je temeljila na ideji, da ena najbolj učinkovitih strategij v edukaciji s katero bi razvili kritičen odnos do sveta, je brezpogojna povezava in pogled na umetnostno in arhitekturno delo z zornega kota "vsakdanjih življenjskih pogojev" za spodbujanje vzgoje in izobraževanja kritične in odgovorne graditelje in uporabnike okolja.

## ključne besede

arhitektura, zaznava prostora, trajnostni razvoj, vloga vzgoje in izobraževanja, strategije edukacije

## abstract

*If we consider the role of education and its implications in the formation of a critical and conscious user of architecture, it is obvious that the development of educational strategies related to our common space and environment become fundamental. The comprehension of the concept of sustainable development is essential. Therefore, it is worth reflecting on how to develop proper programs at all educational levels to promote critical and responsible attitudes towards the common environment covering all the aspects that should shape the concepts of sustainable spatial and environmental development, enhancing at the same time great freedom regarding the formal aspects of architecture.*

*The ideas presented in the article are supported by an empirical research on the image of architecture and the environment, held among secondary school students. The research based on the idea that one of the most efficient critical attitudes towards the world would be to develop an unconditional tie of the art work with everyday life conditions. That is why part of the activities within the research was devoted to recycling relevant architectural spaces. The results show a very heterogeneous image of architecture in the eyes of the students which sometimes overvalues contrasts and originality, disregarding tradition*

## key words

sustainable art education, architecture, spatial perception, the image of architecture

**Sustainable development and architecture**

In our throwaway society, it has always been common for the big-time building entrepreneurs to tear down an older standing building in order to put up something shiny and new. Several big-time building magnates do this without care, wasting energy, resources, and valuable raw materials, just to put their name on a project and stroke their own egos.

In the present conditions it makes too much sense to reuse an older building and rebuild the parts that are necessary. Walls for rooms can be built up or taken down, depending on need. Safety additions like sprinkler systems, fire escapes and magnetic doors can all be added at a far less expensive price than building something new.

Preservation, restoration, and rehabilitation in architecture cause much less destruction to our natural resources than new construction. To appreciate this, architects must be sensitive to the energy used in the production and assembly of materials needed for new buildings, from their origin to their end of life and subsequent reuse.

Statistics reveal that building construction consumes 40 percent of the raw materials entering the global economy every year. Interestingly, about 85 percent of the total embodied energy in materials is used in their production and transportation. Even

before they reach the construction site, building materials have consumed large quantities of fossil fuels.

If all the hidden costs were spelled out in the balance sheet, the recycling of architecture would be perceived as the only rational strategy for the management of material resources. Then we could appreciate huge areas of abandoned and semi-abandoned built tissue as resources, not obstacles for future growth.

Modern construction methods are incredibly wasteful of resources. Up to 25 percent of the total waste generated in the United States, India, and other countries is directly attributed to building, construction, and demolition activities. Demolition of existing buildings wastes the embodied energy as well as the energy consumed in tearing the building down, which can be considerable, given the quality and strength of older structures. Designers sensitive to sustainable practices can establish a recycling program to reduce the amount of solid waste resulting from construction and choose materials which are themselves either recyclable or reusable [Anderson 2008].

By contrast, adaptive reuse is much more labour-intensive than new construction, because it involves the reconditioning the existing structures to adapt to modern day requirements. This dependence on human resources encourages the local community to participate and potentially revives a vernacular

rhythm in architecture. This activity can remind us that vernacular architecture is one cornerstone of our identity. As much as we all like to see change for the good, sometimes change isn't the right way to go about things. There is a certain familiarity about city space, a comfort to know that the building we have known all our life hadn't changed much. We could navigate from point A to point B looking at buildings, and telling at anytime and anyplace exactly where we were because the structures around us hadn't changed and we identify with them.

From a hermeneutical point of view we need to reflect on the issue of sustainable development in order to understand how to approach spatial design in general and how to create a connection between an incomprehensible tradition and a culture that should insist on the conservation of certain elements, in this case, the conservation of specific places or architectural objects worth proper qualification in specific cases [Tomšič Čerkez 2013].

### **Architecture, perception and environmental information**

The definition of architectural space has been throughout history, from the Renaissance onwards, increasingly linked to the product of subjective projection and introjections and hence opposing the idea of space as a constant "container" for things and bodies.

Today, the world of architecture offers a wide range of new experiences: deep shades, due to different occupations of space, loss of the idea of the classical facade and the clarity and "readability" of the principles on which the building was designed replaced by reflecting materials "mirror materials" which transform the conditions of interior and exterior architectural space with reference to the human body. Space without barriers and almost no "foreseeability" is slowly replacing the traditional, centred on the human body, architectural space.

From a semiotic point of view we should unfold the narrative program of a specific place as well as the phenomenological elements in order to elucidate how content and form would combine in the creation of a precise spatial experience.

"Urban space analysis" is consistent with what Gibson called "scanning," or broad "collection of ambient information" (the pickup of ambient information). Individuals explore the sequence changes in the organization of space to obtain knowledge of the "map" of their environment [1986]. Interesting parts of the structure of the environment attract individuals' view, particularly the movements and displacements, differences, certain details contain more information and attract our first sight, says Gibson. Places and objects define space and give space "personality". Space becomes a place when it gets precise definition and meaning [Tuan, 2003; Hiss, 1991]. Things get importance especially after the dictates of culture. Verbal language may also differ in the ability to articulate the levels of experience, therefore, says Tuan, art and rituals take on the task that verbal language cannot. Art works show material images that resulted from emotional images, making contemplation and thinking available. There is an interesting paradox: mind creates distance and simultaneously destroys the immediacy of experience. Reflection on our past returns selected particles, thereby gaining permanence. We always depart from the perception of the cultural characteristics

of the environment. So the forms that we perceive are the unique ones that a particular social context allows. Even the most basic postulates of Gestalt psychology, are largely the result of "cultural situations", not only the consequences of our perception capacity [1979]. Man makes up a kind of dialectic between successive perceptions. Based on current perceptions and previous ones he establishes the new dimensions of perception and attention. Subjects show a certain material, objective qualities and characteristics plus what is added in accordance with previous perceptions. Man establishes the characteristics of nature and nature forms the image of human beings. This process is influenced by an ideological basis, the social context, conscious and unconscious interests, space, time, and by numerous foreseeable and unforeseeable factors more.

The architect creates the image of culture: the natural and human environment is present, which reflects the characteristics of functional rhythmic patterns, which define and constitute a culture. These patterns are a complex of personal and social life. Architect intuitively detects cultural rhythm and seeks to find a symbolic form, creates a world that is "naturally" complementary of an individual: at a personal level, this is his/her home, at the social level, this is expressed by representative buildings and their surroundings, says Tuan [2003].

S. Holl says that to "open" architecture to perception means to leave aside rational understanding being open to intuition, which leads us to the nature of space. Dynamic perspectives series generate fluid space from the viewpoint of the body moving and constantly changing axis. Axial view is not included in a two-dimensional surface, but in three dimensions and is also manifested in the force of gravity, electromagnetic fields, time, etc. The phenomenon of "current perspective" is the basis of spatial experience [2006]. Light, colour and materials open processes which continually raise new relationships. On the other hand, the author adds that in reality there is no other place than points. Summarizes the interesting definition by Bergson, namely that space is a "combination of homogeneous time" that is reflected in a duality: multiplicity of points and continuous stream at the same time.

Architecture consists of two terms, says B. Tschumi, which are dependent on each other, but are mutually exclusive: the reality of architectural experience and the abstract reality of the experience of absolute truth, which arises from emotion. The author says that any architectural intervention today always means a sort of combination of different elements, organized into categories in a complex process of (re) formable relations. The work of the architect is therefore also in the formulation, "invention" of new relationships. Architecture can no longer be bound to composition or function, but to a long and broad list of variables that allow countless combinations [2001].

In such a broad context, we can see the spirit of this study: major changes in attitudes, perception and evaluation of events in the world of architecture, which occur in parallel with major shifts in the school environment and the appearance of a new "viewer-user-generator," student; rapid functional changes in his or her life and our responsibility as managers of the reproductive system of the ideological apparatus that school still is as a necessary part of our social order.

### Education for architecture

K. Lynch [1998] said that as a work of architecture, the city is a building of a large scale. The perception of space in the city is gradual, with time intervals. The image of the city is a combination of all perceptions. So important are the stationary elements as the components that move. The author is interested in the visual quality of the city and the "readability" of urban landscapes that develop an urban image, the product of sensory experiences and memories, which are the basis for the interpretation of any spatial information. He says that effective environmental image gives strong emotional support and confidence. This image is a product of a bilateral process between the viewer and the environment. The environment suggests distinctions and relationships and is the viewer who chooses how to organize and make sense of what he/she sees. That's why the images created by different people are different. Either way, there is something that could be called "basic public architecture", a mental image of the city, which is common to most viewers.

Environmental images can be analyzed in terms of identity, structure and meaning. Efficient images have distinctive characteristics. This is what we call identity. It suggests a spatial relationship with the viewer and other objects. These images contain a practical or emotional significance for the viewer. It is necessary to consider the physical quality of the elements that make up that image. They must be significant enough to permit identification of the structure of space and operation of imagination and "readability". Regarding the development of the relationship between the viewer of images and visual images, there are two poles on which to build: first, demonstrate the changes generated in the environment and on the other, offer the viewer new incentives they can change the images created in the past. This should be the main objective of education at all educational levels.

### Research: Education for Architecture

The ideas presented in the article are supported by an empirical research on the image of architecture and its links to the definition of identification with architectural space, held among first year secondary school students. This "pedagogic moment" is very important in the presented context, considering the role of education and its implications in the formation of a critical and conscious "user" of architecture and architectonic space. The inclusion of such contents from the very beginning of elementary school and the education of future architects defining their role as a kind of "social service", shaping the physical and cultural context of life should mean an important challenge enhancing great freedom regarding the formal aspects of architecture and at the same time a great sense of responsibility.

### Methodology

The pedagogic research was specifically planned for the field of architecture within the subject Visual Art Education, where students develop their own projects in the different fields of spatial design.

The research included 189 15-16-year old Slovenian high school students from schools in Ljubljana, the capital city of the country.

The testing instrument (considering the whole research) was one of "initial achievements" in the field of architectural design encompassing a test of creativity and a concrete task from architecture: the resolution of a project entitled "The Home of Your Dreams." Because the detailed presentation of the entire research exceeds the objective of this article I will present the results of two questions from the test of creativity.

The question we wished to find answers to, is how students evaluate the image of an architectural object, what kinds of



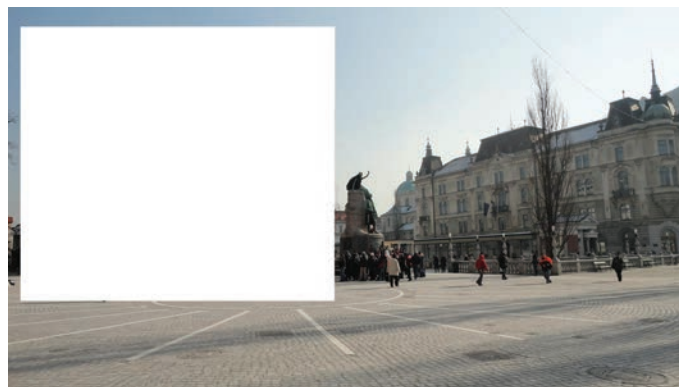
Slika 1: Fotografije različnih arhitekturnih objektov uporabljene pri 1. vprašanju preizkusa.

Figure 1: Pictures of different architectural objects used in the 1st question of the test.



Slika 2: Prešernov trg v centru Ljubljane.

Figure 2: Prešeren Square in the centre of Ljubljana.



Slika 3: Nepopolna fotografija Prešernovega trga.

Figure 3: Incomplete image of Prešeren Square.

impressions they state at first site, how they feel the environment where they live and on what basis do they shape their vision of the world that is linked to the image of architecture.

Students had to answer to the following three propositions:

1. Take a look at the pictures of the three architectural objects below. The pictures present the fronts of three different buildings. Which one do you like most and why?

It is important to state that the chosen images within the first question show images that were not familiar to the students and belong to very different contexts [Frampton, 1992]. Manipulating with them meant a process of analysis, abstraction and evaluation to be applied to the context where they live.

In the second phase of the investigation and after discussing the specifics of the space on a central point of Ljubljana - Prešeren Square - each student received an incomplete drawing of the site. The task performed each student was to suggest a new role and a new way for the "occupation" of the city space. Students could draw, paint, collage or use any other technique of two-dimensional representation.

### Results

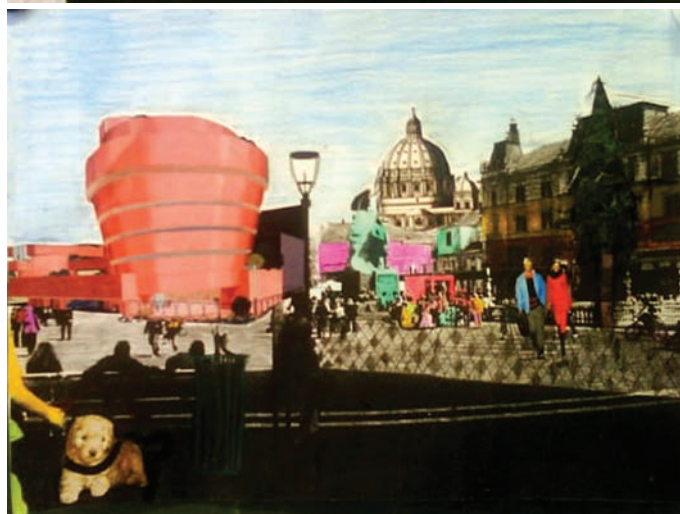
The introductory questionnaire responses were analyzed in two stages: First, we considered the number of responses - the number of points achieved by each image; second, the type of information contained in the explanations of the students. From these data we tried to develop a qualitative interpretation of the answers.

The results were as follows in the case of the first question: picture 1 was chosen by the 4.49 % of the students, picture 2 by the 48.31 % and picture 3 by the 47.20 %. Regarding the reasons for the election, students that chose picture 1 stated that "it looks exotic", "it is not for our context", one of the students wrote that "it could be built in a more developed country than ours". Students that chose picture 2 stated that "it does not contrast the surroundings", "it is beautiful", "it is nice colours," "because of the shape of its windows and roof", "it looks balanced", etc. Students that chose picture 3 stated that "it contrasts its surroundings," "it is especial, different, imposing" etc. Half of the students said that "they like it because it looks modern, contemporary," many said that "it reminds them of a modern and big city." 39.57 % of the students that chose picture 3 stated that "they like it because it looks monumental."

The results of the second phase of our research were reviewed by three independent reviewers to ensure the objectivity of the evaluation. The evaluation was conducted based on a common format for the three reviewers, which contained the following evaluation criteria: type of relationship with the environment , formal characteristics, proposed function, originality and use of artistic techniques chosen.

According to these, in 89 % of cases we speak of an image, as in the responses to the first questionnaire, that expresses wishes about a utopian city that lacks among other features expected; monumentality. Probably these responses are related to the image of Ljubljana, which is not monumental but quite the opposite. Another formal characteristic of the majority of the works is the contrast with the environment, either through colours , materials or shapes. As for the functions chosen by the

students for the buildings of that specific place, it is important to note that the absolute majority, 100%, predicted activities of collective type (gallery, theatre , shopping centre etc.) showing that in general they understand and respect the nature of public space in the city . The proposals were generally very original and very heterogeneous, in most cases, students did set the image of the environment, tradition, and the idea of the "event" to create



Slika 4: Tri primeri likovnih izdelkov dijakov.

Figure 4: Three examples of works done by the students.

architecture. To perform the work, most students chose artistic techniques combined painting, drawing and collage, achieving very expressive images.

Our main goal was to open roads of reflective and critical thinking about the values of culture, related to architecture and urban space. This was the first step in the creation and acquisition of adequate knowledge about the environment and sustainable development of the architecture of the city.

This exercise was also an introduction to the problem of recycling of architectural space and the formal aspect of urban space, especially in terms of its function. The next step is to think about the transformation of an existing building, which obviously is not an easy task, considering the technical possibilities and the knowledge of students in the first year of high school, emphasizing aspects that relate to the sustainable development in the field of art and culture in general and architecture in particular.

### Discussion

However, it is not possible to bring definitive conclusions as far as we would need much more information about the experiences of the students in the city. Nevertheless, the analysed questions were particularly interesting because they focused on the characteristics of the reception of architecture in the eyes of the students. In spite of the fact, that figures do show conceptual oppositions, the answers are quite similar and reflect a special attitude regarding the values architecture fosters in students: it is in a way the materialization of romantic goals and desires: "the noble savage" hidden in a beautiful hut or the dream of progress, modernity and monumentality as a condition for self acceptance. At this point equilibrium becomes a fact that matters. Actually, equilibrium implicates the pre-existence of a dialectical pair, a counterbalance. In the case of questions 1 and 2, students speak about "an image that fosters [romantic] desires and about things they do not possess." The same could be applied to "monumentality". In any case it reflects that there is always an element that is missing and that we should pay attention to what kind of ideas we oppose in our analysis [Livingston, 1993; Willis, 1999].

Some students are not aware of their relation to space and of the fact that how its changes affect them, while others are quite aware of that. Nevertheless, the majority feels space as a category that is quite constantly linked to their own vital experiences.

It is possible to conclude that these results show a kind of lack that could be eventually filled in, [paradoxically regarding the third question] by architecture. The architect can become "the realizer of a dream", filling the blanks of what individuals see as a lack in the elements that originate their identity and identification with a specific space. This also in a way helps us explain the unclear reality of architecture today: renegation from rationalism, application of certain foreign models while not accepting others, criticism of the possibility of global strategies mostly because there is a necessity to replace a lack of local experience [Vidler 2001]. Probably, one of the reasons is, that Post-Modern, actually born in the field of architecture and often characterised by the pursuit of local and contingent theories

unlike the grand and totalising theory of modernism adopted very specific forms in our context [Rossi 1971, Grosz 2001].

Recent thinking about the reposition of architecture into the social sciences [Beck, Giddens, Lash 1994], so that architectural development can be seen in conjunction with other areas of culture opens new questions and encourages the location of dialectical pairs that consider the balance between the individual and the social, the historical and the contingent, local and foreign, style and place, utopic and real etc. Posed in these terms, the question of modern architecture, once articulated within the cosmopolitan, moves architecture beyond the image while still allowing for the image of architecture, which of course is never mere appearance, mere image, says A. Benjamin [2003]. This is in my opinion a good starting point for the reflection about the implementation of concrete strategies in art education and specifically in the field of architecture.

### Conclusion: Conserving Cultural Energy

The dichotomy of ideas and facts in the field of architecture is also the reason why we can affirm that art education at the beginning of the 21st century faces new challenges. It is obvious that a global sight on the pedagogical process of art education demands the inclusion of a new, specific way of accurate evaluation of activities that would enable students to experience architecture from different points of view: as users, critics and eventually as producers. In fact, the understanding of past as well as contemporary interventions demands a set of complex and rich experiences, which is one of the principal objectives of education at all levels. These experiences must contain a clear consideration of spatial sustainable development. Some illustrative facts were shown at the beginning of the article. Probably it is not a coincidence that none of the students mentioned sustainable development in their answers.

The barriers that once separated the different fields of art no longer exist. New technologies brought an entirely new range of experiences and possibilities. Dynamic socio-cultural changes affected artistic expression of all kinds, also within architecture; debates about the cultural identity of minority groups, issues of national identity, rapid changes in technology, and the advent of the post-modern philosophy of fragmentation and plurality reshaped assumptions supporting art, architecture and education. These transformations affected the way we approach and learn about architecture.

The evolution of our societies is reflected in our building types and styles. This relationship gives older buildings a character we value and identify with. However, the corporate mentality does not seem to appreciate the long-term economic value of buildings nor their cultural spirit. Such devaluation is part of so-called "globalization".

The famous quote by Louis Sullivan, "form follows function", seems to have become an outdated philosophy. Today's corporate approach to architecture often would suggest that this sentiment could be reworded as "form follows fashion." Many modern buildings do not reflect the richness and complexities of cultural evolution. Few contemporary designers seem to value the emotional spirit of architecture.

When a building of historic merit is preserved or restored for adaptive reuse, its cultural energy is also "recycled." Old buildings preserve the local culture and identity and create a sense of belonging. In a way, we recycle embodied human resource energy along with material energy. We bring alive the past to be a part of the future, creating important connections through time.

In this context the commitment with authentic and actual problems in our societies must be between the main objectives of sustainable art education. One of them is the awareness about the characteristics of the built environment. Our cities are in fact the results of time-space plasters that function as units of spatial experiences in everyday life. The oldest buildings are often urban milestones. They are iconic points of reference and their simple presence brings out a collection of unique meanings to the collective memory of a culture. Composed by strong formal and symbolic elements, they are easily recognizable. Even whether or not they are still used for their initial function, they nevertheless invite passers-by to contemplation. Their demolition should in many cases injure the cities' images and memory. This theme – recycling of architectural spaces instead of destruction - should be one of the important authentic tasks that could be realized within visual art education in order to develop awareness about the idea that it is possible to recover relevant objects in the urban framework that are no longer in use and to assign them a new use eventually associated to the contents of collective memory. Stress on the values of collective memory is undoubtedly another key goal of Art Education at all levels.

In effect, a global understanding of our past as well as our contemporary world demands this set of complex elements and rich "connecting experiences," which should be one of the principal objectives of education at all levels, developing at the same time an unconditional tie of the art work with "everyday life conditions" and promoting the education of critical and responsible "perceivers" of the environment.

The next step in this research should be to consider the educational strategies and methods that would ensure an improvement in the awareness about the serious situation the world is facing. However we should consider experiential learning as the basis of these strategies.

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**izvleček**

V članku se osredotočamo na osnovne lastnosti bal slame kot gradbenega materiala. Bale slame so dokazano ustrezno gradivo, v kolikor se pri načrtovanju in izvedbi upošteva njegove specifične lastnosti. Kljub številnim realizacijam je še vedno navzoč dvom o uporabi tega alternativnega gradiva. Tehnike gradnje s tem gradivom so relativno enostavne in hitro priučljive, rezultati take gradnje pa z upoštevanjem smernic in zahtev nudijo številne kvalitete. Med največkrat izpostavljenimi kvalitetami uporabe bal slame pri gradnji je nizek ekološki odtis. Hkrati je bala slame učinkovita pri zagotavljanju ustrezne toplotne in zvočne izolativnosti stavbe.

Mnogo predhodnih raziskav je osredotočenih na preučevanje konstrukcijskih karakteristik, požarne odpornosti in vpliva vlage na bale slame. Upoštevanje omenjenih področij je pri načrtovanju objektov iz bal slame nujno, na ustrezno delovanje stene pa vplivamo tudi z izbiro ometa. Z vrsto ometa ne vplivamo le na ustrezno zaščito slame pred vlago, ampak zagotavljamo tudi požarno odpornost in konstrukcijsko stabilnost sten iz bal slame. Ena večjih pomanjkljivosti, vezanih na obravnavano gradivo, je tudi relativno nizko število opravljenih raziskav.

Članek je razdeljen na tri dele. V prvih dveh delih so predstavljene prednosti in slabosti uporabe bal slame pri gradnji. V tretjem delu so predstavljeni rezultati izvedene ankete, v kateri so uporabniki stavb iz bal slame opredmetili prednosti in slabosti obravnavane gradnje na osnovi osebnih izkušenj.

**ključne besede**

prednosti, slabosti, bala slame, gradnja, anketa

**abstract**

*This paper is focused on general properties of straw bale as a building material which has been proven by buildings throughout the world to be an appropriate material choice. Still, there are many hesitations about using this alternative building material. The building techniques are relatively easy to learn and the performance of straw bale structures has a high value in terms of several aspects as long as general requirements are followed. The primary benefit of straw bale as a building material is its low embodied energy. It also has high thermal and sound insulation properties. Many previous research studies on straw bale building have been focused on structural stability, fire resistance and assessing moisture content in straw bales which is one of the major issues. Therefore, special attention needs to be devoted to details to insure proper building safety. Render selection is especially crucial and an extremely important step in straw bale building, not only in matters concerning moisture but also structural capacity and fire protection. A major disadvantage of straw bale construction is its lack of material research. The paper is divided into three parts in which advantages and disadvantages of such a building are discussed. In the third part, results are presented for a survey in which correspondents emphasized the advantages and disadvantages of living in a straw bale building.*

**key words**

advantages, disadvantages, straw bale, building, survey

**Introduction**

Straw bale building is recognized and practiced worldwide. Since the construction of the first such building in the 19th century in USA, several straw bale building techniques have been developed and successfully implemented practically in every country in the world. Straw bale buildings are built by owners and investors as a result of their desire for natural and environmentally friendly buildings. The idiosyncrasies and perceptions of straw bale construction prevent its universal adoption in the building industry - its use being mainly restricted to suburban and rural applications.

Despite the positive qualities outlined by many researchers, there has yet to be a breakthrough of straw bale as a serious building material on a global scale. Recently, however, straw bale buildings have branched out from residential use and have been built for the commercial sector with the erection of buildings specific for public use. Beside many straw bale houses, many commercial buildings in larger scale (over 3 stories high and with useable area over 1000 m<sup>2</sup>) have been erected. The most notable examples are the Gateway Building in UK (3100 m<sup>2</sup>), (see Figure 1), North German Centre for Sustainable Construction in Germany (1800 m<sup>2</sup>) and Sanierung Complemedis AG in Switzerland (3145 m<sup>2</sup>).

The choice of basic building materials is an important part of each project and is usually based on professional judgment, taking into consideration the importance of various criteria such as economic, environmental, functional, aesthetic and health aspects. The priority varies depending on the needs, desires and abilities of each user/investor usually in agreement with the designer. Choice of basic building material is also based on consideration of many other factors and its properties. In this paper the most evident properties of straw bales as advantages and disadvantages.



Slika 1: Vstopni objekt, Nottinghamska univerza, VB.  
Figure 1: Gateway Building, University of Nottingham in UK.

Low impact on the environment is one of the key benefits of straw bale building [Brojan et al., 2013; Sodagar et al., 2011; Garas et al. 2009]. Straw bale houses rendered with loam and lime have demonstrated excellent results in terms of fire and earthquake resistance, heat and sound insulation values - (almost ten times as much as wood and bricks), energy efficiency, and they require minimum maintenance [El Gowini, 2002]. Yet, there are still many concerns among potential investors and builders who address most of the concerns to fire safety, moisture problems, structural stability etc. of straw bale building.

### Methods

The aim of this paper is to investigate the advantages and disadvantages of straw bale building. The properties being discussed have also been verified with survey results. The research is divided into three parts. In the first two parts, advantages and disadvantages are discussed and a descriptive research method is used. In the third part, an empirical research method is used and a survey results are presented in which correspondents emphasized the advantages and disadvantages of living in a straw bale building. For the purpose of ongoing research, a survey was created and over 30 questions were sent to over 500 straw bale building owners. The survey questions followed the format of previously conducted surveys on similar topics of natural building [Wihan 2007, Thompson 2006]. Altogether, 166 responses were received.

### Advantages

For the purposes of this paper, the most noticeable advantages of straw bale as a building material are presented:

#### Straw availability

Remains of grain harvesting are insured annually in enormous amounts [FAOSTAT, 2013]. Even in a bad year millions of tons of straw have no use and have to be ploughed back; for example, in 2007, rain ruined the harvest and 2.37 million tons (40% of all produced) straw was wasted [Barbara Jones 2009: 20]. With this amount of straw in Britain alone, more than 420 000 houses with area of 150 m<sup>2</sup> could be built [Jones, 2007: 13]. With annually produced straw in Germany, over 350000 single family houses (150 m<sup>2</sup>) could be built [Minke in Mahlke, 2005: 11], in Slovenia over 17 000 houses.

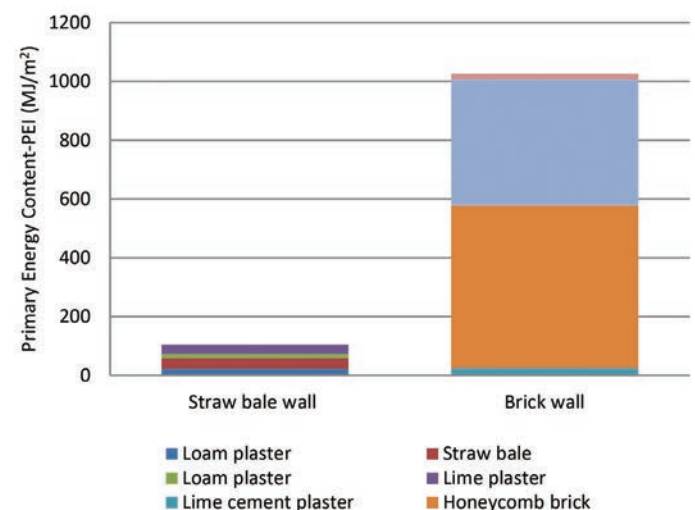
#### Ecology aspect

Alcorn et al. [1995] affirmed that using biomaterials, such as straw, timber, and emission-reducing technologies, for house design and construction reduces CO<sub>2</sub> emissions towards net zero. This was shown using a life cycle analysis of different house designs with comparison of the effectiveness of biomaterials with CO<sub>2</sub> - minimizing technologies. Furthermore, Garas et al., [2009] presented an ecological and economical aspect of building with straw bales. Their main focus was comparison between a load bearing wall unit built with locally produced rice straw bales and a traditional load bearing wall unit built with cement bricks. One finding was that a cost saving could be achieved in favor of straw bale building of about 40 % of the total construction cost,

in addition to the indirect cost saving in energy consumption and thermal insulation. Sodagar et al. [2011] compared whole-life performance of load-bearing straw-bale wall construction with alternative conventional external wall systems. Evidence demonstrated the viability and performance benefits of straw-bale housing for rural communities. Brojan et al. [2013] also studied comparative environmental impact by calculating different parameters (PEI, GWP and AP) for two types of walls (straw bale and brick) with an area of 1 m<sup>2</sup>. The results confirmed a much lighter environmental footprint for straw bale. Regarding the environmental impacts of the discussed walls, the results show that the brick wall requires 985,65 MJ of primary energy (PEI), which is approximately 10 times more than the straw bale wall, where the energy consumption is 104,83 MJ, Figure 2 [Brojan et al., 2013].

### Insulation properties

Combining straw bales and solar orientation can create a very comfortable and efficient building [Garas et al. 2009: 54]. As confirmed by many tests, the thermal conductivity of straw bales is comparable to values of other insulation materials; for example, a bale thickness of 45 cm provides 0,05 W/mK [Waldland, 2013]. Furthermore, the acoustic insulation of the same thickness ranges between 43 and 55 db [Minke in Mahlke, 2005]. The thermal transmission (U) of a straw bale wall easily meets the standard of passive house for which U is required to be lower than 0,15 W/m<sup>2</sup>K [Zabšnik-Senegačnik, 2007] or more often lower than 0,10 W/m<sup>2</sup>K. Brojan et al., [2013] calculated U of a clay plaster – straw bale – clay and lime plaster wall composition to be 0,12 W/m<sup>2</sup>K. Therefore, neither heating nor cooling of straw bale building is challenging, assuming that the floor plan design is well designed (eg. in terms of position and size of openings/windows) and details are appropriately considered and built.



Slika 2: Vrednost primarne vgrajene energije za steno iz bal slame in steno iz opeke.  
Figure 2: PEI value comparison by layers for researched walls.



Slika 3: Hiši iz bal slame v Šulincih (a) in Celovecu (b).  
Figure 3: Straw bale house in Šulinci (a) and in Celovec (b).

### Design options

Straw bale makes a unique structure that is appealing to many, and is especially suited to the owner-builder. Straw bale modular construction allows for a faster wall erection and a flexible design, such as, integrating deep windows, deep overhangs, curves, etc. Straw can also be incorporated into modern architectural plans because of its adaptability and applicability, see Figure 3 a) and b). This is proven by many straw bale buildings around the world, which all present a variety of design solutions in combination with other materials such as, timber, clay, steel, concrete and glass. Applications such as these create contemporary architecture and enable a wide range of designs [Brojan, 2013]. The design is completely flexible when straw bales are used as infill; whereas, load bearing straw bale design is more rigid and strict, particularly in the matter of wall dimensions and opening sizes.

### Disadvantages – drawbacks

The most often discussed and highlighted problems of straw bale building are its vulnerability to moisture, fire and structural instability. Many tests related to these problems have been conducted for which findings conclude that if care is taken, problems can be overcome. Test results have led to certifications of straw bale as an appropriate infill building material. The most recent such certificate (Z-23.11-1595) was issued by DIBt – German Centre of Competence for Construction (Deutschen Institut für Bautechnik) in June 2014 [FASBA, 2014].

### Humidity and moisture

Moisture control is critical for straw bale builders because of the moisture sensitivity of the materials [Straube, 2006]. Without proper design and building procedures, straw will rot. Straw bales must be kept dry, both during and after construction. The highest acceptable range of moisture content is between 20-25% [Wihan, 2007]. But, as practice shows, most builders use straw bales with moisture content around 10 % [Morrison, 2012]. Straw bale walls should remain breathable, and protected with good anti-moisture barriers. Straube [2006: 139] outlines the four major sources of moisture and the wetting mechanisms involved for a building's enclosure as follows:

1. Precipitation, especially driving rain, whether wicked, leaking through the cladding, or splashed upward from grade.
2. Water vapor in the air transported by diffusion and/or air movement through the wall (from either the interior or the exterior).
3. Built-in and stored moisture.
4. Ground water, in liquid and/or vapor form, wicked up through the foundation or through cladding that touches the ground.

According to Straube, [2006: 141], moisture is usually removed from an enclosure by:

1. Evaporation of water transported by capillarity to the inside or outside surfaces.
2. Vapor transport by diffusion, air leakage, or both, either outward or inward.
3. Drainage, driven by gravity.
4. Ventilation (ventilation drying), which is not usually effective for straw bale enclosures.

It is important to provide a separation between foundations and straw bales (i.e. toe-ups) to prevent ground water from reaching the straw bales. The first layer of straw bales should be kept at a minimum of 20 cm from the ground level. Wihan [2007] reported that appropriate plaster should be selected based on the building location and the average relative air humidity. He further concluded that earth plaster seems to be the favorite wall cover for both sides of straw bale walls. Straube [2014] also tested different plasters (i.e. cement, lime, earth/clay) and their mix ratios. His main conclusions were that:

1. Cement based plasters are relatively vapor impermeable,
2. The addition of lime to a cement plaster mix increases permeability. As the proportion of lime is increased, the permeability increases, and
3. Earth plasters are generally more permeable than even lime plasters.

### Fire resistance

General perception is that straw bale buildings are inherently weak and susceptible to fire; when designed and built properly, however, straw bale houses can be strong and highly fire-resistant. In general, once a bale wall has been plastered on both faces, the combination of an incombustible surface and an insulating interior that neither burns well nor melts makes an exceptionally fire-resistant assembly [Theis, 2003]. Theis [2003]

reviewed five lab tests which all verified the fire resistance of straw bale walls. His report stated that straw bale construction would require little or no additional testing to be readily acceptable for uses such as urban infill, row housing, commercial, retail, and educational buildings. This conclusion was made despite the acknowledgement that fire safety concerns are rising as building and population density increase. The test report also includes straw bale inflammability. Inflammability of straw bales is categorized with a class E as it is stated in certificate Z-23.11-1595 [FASBA, 2014].

### Air tightness of straw bale construction

Research on the air tightness of straw bale construction has been limited and has not isolated the various air leakage pathways through the assembly. Air tightness of straw bale buildings is under-researched in the scientific literature, though data on whole building envelope air leakage are available [Racusin et al. 2011].

The experiment results [Brojan et al., 2014] indicate clearly that straw is a poor air flow retarder, and that construction detailing is extremely important to insure appropriate air barrier performance. The results of the study on the whole also indicate the need of future research on the means of assuring air barrier continuity between different elements of straw bale construction. With solid details at joints, better air tightness performance of straw bale buildings can certainly be achieved.

### Structural (in)stability

Straw bales are used either as infill in a post-and-beam structure (see Figure 4), or as a load-bearing system where the bales themselves support the above load. The bale walls are commonly wrapped with stucco netting and plastered with mud, clay, lime or cement plaster. In many cases, the netting has been found to be unnecessary, and plaster is applied directly to the bales. In terms of load bearing straw bale walls, the walls can function as load carrying. Research has shown the technique to be an environmentally sustainable practice primarily due to the attributes of the straw bale [Sodagar et al., 2011]. As a result, the method is gaining interest of late from researchers and practitioners who seek ways to counter the negative impact of building on the environment.

It has also been discovered that load bearing straw bale structures are resistant to higher vertical and horizontal loads. King [1996] mentions a few examples of load bearing straw bale buildings that resist high wind loads. He also gives a simple calculation showing resistance of such a building in environments with extreme earthquake hazard (like in California). The ability of such structures to resist high vertical loads can be justified by a few examples of buildings built in Switzerland designed by architect Werner Schmidt [2014].

So far, only a few building codes allow straw bale load bearing construction. One such code is the proposed appendix on straw bale construction in the USA which was approved by the International Code Council (ICC) in October 2013. The appendix will be included in the 2015 International Residential Code (IRC) for one- and two-family dwellings [Hammer, 2014].

### Not enough information or experiments

Straw bale building techniques are simple, easy to learn, and require only a few tools to implement. It is a sustainable material with excellent ecological potential. However, straw is still regarded as an alternative building material, marginalized for use in suburban and rural environments where usually the builder is the dedicated owner. Despite its advantages, a general lack of knowledge hinders its use in building and it has yet to be accepted as a universal building material on a global level. In the past few years, however, a few substantial and encouraging straw bale buildings have been erected for commercial use.

### User's opinion - survey results

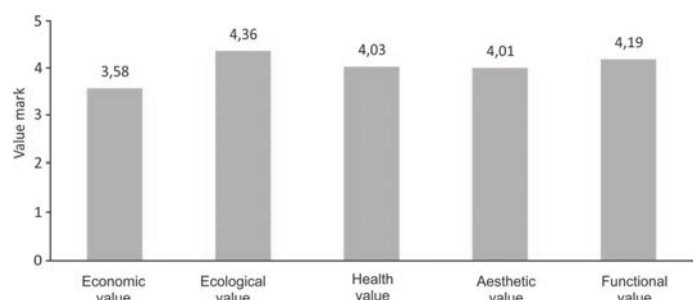
To justify the presented advantages and disadvantages of straw bale building, we created a questionnaire to examine the emphasized straw bale building properties. Over 30 questions were sent to over 500 straw bale building owners. Altogether, 166 responses were received.

Respondents evaluated straw bale building based on five basic attributes of building: economic, ecological, health, aesthetic and functional aspects. In an attempt to put into perspective the relevance and importance of straw bale building, participants of the survey were asked to subjectively compare and contrast and thereby rank the order of importance of these attributes for their building. Each attribute was given grades between 1 (not important) and 5 (extremely important). Within the questionnaire, respondents also had an opportunity to share and



Slika 4: Lesen skelet s polnilom iz bal slame.

Figure 4: Timber frame with straw bale infill.



Slika 5: Povprečne vrednosti ocen.

Figure 5: Average value estimation.

express any comments regarding advantages and disadvantages experienced while living in and using the straw bale building. The results show (n = 166) that investors generally considered all values as very important, but with some differences (see Figure 5): the ecological value had an average mark of 4.36, followed by functional at 4.19, health at 4.03, aesthetic at 4.01 and economic at 3.58. By ranking each value the following order by importance was gained:

1. Ecological value
2. Functional value
3. Health value
4. Aesthetic value
5. Economic value

The ecological value was voted as extremely important by 67 % of people and the average was 4.36. Regarding functional value, 54% of participants considered it to be extremely important. In the case of health, almost a majority of participants consider it to be extremely important (45 %).

Comments regarding advantages experienced while living in and using the straw bale building given by respondents were as follows: the majority of survey participants emphasized a high quality of living environment. Most frequently, a pleasant indoor climate was emphasized in the sense of temperature and relative humidity, low maintenance costs as a reflection of low consumption of heating sources, superior thermal and sound insulation, and a general pleasant feeling inside the straw bale building. Eight percent of respondents did not give an opinion. We have also learn, that 91% survey participants would build again with straw bales.

Considering the disadvantages of straw bale building, the following comments were given by respondents: 30 % of respondents didn't have any negative experience with living in a straw bale house. The biggest disadvantage (20 %) was explained that straw bale building was too labor and time intensive and that it was difficult to find skilled workers to design details that work well in practice, 10 % of respondents mentioned plaster cracks, moisture problems, rodents, difficulties to hang a picture on the wall, and difficulties to get house insurance. In this case, 20 % of respondents did not express an opinion.

## Conclusion

Straw is an annually renewable crop, available wherever grain crops are grown. It is indeed a waste product, much of which is currently burned in the field. The thick walls offer superior insulation when appropriately built. And together with natural plaster, straw bale walls "breathe", have excellent sound absorbing and fire resistant qualities providing a quiet, safe, and healthy interior environment. Furthermore, bales are easy to work with, lightweight and require a minimum of tools. Straw bale construction has been shown to be a viable and sustainable building material. However, lack of information and misguided perceptions about the building system currently prevent its widespread adoption. More research is necessary to foster further advances in the technology and more general education efforts on the merits of straw bale building may help elevate it to a mainstream building practice.

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**izvleček**

Vernakularna arhitektura je razpršena po vsej Evropi. Prepoznavnost in pomembnost takšnih objektov, med katere uvrščamo tudi koruznjake, je mnogokrat spregledana in podcenjena. Koruznjaki so bili v preteklosti ključni objekti za shranjevanje pridelka - koruze, danes pa izkazujejo pomembno vlogo pri predstavitvi identitete posameznih regij, kljub izrazitim tehnološkim spremembam v kmetijstvu. Skupne značilnosti različnih tipov koruznjakov po celotni Evropi so konstrukcija, material in oblikovne značilnosti. Še pomembnejša pa je ugotovitev, da so koruznjaki postavljeni na lokacijah s specifičnimi podnebnimi in geografskimi značilnostmi.

V tem preglednem prispevku predstavljamo značilnosti različnih tipov koruznjakov. Osredotočamo se na uporabljene materiale in sisteme konstrukcije različnih tipov koruznjakov in njihov razvoj skozi čas. Obravnavali jih bomo z vidika arhitekture, etnologije in zgodovine. Namen prispevka je večplasten. Izpostavili smo prelomno točko začetka uporabe teh brezčasnih objektov, začetek gojenja koruze v Evropi in uporabljene prilagoditve, s katerimi je zagotovljena njihova optimalna uporaba. Pri tem opozarjamo na problematiko, ki se je pojavila ob teh prilagoditvah.

**ključne besede**

sušilna lopa, koruza, kozolec, koruznjak, hórreo, espigueiro, identiteta, dediščina

**abstract**

*Vernacular architecture is sprinkled all over every landscape we may see, however the importance of these constructions are not often recognized. Aerial maize drying sheds played an important role in human development and settlements and still play a vital role in some regions' identity after remarkable advances in agriculture. These constructions share not only construction, material and form features, but also the areas where they can be found have common climatic and geographic conditions despite the physical distance.*

*This review article intends to give a view of this vernacular type of construction. Not only will an architectural point of view be given, but also an ethnologic and historic perspective. It presents the biggest inflection point in these timeless objects, the introduction of maize [zea mays] in Europe and the adaptations required for a maximum profit as well as problems derived from that. Materials and construction systems used will also be included and their particular evolution in each studied region.*

**key words**

*drying shed, maize, kozolec, koruznjak, hórreo, espigueiro, identity, heritage*

**Introduction**

Vernacular architecture is the work of skilled craftsmen with no technical official education but their own experience and the knowledge of craftsmen before them orally transmitted in time. It has no trends, no recipes; no dogmas further than solving a problem or meeting a one-off need. But it has rules that have been tested throughout time to ensure the result – the architectural object – is durable, functional and practical. It has a balance between available resources and technology. Aesthetics are taken care of within some boundaries, but it is never left aside the fact that it is just a cover and the essential factor is the interior of the object and its proper functioning. Construction is beautiful on its own and nothing else is needed to make it appealing.

Its value rests in the fact that despite its apparent simplicity and meaningless importance, these buildings have survived through time and they still can be found in our landscapes. They continue existing and coexist in the majority of the cases beside modern architecture. Their functionality and technology, if well maintained, haven't been compromised and can still carry out their original function. What is left from vernacular architecture nowadays is the fruit of centuries of experience. All the bad architecture was discarded long time ago and what we see is the

result of a timeless heritage. No detail is left to chance in these constructions, everything has a purpose in it and nothing is 'ad hoc' without a reason. Alberti's definition of architecture becomes truly clear in vernacular architecture: "Its beauty (of architecture) consists in such accord and harmony of the parts that nothing can be added and nothing can be taken away." Therefore, it is only when studying the construction, proportions and materials of traditional architecture that we can realize the simple yet complex machines these objects are; how everything has a reason to be and nothing is superficial or meaningless in them.

Among these buildings, the aerial drying sheds have an indisputable place. While storage and drying spaces have been widely built throughout history in the shape of barns or silos, drying sheds on piles are not so spread and the environment where they are developed seems to meet certain conditions and characteristics. Along the Cantabrian and Mediterranean coasts, these objects have been evolved in very similar ways, using the same materials and similar construction systems. They have encountered the same problems and turned up to become a symbol of that land's identity after all.

We will present specific locations where aerial maize drying sheds can be found in Europe: from the North of Portugal and Spain to Slovenia. We will expose factors that have determined

their evolution in these areas, factors that have determined materials, proportions and construction found in these objects, and the reasons of the crisis of these objects in time. It will be demonstrated that they are a same group and therefore, a classification is licit. A wider area from the Atlantic Sea to the Black Sea will be proved to be a potential area to find more examples of this study group.

### Historical aspects: origin and evolution

#### Necessity and function

Farming is a subsistence activity, and therefore harvesting crops brings an important problem that has always needed to be solved: storage and preservation of these goods for a later use. In the past, family economy relied on subsistence agriculture. Not a big plot was worked by each family, and a minimum quantity was produced to meet their own needs. If there were leftovers, they were sold to get some profit out of it. It is for this reason that storage buildings become so important throughout History and holds the key in understanding our own evolution and social development. The harvest would be stored in these constructions and only the necessary daily amount would be taken out. Consequently, their size has to be in accordance with the volume of the harvest: wealthy people with larger fields need a larger storage room than common peasants, who would have a small plot and consequently smaller storage room for their harvest.

Specific cereals need specific conditions when being stored, and in the case of maize is not only about having a place to stay till needed for feeding. This cereal is not completely mature when harvested; instead, it has an elevated index of humidity. Dried maize grains are really stable but when still humid or stored in a room where its moisture can be increased, it is very likely to heat up, ferment and mould, becoming useless for its original purpose. This should be avoided at all costs controlling the temperature inside the storage room by cooling it down, and the humidity decreasing it by constant evaporation in its interior. Continuous ventilation is vital.

It is at this point when a specialized drying shed is needed and the maize drying shed comes to light. The corn is not threshed and the cobs are dried in cobs, making the task of storing faster and more efficient. In some cases the cobs are first hung outside in strings to be sun-dried and then taken inside of the construction to finish the process by air-drying; in others, the first step is skipped and the cobs are simply air-dried. Not separating the grain already has a positive effect in the process: it creates a spontaneous ventilation of the crop. This, together with the isolation from the ground provided by the drying shed as it is elevated on pillars and the constant aeration of the room through the numerous openings placed along it completes the new system for this crop. Aerial drying sheds will be located next to the farmers' house or in the surroundings of the living unit so it is easy to reach when needed. This is not incompatible with its last general characteristic, which is that an aerial drying shed will be located in a place where it can easily get currents of air to renovate the one inside of them and make it efficiently work. [Villes, 1985]

Aerial drying sheds have also the function of concentrating solar heat so that maize cobs can finish maturing by heating up. The roof inclination catches the maximum amount of solar radiation increasing the temperature inside of the chamber. Theoretically, in this process the corn is not only being dried but also being nourished from the pith. This happens because the grains are not separated from the cob and in the process, they still get nutrients from the still attached central part. According to this theory, aerial maize drying sheds combine constant ventilation with heat drying to preserve this cereal and contribute to enhancing its nutritional value. [Pracchi, 1952]

On the other hand aerial drying sheds are built with bad heat isolation materials in their walls and roof. The exchange of heat is easily done between them and the surrounding air but it has been empirically demonstrated the zero effect of the solar radiation on the temperature inside drying sheds. It does not affect the inner temperature of the construction and consequently, the roof is only used to efficiently drain off water. The conclusion is reached by studying Spanish drying sheds built on piles with stone and wood. These buildings' main function then is to constantly and efficiently ventilate the cobs to avoid overheating and decay of the maize. No proof of heating was found. [Martínez, 1975: 46]

Later on, by studying the inclination of the roofs in the traditional Slovene aerial drying shed it was proved that roofs are intentionally built with a 45° slope. Not only it promotes a more systematic construction, but it was also proved that this angle maximizes the amount of solar radiation on the building. Since constant ventilation is the main function of these constructions and the indoor temperature is not affected by solar radiation, a new idea was developed. The solar radiation might be used to create forced ventilation inside of the construction. Kozolci are wider aerial Slovene maize drying sheds and consequently the storage chamber has a bigger chance of malfunctioning. Forced ventilation would secure well stored dried maize.

Research proved that the air trapped under the roof is heat up faster than the air surrounding the drying shed. Next to the ground, the air becomes cooler as it is in constant shadow. As the air under the roof escapes sideways outside the kozolec, it sucks the lower air into the storing space, forcing new drier air inside of the construction. And so, fresh air is continuously provided by physics and it ensures a functional drying process in all the stored goods, not only the ones in the perimeter. Form affects directly to the efficiency of ventilation, becoming a result of a given need. Aerodynamic knowledge is included in the design of the construction since the beginning and the result is an efficient functioning object. This same system could exist in narrower constructions such as *hórreo*, *espigueiro* and *koruznjak*, only it is less obvious due their dimensions. It is not yet proved and it would need further research. [Juvanec, 2007: 56]

#### Adaptation to the environment

At the beginning of the 20th century it was stated that drying sheds built on piles are simply the result of certain environmental conditions found in certain regions. These aerial sheds exist only in areas with a very high average annual rainfall and where



there is a need of isolating the crops from the floor because of humidity. Therefore, when the need for isolation disappears, so does the elevated shed and a conventional barn comes along. Enough information is collected to create a world map showing the correspondence between these two facts, but unfortunately these studies and considerations are only general and they don't go deeper in proving this matter. [Frankowski, 1918:16-27]

Some years later another research full of references to the adaptation of aerial drying sheds to the environment, opened again this subject. It claimed it is not only the climate and weather conditions that compromise these objects, but also the geology. These vernacular constructions are built with materials found in the areas where they stand and they reflect the nature of the rock present in the ground. There is a co-relation between materials and location. These studies focused on the North of Spain and claimed that ideally, a geologic map of its Northern coast could be drawn by studying in depth the materials used in *hórreos* and their geographical location. [López Soler, 1931: 1-66]

A study published later provided with some more light in this discussion. Despite the author's background in geology, he barely talked about the influence of the soil composition in these objects. He mentioned the co-relation between the materials used for the roofs in drying sheds built on piles and their availability in the surrounding area. He didn't go further and omitted completely the rest of the materials use. However, he finds references and data to answer the question of why these drying sheds extend to areas with a low amount of rainfall. By studying closely the Northern Iberian Peninsula, he realizes that these constructions are inevitably connected to the corn, and so, if the corn fields extend further from the maximum humidity area, the aerial drying shed will follow it. [Carlé, 1948]

It is also stated that the different supporting elements found in *hórreos* and their location within the region, means they were chosen to be used in one area or another according to the corresponding climate and rainfall. According to research observations, the most stable and the strongest supports correspond to the area with the highest rainfall, which would prove this hypothesis firstly stated in 1931. [Pracchi, 1952]

After a deeper research in *hórreos*, it could be proved that they had a geological influence in their construction materials and a climatic influence in their structure. The existing rock in the soil composition, its characteristics and quality are the key to understand why the stone is the only material used, the main one, or completely replaced by wood; why it is used in big blocks or small pieces: why it is combined with wood and why each material is used only in certain parts of the building. [Martínez, 1956: 174]

At the International Congress in Rio de Janeiro it was explained how vernacular architecture is certainly influenced not only by the climate and geological characteristics of the soil, but also socio-cultural factors. Galicia was taken as a study case. This region has an Atlantic climate, with a high amount of rainfall and lots of woods, and even though wood and stone craftsmen are the pillars of their traditional lifestyle, houses are built completely in stone. Wood is left only for certain indoor details and for accessory elements of the house and external complementary buildings like *hórreo*. So even though in some

areas good quality stone could be extracted, wood would be still used in aerial drying sheds. Tradition and culture appears to be strongly related to these objects too. More information is provided to refute Pracchi's idea and it is suggested that the true reason has not been investigated yet and may be historical. [Martínez, 1956: 174]

Till that moment, all the adaptations to the environment of drying sheds were external to mankind: climate, rainfall, geology, composition of the soil, accessibility to materials, and suitability to plant crop. However, we cannot forget to take into account the history and the culture of the area where we are studying vernacular architecture. It will certainly help in understanding better its evolution and adaptation.

### **Architectural study: Elements and form**

All these constructions have been built with a clear purpose: drying and storing crops for later usage, protecting them from the moisture, rodents and vermin. Regardless the geographical region or ethnical area where each drying shed has been developed and implemented, the same main parts can be identified in each one of them from bottom to top: A structure, a main body and a roof.

#### **a) Structure**

It supports the whole drying shed raising it on pillars tall enough to isolate it from vermin and moisture. The height of these pillars may vary from one region to another, but they are always driven into the ground and normally crowned with bigger stone slabs that prevent rodents to access the main body. Any structure consists of three main elements: foundations, feet, and corbels.

#### **Foundations**

Drying sheds built in stone need more carefully planned foundations than wooden ones since they are heavier, but despite this fact, they all must have a solid support. On a steep slope, a basis is needed. Sometimes it comes in a natural way, offered by the bedrock of the location. Sometimes, it has to be built creating a plinth with stone blocks filled in with dirt and covered by a horizontal stone, or pillars or masonry walls are built to absorb the height difference. When the location is practically horizontal the plinth is not needed and an individual basis is driven into the ground for each pillar or wall were the drying shed stands.

#### **Feet**

They can be built in wood or stone and shapes can vary from circular to square and rectangular. They can be conceived as pillars and appear in different numbers depending on the size of the drying shed and the style it is built in. However, these feet can also be dwarf walls set at a regular distance and parallel one to each other acting not only as supporting feet for the construction but also as beams where the floor can be directly laid. One thing is common for all types: they are divided into sections that are taken advantage from when setting their feet layout.

#### **Corbels**

Pillars and dwarf walls built to raise this construction have on top of them slabs where beams later rest on. These slabs are larger than the columns and beams they serve and it is because they prevent rodents to reach the corn. Mice and vermin can

climb upwards, but they are incapable of walking upside-down, what makes them give up and find food somewhere else. Corbels are structural elements and protection devices at the same time. The resulting void underneath such constructions isolates the storing chamber from moisture within the soil. It allows the air to flow around the object removing high levels of humidity and allowing constant air replacement. It prevents moisture to reach the storing chamber and acts as a natural barrier for rodents to access the maize. In time, this void has been also used as a storage room for tools, carriages, vehicles and often as a henhouse. All these added uses don't stop aerial drying sheds from working as designed, and turn them into more multipurpose.

### b) Main body

It serves as a drying and storing room, with permeable walls that allow continuous and efficient ventilation or completely blind depending on their main function but always minimizing the direct sunlight on the stored goods.

The floor always lays on the beams set on top of the structure supports and can vary in size as well as in layout. The may be set together or may leave some space for ventilation. It depends on the material used and the type and style of drying shed. It may also be laid in a longitudinal way resting on the transversal walls of the structure, or in a transversal way on the longitudinal beams set in case the construction is set on pillars.

Walls can be curved or flat. The first case is the most primitive type and reminds of big knitted baskets in a truncated cone shape with irregular openings all around its perimeter. Its shape is so irregular that it is virtually impossible to find two identical, and creating a systematic construction with pre-establish details is unconceivable. Flat walls on the other hand, provide builders with a common ground where they could simplify the construction to improve the system as well as the details. Consequently, almost all the drying sheds found nowadays have flat walls, straight angles and regular uniform openings.

### c) Roof

It protects the interior from the elements and direct sunlight and it can be either pitched or hipped depending on its size and style. At first, these roofs were movable as the main body was loaded from above. Every year straw was replaced as it didn't keep its properties longer, and the drying shed was loaded with a new crop. Later on, it became a stationary roof as straw was replaced by more durable materials and an access on the walls was opened for loading maize.

A detached access is a barrier against snakes and vermin. Drying sheds are raised so much only a person could jump up or down that distance. When raised even more, stairs are built next to the construction as a separated object. They are never connected on the upper level and the void left corresponds to human dimensions and proportions, preventing rodents or snakes to be able to save that distance on their own. It may consist of a removable ladder stored somewhere else when not needed, or stationary isolated steps design for human body proportions.

In relation to drying sheds shape, it is crucial to understand that all this vernacular architecture is built in proportion with the

human body. Craftsmen simplified measurements to those they could handle and built in accordance to them.

When studying carefully drying sheds and their measurements an interesting fact comes to light: their construction is bound to a square and its diagonal, and by extension to a 3D construction with squares, is also bound to a cube and the different diagonals contained in it. One measurement was taken as a reference for the whole structure and every element was design after it by combining squares and circles, extending those squares into rectangles and using again their diagonals. Consequently, it is almost impossible to find two drying sheds with exactly the same measurements, while on the other hand, almost all the working drying sheds follow this proportion system.

The proportion system used in Slovene drying sheds is ingeniously simple and effective: two squares are used one of top of the other. One is parallel to the floor and it is used to create the structure, while the second one is rotated 45° and located with its diagonal on the upper edge of the lower square, creating the roofing system. Inside this one, a smaller square can be inscribed and it is exactly there where the storing room is built. It is important to highlight that all these proportions did not take as a reference the finished building with its finished materials and cladding, but the construction elements. Within this square (below and above) run other elements that use an increase and a decrease by the square root of two, so that *kozolec* has only two measurements: 1 and  $\sqrt{2}/2$ . Besides, the height is composed of the measurement of  $1+\sqrt{2}$  which is a little percentage less than  $\sqrt{3}$ ; fact that doesn't make the composition more demanding but simplifies it. The same principles can be applied to the rest of the drying sheds found in Portugal and Spain: a simple base unit exists and is used to create a simple, harmonic yet functional and complex building. [Juvanec, 2007: 61-71]

### Architectural study: Materials

By studying different examples of drying sheds in Portugal, Spain and Slovenia, the materials used are stone and wood for the structure and the main body; and straw, wood or stone for the roof. The question that arises before this data is what influences the use of one material or another; is there any physical relation between the chosen materials and the climate, the geology and the flora or fauna in a region and if so, which one is the most influencing on the decision.

As explained before, some researchers such as Frankowski and Pracchi, claimed the materials used in drying sheds are related to the annual average rainfall an area has. Stone drying sheds distribution depends on how much it rains in an area, and consequently being located only in such wet regions. For the same reason, they claimed that wood is used in areas where there is a lower rainfall and wood can be preserved better; as an extension, so does the drying shed.

In Spain a coincidence exists between stone built drying shed distribution and the highest average rainfall. But the same coincidence happens with stone drying shed distribution and geological areas with high quality bedrock. This led other researchers like Martínez and López Soler to defend geological factors as the main influence when choosing materials in these

constructions. A debate is still opened around this matter and got more complex when he later suggested that tradition and culture also influences the choice despite climate and available materials. [Martínez, 1975:49-58]

In areas where there is a natural bedrock offering stone with a reasonable hardness, compactness and resistance, it will be extracted and used not only in building drying sheds but in any traditional architecture in the area. However, if the available stone is not such an easy resource to find or is barely compact, cracked and has a thick grain, ashlar will be impossible to carve and consequently this material will be avoided leaving an open window to the use of other local resources. Hard wood takes that place and is combined with stone or stand alone in the design. Soft wood is also used, not for structural elements but for cladding or flooring. This ensures no available resource is left aside and the construction is profitable and efficient. It will lower the cost and promote local economy of the area.

It is important to realize that the available materials will induce different construction systems and details. The more fine-grain sedimentary rock we can find in the area, the larger pieces of stones we can carve, meaning the bigger spans we can cover with one piece and faster and more efficient construction. The bigger grain the stones have, the smaller pieces we can carve and more masonry-like systems without mortar we find. With the wood happens the same: harder wood is reserved for structural elements as we have mentioned, having different construction details than elements of softer wood which is used to create ventilation opening, flooring and access to the building.

Finally, when analysing the construction methods, wooden construction details have been found in stone-made drying sheds. Not knowing the exact reason, a paralleled materialization of form happened when using wood and stone. As a consequence, specific wooden details can be found in stone built drying sheds.

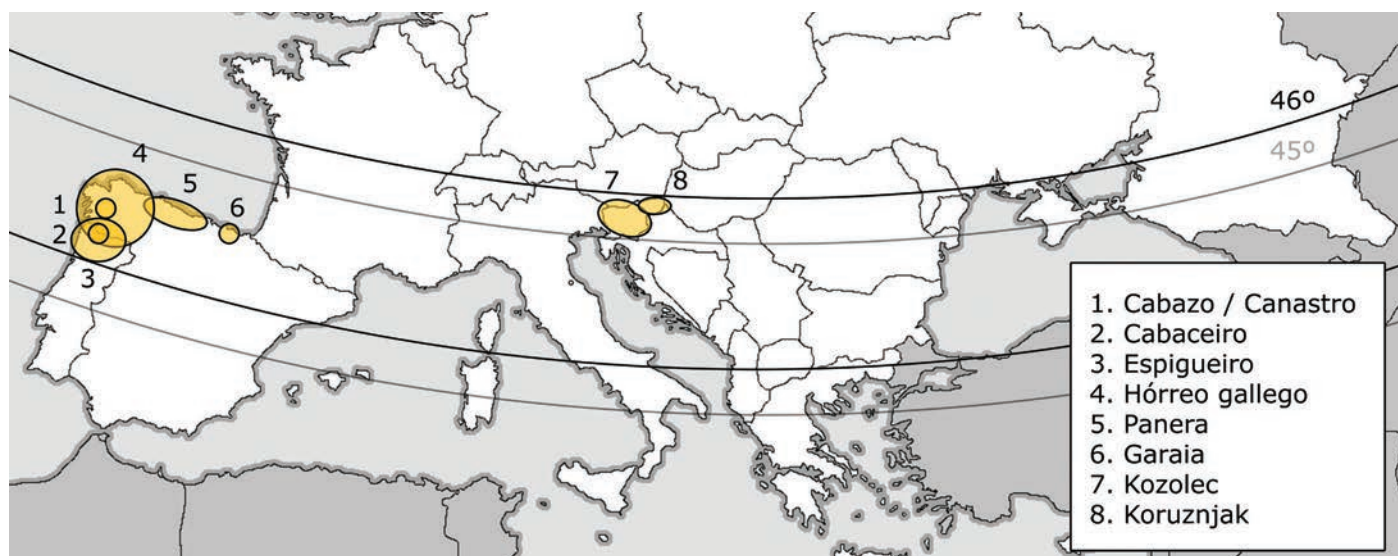
### Geographical distribution

The need to isolate the crops from the soil is absolutely crucial in areas with a high average rainfall. Harvested goods lose their

nutritional value if left on the ground to dry and the chance of improving the quality of dried cereals for human use and animal's fodder will be taken. However, isolating the cereals and grains from the floor doesn't mean a lifted drying shed is needed. Therefore, the reason why they appear in certain areas has to be carefully studied as well as the different typologies and their specific location. Only in that way the relation between the land and the object can be understood and valued for what is worth.

This study is focused on Northern Portugal and Northern Spain, which are comprised within 41° and 43° N limiting with the Atlantic Ocean and the Cantabrian Sea on one side and mountains on the other. Due to their complex orography, it is possible to find a large number of small microclimates. A wide variety of soils, geographical accidents, and hydrographical systems create in each area a different landscape comprising the identity of the different settled groups. In Slovenia, located in between 45° and 46° N, it happens the same: even though it is a small country a wide variety of landscapes can be identified and the human settlements there have made this orography their own adapting it to their needs as well as adapting themselves to it. When looking into more Balkan countries, we find similar latitudes: Bosnia is within 42° and 45° and Serbia within 42° and 46° for example. The similar latitude of these countries and regions and the complex orography already gives us a common starting point.

Within these areas we can find three different climates: Atlantic, Continental and Alpine. Despite the different terminology, these regions are influenced by very similar conditions which create the very same frame to settle an agriculture that relates to the particular landscape and orography. All of these areas have a high average rainfall, with cold winters and warm summers, good characteristics to develop an agriculture based on two crops per year. The corn, provided a large harvest and suited perfectly the summer time conditions, the only need was developing a place where it could dry during the winter and be used throughout the year. Due to the high amount of precipitation and the continuous need of avoiding vermin indoors, elevated drying sheds were perfectly suitable and they were adapted to this new cereal's needs.



Slika 1: Izbrane lokacije koruznjakov po Evropi.

Figure 1: Selected location of aerial drying sheds in Europe.

In between these regions aerial drying sheds cannot be found. In the Mediterranean limiting French regions and the Italian northern areas around the river Po, corn wasn't such a success. Despite having similar latitudes, these regions are warmer and with a lower annual average rainfall, conditions not so suitable for corn. Consequently, maize didn't spread here and drying sheds didn't have to increase their size nor adapt to this cereal special needs.

### Typology according to location

#### Cabazo, canastro

Canastro as it is known in Portugal, or cabazos as they are also called in Spain, are indeed the same first object developed to preserve and air-dry cereals set on the air.

It is the eldest and most rudimentary drying shed found in the North of Spain and Portugal and it is inherited from primitive gather communities settled there in the Neolithic. Although it is rare and despite its short life span, it is currently still used in areas 500 m above the sea level or higher because it is a low cost, easy to build object any farmer can make with resources at hand. In these areas maize is cultivated in small quantities due to its low profit, and which makes cabazo size perfect for its function.

This simple aerial drying shed has a circular floor plan that is rarely bigger than 1,50 m in diameter, truncated cone shape walls and a steep conic roof ended in a sharp point. The main body is made by flexible vegetable materials – thin young branches – knitted on vertical thicker sticks, reminding us of a big knitted basket. Proper ventilation is secured as these knitted walls provide enough openings all along their surface. It doesn't have an access to the interior though. On the contrary, the roof can be lifted to load or unload the maize cobs, and in some cases a temporary opening is made in the roof that is later filled in again once the action is finished. Straw is used for roofing the object, which makes this process easier and bearable. Sometimes, a small opening can be done to take cobs as needed. The object is lifted on the air by short crude wooden or stone posts and rarely also by dwarf walls. On top of them, wooden or stone lintels create a base where the basket rests.



Slika 2: Cabazo. Palas de Rei, Španija. [Martínez, 1975]

Figure 2: Cabazo. Palas de Rei, Spain. [Martínez, 1975]

#### Cabaceiro

It is a later implementation of cabazo. It still has knitted walls but its floor plan is no longer circular: it is rectangular with straight walls and a pitched roof originally built with straw although current examples can be found with ceramic or stone roofing. Apart from knitting tender flexible branches, a new system is introduced and coexists with it: pre-braiding vegetable fibres and later knitting them on vertical sticks along the perimeter. It is bigger than canastro or cabazo, which means that the moving roof is no longer an option due to its incremented weight and size. A door is built on one of the smaller doors and even though it is set on pillars, no steps or stairs are needed as the structure is not that high and a person can easily save that distance. Vermin and snakes are avoided while owners can access the stored goods.

#### Espigueiro

On the North of Portugal these aerial drying sheds can be found in greater concentrations such as in Soajo (27 objects) and Lindoso (64 objects) as well as single objects in households. With a rectangular floor plan, a pitched roof and a marked structure with protuberant lintels over the pillars where the main body stands, these objects can be built in stone or mixed stone and wood.

In any case, it is surprising the large size of the ashlar used. This is mainly because the granite used for their construction is so resistant that it can be carved in pieces large enough to cover the distance between pillars and resist the weight of the drying shed without collapsing. The openings are generally made with vertical ashlar carved in a hexagonal profile so the façade and the inner surface remain flat and the air is directed to the interior making easier its ventilation. When using mixed materials, wood is used to create these openings by using vertical boards with a small separation among each other. The sun rays are therefore avoided in both types of espigueiros and the access to the chamber is granted with a wooden door. Roofing is always carried on in stone and in the most modern cases, with ceramic tiles. No stairs are required in most of the cases as the pillars' height is not so much to avoid a person to jump to the interior, though in some cases a removable step can be used to make it easier. Of course, wooden espigueiros can also be found.

#### Galician Hórreo

Within the Spanish territory and due to the number of remaining samples found, its geographical extension and its invariability in form through time, it is the Spanish type of aerial drying shed for excellence.

Built in stone and wood, as well as only in wood or stone, it presents a rectangular floor plan longer or shorter depending on size of the crops and the amount of corn to be dried, but with its main body being always in between 1'00m and 1.20m wide and from 1.80m to 2.00m tall. A pitched roof with short eaves covers the construction having quite often decorations like pinnacles or crosses.

Hórreos built in wood are set on dwarf walls with rectangular slabs to stop vermin to access the inside of the building. The body walls are built by vertical boards tied with one or two horizontal boards set at a middle distance, leaving uniform small spaces in



Slika 3: Cabaceiro: Libureiro. Španija. [Martinez, 1975]  
Figure 3: Cabaceiro: Libureiro. Spain. [Martinez, 1975]



Slika 4: Kamniti espigueiro na stebrih. Soajo, Portugal. [José Olgon]  
Figure 4: Stone espigueiro on columns. Soajo, Portugal. [José Olgon]



Slika 5: Hórreo iz lesa na več zidcih. Abegondo, Španija. [www.horreosdeg Galicia.com]  
Figure 5: Wooden hórreo on dwarf walls. Abegondo, Spain. [www.horreosdeg Galicia.com]



Slika 6: Hórreo iz lesa in kamna na več zidcih. Amoeiro, Spain. [www.horreosdeg Galicia.com]  
Figure 6: Mixed hórreo on dwarf walls. Amoeiro, Spain. [www.horreosdeg Galicia.com]

between them to allow natural ventilation to happen. It is widely accepted that wooden hórreos are only owned by smaller and less wealthy farmers, as well as used for lower quality variety of corn. However, despite being easy to find examples for this, it is also true that there are beautifully decorated wooden hórreos with a special attention put into details, which makes impossible to sustain this hypothesis. The stone ones are found in areas where the bedrock is such an available resource it becomes easier to carve it and build with ashlar, than cutting wood and transform it into beams and boards. It has been also related to areas with a higher average rainfall, but this is not the main reason as it has been discussed before. The structure presents a wide variety of systems again, and so does the main body: big vertical ashlar, horizontal masonry alternated with smaller stones or dry stone walls with irregular pieces to create ventilation openings; all different and adapting to the characteristics of the available stone. The walls become thicker because of the incremented weight of the construction, more stability and the way of working this material. Only when using slate thinner walls are possible.

The mixed type can be found all over the region of Galicia, which makes it very variable in measurements, structure and aesthetic. They can be built with ashlar, pillars, dwarf walls and basis, with circular or rectangular slabs as well as double ones. But they all keep the same main body structure: dry stone fronts in the shorter sides and dry stone columns in the longer sides where the wooden cladding frame is supported. The roof substructure is also stone made, and it rests in these columns to ensure stability. The difference in the stone construction details comes from the kind of stone used, which depends in great measure on the bedrock of that particular area. As we mentioned already, the finer grain the rock has, the bigger ashlar will be used in drying shed construction; the bigger grain it has, the more susceptible the rock will be to break and the smaller ashlar will be carved.

In all cases a door is always located on one of the short sides of the object and no stairs are needed to get inside due to the short height of the main body. The roof becomes stationary not being moved at all like in cabazos, and therefore, more durable materials are used such as ceramics, stone or wood.

### Asturian hórreo or panera

This drying shed was originally built with a square floor plan main body supported by only four pillars. Its roof is not pitched but hipped with the catslide joint in a ridge. Some of them later adopted a slightly more rectangular shape, but not as marked as in hórreos. They are higher than their neighbouring hórreos and therefore, a removable ladder is needed to access the interior. Stone stairs are also quite normal to be built next to these buildings too, but always disconnected from the main body to physically create a barrier for vermin, snakes and rodents. A gallery is often added to the main body both for loading and unloading the stored goods, as well as to extend the drying surface in the object and use it to sundry other harvested products. While the structure can be built in stone or wood, the main body always remains in wood with a tile or slate roof.

They are mainly found in the regions of Asturias and Cantabria, on the east of Galicia.

### **Garaia**

Found at the eastern side of the northern Spanish coast, they decay on the XV and finally disappeared on the XVI due to an extensive change of agriculture for stockbreeding, turning the cereal fields into pastures. Today, a few examples can be found but all in very bad condition as the need for a specialised maize storing room does not exist for a long time now. They had a rectangular main body, built in wood and normally divided into three rooms. Four or six pillars with lintels would support these objects, and they would have a hipped roof when being small, and pitched when growing bigger. No gallery was attached to the main body.

### **Koruznjak**

Found only in the Northeast and Southeast of Slovenia, the koruznjak is a specialized rectangular floor plan drying shed used only for corn. The eldest types were built with a wooden structure cover in wattle knitted walls and 45° pitch roofs, reminding us of the cabacerio that once existed in the north of Spain. Later on, the wattle was replaced by wooden laths, making this construction more durable and consistent. Openings were now more regular than in the previous constructions and the walls became perfectly straight and perpendicular to each other. The roof continued to be thatched but the wooden substructure that held it turned into a more systematic one, following proportions and adding always eaves long enough to ensure rain water would not access the corn.

On one of the shorter facades a door is built to access the interior like in Portugal and Spain, but the structure that holds the main body, is however significantly shorter and; as it can be saved with just a step, no external devices are needed to access the corn. In more recent examples, the wooden angled structure has been replaced by concrete or masonry dwarf walls, raising the total height of these drying sheds, but still not enough to make necessary any attached steps.

### **Kozolec**

It is the most extended drying shed type in Slovenia and even though it was not originally developed to dry corn, it was adapted to do so once this cereal spread across the country. Giving that the starting point of this device was a wooden vertical grid, supported by brackets and covered by a roof, where hay was hung to be dried, it is surprising how it evolved till becoming a multipurpose daily object.

Though there are many kinds of this drying shed only the one used also for corn is the so called couple-kozolec and it comprises two single kozolec – wooden vertical grids – joined with cross beams and covered by a hipped roof. Inside, an upper floor is set using these beams as a primary structure where another set of cross beams are laid perpendicularly. It is on this upper level where the corn is dried and stored. It is already protected from direct sunlight by the grid set on the longer sides of this construction, however it incorporates not only an almost

opaque wooden cladding on the shorter sides, but also another wooden grid, with more or less openings depending on its use, on the upper floor. This creates a chamber well ventilated and protected that ensures corn dries in optimal conditions.

Couple kozolec are covered with a hipped roof set with a 45° slope. This ensures not only protection from the elements, but also creates a natural flow of air within the object: as the lower part receives direct sunlight and the upper one is in constant shadow, the hot air rises creating a natural ventilation around the upper level, removing high humidity levels.

### **Influence and changes in society**

Aerial drying sheds have been used for a long time, and are constantly adapting to the different crops and cereals used in the fields as well as available resources in the area. They have been target of constant attacks since they represent the wealth of a region and their immediate future, and any conqueror would constantly burn them, tear them down or loot their content just to subjugate the local population. In some cases, it wasn't even about physical control of people, but psychological. We shouldn't forget that aerial sheds are really specific to certain areas and they are part of their identity and culture of their native population. Eliminating that identity can be achieved also by destroying their symbols and common cultural heritage, and therefore, drying sheds become a recognizable target. This is why these objects have a common spatial position within farmsteads. They need to be protected as well as easily reachable for daily needs. Therefore, they are always set next to the main house under a visual control.

Not only rivalry caused destruction of aerial drying sheds, also new discoveries and good improvements have had a collateral damage for these constructions. In fact, a new cereal created the first true inflection point in the evolution of such an ingenious construction: the corn (*zea mays*). Though it was introduced in Europe from America in 1515 with Sevilla as gateway – Spanish obligatory port for ships coming from and going to the new continent – it is very difficult to establish exactly when this was since the new cereal in most of the cases was designated under the same term as the main traditional cultivated cereal in each region. In the case of Portugal milho was the substituted cereal and the name given to maize in an effort for continuation in traditional agriculture; in the case of northern Spain mijo was the target for this change; and in the case of Slovenia sirk known in English as sorghum. But approximately, we can say that it did not reach the northern area of Portugal and Spain till the XVII century as well as Slovenia. [Martínez, 1975: 27]

The reason why a tropical and subtropical cereal reached such a rapid and important dissemination in Atlantic and Continental climates is because it was perfectly suitable as a summer crop: relatively hot summers with temperatures not lower than 13°C at night and day temperatures 18°C or higher ensured a fast growth and prevented it to slow down at nights. A constant annual rainfall made it perfect for varieties that ripe before the arrival of the autumn and the cold temperatures, making possible the harvest and later cure and drying process outside the fields, leaving the land ready for a second winter crop.



Slika 7: Panera. Asturias, Španija. [www.teyvert.com]  
Figure 7: Panera. Asturias, Spain. [www.teyvert.com]



Slika 8: Garaia. País Vasco, Španija. [Indalecio Ojanguren]  
Figure 8: Garaia. País Vasco, Spain. [Indalecio Ojanguren]



Slika 9: Koruznjak. Prekmurije, Slovenija. [Juvanec 2010]  
Figure 9: Koruznjak. Prekmurje, Slovenia. [Juvanec 2010]



Slika 10: Kozolec. Slovenj Gradec, Slovenija. [Juvanec 2010]  
Figure 10: Kozolec. Slovenj Gradec, Slovenia. [Juvanec 2010]

Thanks to it and within the Spanish territory, the *hórreo* reached its maximum peak in the North-Eastern Cantabrian coast, while on the other side of the northern coast the complete opposite effect happened: its downfall. Bigger productivity brought by the maize in the fields meant a need for a bigger storage. But this was developed in different ways depending on the owner of the land and the immediate effects on the drying sheds were inevitable.

In Asturias, where the Church was the main landlord, *hórreo* was promoted and even extended in some cases with an outdoor corridor to create a larger drying surface, making it more profitable. In Galicia and north of Portugal, where the land was owned by parishes, seminaries, religious houses and monasteries, not only they incremented the number of these constructions, but also grouped them giving birth to parish and monastic *hórreos*. Big private landlords followed the example given by the church and grouped their new *hórreos* and *espigueiros* keeping them close but never being an obstacle for their proper functioning and ventilation, creating an unusual picturesque image. Higher efficiency and production brought higher security and protection.

On the other hand, in Cantabria, Basquia and Navarra actions take a different turn and landowners build big stables with wide attics where they dry the cobs together with the stored cereal and grain. The drying sheds as individual objects disappear brutally from the landscape in these regions, remaining only a handful of examples.

In Slovenia maize also made a remarkable impact in agriculture and family economy. In the Pannonia plain the best conditions were found for this new crop and the need for a specialised drying shed appeared. Small objects spread across the landscape. Except in the coastal region, where this cereal had no effect at all, in the rest of the country no new construction was developed as it didn't become the main cereal. It was however included as a summer crop in farming and so, the old drying constructions used for fodder evolved and included a room where maize could dry under suitable conditions. Both *koruznjak* and *kozolec* (first and second type) are still in use and can be seen throughout the country.

Apart from this, drying sheds were also abandoned when not working properly. This could be due to inadequate used materials, construction problems, later earth moving that affected foundations, lack of training or construction knowledge or improper maintenance of the building. Transferred knowledge among generations was defected. Also, when located within the living area it could happen that later constructions around the drying sheds would stop the natural ventilation by obstructing the currents circulating around the building, and consequently making it not dry the crops and turn it into a useless object. This doomed a relevant number of aerial drying sheds after some farms became wealthier due to maize incomes.

More recently, another inflection point occurs in the history of the drying sheds. Due to technological developments, new machinery is implemented to harvest the cereals and bale them in rolls where they can directly dry and ferment without any specialised extra building or space needed. It is good news

for farmers, who can save time and energy with this useful simplification of the harvesting process as well as get a more profitable outcome; but seriously threat drying sheds. The key of survival for them is that even though a larger quantity of fodder can be obtained by new technologies, the quality of dried cereals in drying sheds is anyway higher.

### Conclusions

Similarities in the outcome are visible: the studied aerial drying sheds belong to a same group and establishing a classification is licit. Besides, the similar construction details suggest this classification can be carried out following different factors: materials, construction, form or use.

The introduction of corn has played a remarkable role in these constructions' evolution and development. It should be possible to create a map of maize expansion through Europe and connect it with changes induced in aerial drying sheds: implementations in the design, expansion of the buildings and their disappearance in some regions.

There is a connection between the geographical distribution of these objects and the climatic and geological factors in these areas. It is licit to agree with Martínez and his defence of geological factors going over the climate. It may seem a bit controverted in the Iberian Peninsula, as the areas with higher amount of precipitation coincides with good quality bedrock areas. But when looking into Slovenia and the average amount of rainfall per year, we can state that it is not a matter of how much it rains but about what resources and materials are more at hand: The main accessible material along the country is wood, and only in certain parts with a better quality bedrock, stone elements can be found without a considerable difference in rainfall average. Tradition must be regarded as it influences them too.

Juvanec's theory of the usage of the 45° roof on a drying shed not to warm up the stored goods but to create forced ventilation should be proved in the whole study group. Extrapolating this system to modern materials and current construction systems seems plausible and could bring many benefits to sustainable architecture.

Drying sheds have suffered crisis throughout time, and their future is threatened by new technologies, lack of use or indifference. This vernacular architecture has to evolve and find a new position and use, but we also have to realize their cultural and social value, the identity symbol they are.

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### izvleček

Pri raziskovanju tega področja obstaja mnogo virov tako grafičnih kot pisnih, mnogi so dostopni prek svetovnega spleta. Odprt dostop do teh spletnih prostorskih baz omogoča javnosti in strokovnjakom, da dostopajo do teh vsebin. Težava nastane pri ažurnosti teh vsebin, saj so pogoste napake in odstopanja. Sorodno problematiko srečujemo tudi pri dokumentacij arhitekturne dediščine. Z uporabo fotografske dokumentacije in grafičnih podlog lahko z uporabo primernih programskih orodij upodobimo prostorske modele.

Z uporabo IT tehnologije so ti podatki dosegljivi dobesedno na dlani (mobilniki, tablice), sočasno pa se lahko baze podatkov dopolnjujejo s podatki iz teh naprav. Diseminacija podatkov potek prek različnih orodij (odjemniki e pošte, oblachna tehnologija, strežniške knjižnice, spletni dnevniki). Avtorji opozarjamo na slabosti izbora teh podatkov, kvalitete podatkov in klasifikacije. Tu gre za sistemski pristop, ki ga avtorji predstavljamo v članku. Zajem podatkov smo izvedli z metodami fotografiranja, inventarizacije in datacije v času. Podatke smo rangirali tudi z vnosom geografske lokacije. Strnjena baza podatkov je dostopna kot GIS baza, kar omogoča njeno uporabo v praksi in pri drugih raziskavah.

Avtorji smo na opisani način izvedli delo na primeru Cáceres, ki je del UNESCO baze (1986). Pri tem smo avtorji naleteli na mnoge ovire, ki smo jih uspešno presegle. Včasih smo morali uporabiti preproste tehnike snemanja podatkov.

### ključne besede

dediščina, arhitektura, dokumentacija, risba, GIS, Cáceres

### abstract

*There are so many literary and graphic resources available on the network that is impossible to get in touch with all of them. The free access to the computer sources, disseminated in different places and supports, facilitates an increasingly amount of information. This huge quantity of stuff does not correspond to its accuracy or precision. In reference to the graphic documentation of the architectonic heritage, something similar occurs. Nowadays we can have photographs or plans of any corner in the world, so we could rebuild in 3D the most visited highlights in our planet. This fact has been facilitated by the IT (Information Technologies), not only in the data collection by means of cameras or other devices as phones or tablets, but in its dissemination on the internet by means of webs and blogs. Two different lacks can also be found. On one hand, the source treatment from the data collection to the exhibition and on the other hand, its hierarchy or classification, so quality information can be reached. Both aims are proposed in this work. On one side, a systematic treatment of the documentation, being transferred to a unified database. On the other side, the exhibition, by means of a data basis in GIS support. As a sample the experience started in Cáceres, declared World Heritage Site by UNESCO in 1986, is shown. Achieving this objective was a fact, thanks to adding efforts, having arguments and agreements, which was clearly difficult to get.*

### key words

heritage, architecture, documentation, drawings, GIS, Cáceres

### One place, thousands of images

A high amount of documentation like photos and drawings can be discovered when visiting Cáceres or any other place in the world. The will of being immortalized in a photo beside an inherited place produces an avalanche of documentation with similar contents, although with particular points of view. The repetition of the same image aimed to different receivers gathers a huge volume of reports of difficult deal. This high amount of documentation is due to the fact of the desire of having an important place photographed with one of us in front.

The situation showed in San Jorge Square in Cáceres (figure 1), a downtown place of a city of nearly one hundred thousand inhabitants, is repeated in the most visited places in the world or in those that appear in the tourist guides, as Plečnik's Church of Saint Michael on the outskirts of Ljubljana, in the South of the city, e.g. Meeting people who are peacefully watching the church in order to have their own views while their car has just stopped for scarcely five minutes, is quite common. The fact was the same as that besides Tower of Pisa, the Colosseo in Rome or the Zero Zone in New York. These are some of much visited examples. The inflow of visitors to those places can be considered enormous, which does not occur with Saint Michael Church in Ljubljana or San Jorge Square in Cáceres, though the phenomenon is quite similar.

### Technical documentation

In reference to the most important aim of this work, we are referring not only to the photographs, nowadays reachable by any tourist, but to a certain more technical and heritage documentation coming from either professional or academic researches. Forgetting neither the most recent and advanced data collection techniques, the images from digital photography nor the point clouds got by laser scanner is not advisable. These techniques can produce very real models. In fact all that material, as it contains a lot



Slika 1: Sekvence gibaja ljudi na trgu San Jorge (Cáceres).  
Figure 1: Different moments at San Jorge Square (Cáceres).

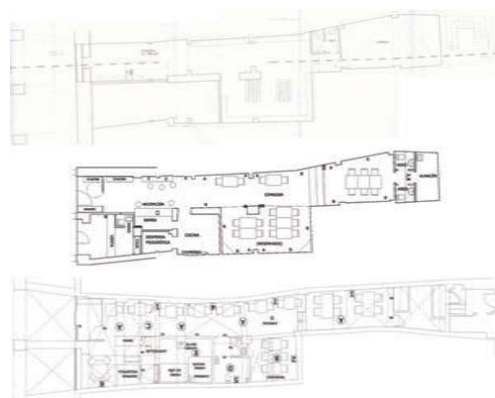
of data, must be manipulated and simplified before being offered to the general public, as the applications Google Maps for mobile in 3D, where over 100 cities around the world and their buildings can be seen in 3D.

Among these available graphic and specialized papers, the building plans, floor plans, elevations and sections can be studied or as in the past it was used to know as iconography, scenography and orthography [Gentil, 1998]. Getting plans to project buildings continues being necessary. The minimum contents are defined in Spain in the Technical Building Code since 2006 [<http://www.codigotecnico.org/web/>], summarizing some previous and always developing regulations.

When the level of information is defined, we choose the ground floor or street level floor to be elaborated and disseminated. Among the reasons for this election is the special synthesis that is got with the ground floor as Anton Ulrich has written: "Ground-plan is an explicit presentation of the solution for a building which shows its actual contents (...) It still enables us to vividly visualize an edifice in terms of logical interrelation of space within an organic wholeness that will serve for some specific purpose and fulfill the requirements of that edifice." [Ulrich, 2003:6]

Regarding the plan documentation, more concise due to the need of a process of selection and development of metrical elements, a lot of reports are produced. On one hand, the property of the building can conserve original plans, even from different periods. On the other hand, technicians participant in following remodeling, prepare appropriate documentation for licenses in order to the restoration of the whole building. And licenses for partial restorations, e.g., due to the change of management in the business placed on the ground floor. In the case of asking for a capital grant, a plan adapted to the official announcement will be made. And if it is a classified building, the local government, or the administrative organization which may concern, will keep a cataloging card in the especial plan of protection. This could be added by the documentation from the cultural organization we are dealing with, in its different levels [Special Plan Cáceres: Rodríguez, S. (1985)]. To finish with, the construction plans made as teaching works in the colleges should be added, registered as End of Degree Projects, End of Master Projects or even Doctoral Theses. This is to show that different plans are generated for the same building, often at the same time.

But technical projects are also kept in the town halls, buildings of the province or regional government or even in the buildings of the government of the country. And this scattering could be a problem. Or should be an opportunity. Getting from this point, a lot of disseminated information can be found. Discussing with the colleague Professor Borut Jubanec, from the Faculty of Architecture of Ljubljana, in summer 2013, it seemed impossible to carry out the collection, unification of the exposition criteria and the data sample. But in Cáceres that is a fact, just now. The Civil Council in Cáceres, knowing our research work, looked for other projects in several archives like their own one, from different public institutions and from some professionals. When the Municipality of Cáceres started working in the project, the progress was quicker especially thanks to some researchers' works, like José Luis Sánchez de la Calle's one, that at that moment was the coordinator of the Integral Rehabilitation Area (ARI) of Cáceres, Luis Antonio Álvarez and Faustino Cordero, in charge of the SIG office in Cáceres [SIG of Municipality of Cáceres, 2014]. The former one has made a big effort in contacting people with institutions, getting a huge compilation of material. The others have helped in the process of the research and in the transfer to the GIS basis of the municipality.



Slika 2: Tlorisi variantnih rešitev na glavnem trgu. (Cáceres)

Figure 2: Plans on business premises in the Main Square (Cáceres).

### Researching papers

In the same way, we could refer to bibliographical information for its distribution: academic and school studies, specialized monographs on research by researchers, reports presented in official requests or licenses required for building or remodelations, locally, at a provincial or autonomous level. In the case of Spain, we must deal with varied intermediate stages between council and country. As well as at a national, European and supranational level or at the stage of other institutions like UNESCO or ICOMOS. A suitable source in Cáceres on building historic studies could be mentioned, a monograph on religious architecture [Garcia, 2005], which is prepared to be incorporated into the database. At the same time in Ljubljana, Joze Plecknik's monographs, as a sample. We usually read very interesting papers on Arts and History about buildings and constructions, written by experienced researchers, without the help of precise drawings of a figure or a plan drawing. And we think that an image shows more than a thousand of words. Historians could use technical supports if they had them [Lozano, 2011].

A previous and similar experience on mainly archaeological remains in Rome could help [Carafa, 2010]. The multidisciplinary approach of this task, object of study, could allow us to work on a wider project. By now, geographers, historians, computer experts, librarians or architects, who provide the technical support of the material, are working at the same time. Without the help of these, the dissemination would certainly be much more limited.

### Technical process

The process kept to achieve our purpose began five years ago, about in 2008 in Cáceres. Then, we discovered at the archives of the Central Library of the University of Extremadura in Cáceres a large amount of graphic works, part of them without a suitable organization due to the fact of having been moved from one building archive to another. Graphic designs from survey works, part of End Degrees Projects from the field of Technical Architecture as this degree is known in Spain and sounds in other European countries as Building Engineering, were deposited in a Letters Library. It was a transfer from a Technical College without research experience to a professional library with many researchers working in it and with a good team of librarians and file clerks in charge. But with the risk of losing these works as they were printed only in paper and with no digital register.

The first phase consisted of the selection of the material available. A good database created in 2000 was there, with the works produced from 1985 until then [Prieto, 2000]. But it became old-fashioned through the last eight years and we were not able to transfer it to an actual database, despite of the efforts of computer experts and documentalists. The advantage of belonging to a small university located in a surrounding campus is the fact of holding interdisciplinary consultations very easily. As not much time has passed from 2000 to now and thanks to the faculty files, we could find the author of the work in case she or he could remember the access key. Sometimes, despite finding the author, it was impossible to recover the key. Although we really could print the collected cards in PDF format.

From those cards, the works containing the former materials of the buildings were selected manually, with the aim of placing them on an actual and accessible database. This table contains the signature to be located in the library, the date of execution of the graphic work, the academic rate got, the name of the work, its physical location on a map, the support (paper, photograph or slide) available, the author, the tutor and the scale of the lines. Some other paragraphs to be completed in the future were left in order to facilitate its location, as the postal code or the coordinates.

Once the works are located, they have to be processed to unify their formats in order to be shown with certain uniformity. We needed to scan or photograph these drawings to rectify with a basic program as Perspective Rectifier, Photoshop or On-Site Photo, and redraw with CAD help obtaining DXF or DWG format support to insert in a certain scale on a GIS web page. We chose the detail of 1:1000 or 1:500 scales where you can discover building spaces and levels, but no specific details.

After tracing DWG formats, some difficulties were patent due to the lack of technical means within our reach. Nowadays, a plan reader by means of a scanner technology size A1 or bigger can be reachable [Ademsis, 2014], but couldn't in that moment. Then what we used was an image-setter, made with a group of colleagues from other department [Herrera, 2012] that has been improved through the years. The image setter consists of a group of auxiliary elements for plans photographing. The aim is searching the accuracy and efficiency. The components are: four tables –three supporting and one on –forming a lectern, two spotlights, a tripod and a photo camera. On the table, the paper to be photographed is set; the wrinkles are decreased thanks to a glass or methacrylate table. The whole is prepared in a wooden suitcase in order to make the storage and transportation easier. The case is also used as a basis support for the image setter. (Figure 3)

At the beginning we got the lay-flat of documents that had remained without being unfolded for ages by means of a transparent glass, with the risk of breaking, or a methacrylate. In both cases, the image definition was lost due to the light diffraction, taking into account that we were working in a cellar in quite uncomfortable conditions. The intensity of light that the plan gets can be measured with this system, in order to get the best image resolution (Figure 3b).

Slika 3: Detail izvedbe zajema podatkov z uporabo fotografskega aparata, umetno osvetlitvijo in s stojalom. Zaradi izravnave paprja smo v postopek uvedli sesalec za prah, ki izsesa zrak v ozadju in izravna papir (zadnja slika v nizu).

Figure 3: Image setter; detail of the camera and lens, the spotlights and the measure of the intensity of the light that the plan receives in the image setter. Board of the image setter. Incorporation of the vacuum cleaner in a corner. Detail of the image setter. The vacuum cleaner has been added, turned on and sturned off.

Later from 2013 on, we were improving the technique thanks to a craftsman, José Manuel Rubio Ordiales, who invented a vacuum suction system based on a domestic vacuum cleaner and a box of dimensions about 1m x 0.70 m x 0.04 m. with micro perforations on the highest dimension, which maintains the document plain and decreases the image deformations. We are dealing with a double sheet table, drilled in one of the faces with a vacuum cleaner connected in a corner. The fact of having folds or deformations is avoided with this system. Using a glass board is not needed (figure 3c) as it can be watched in a photo sequence before (figure 3d) and after (figure 3e) connecting the vacuum cleaner. This manual phase of the research continues being very useful for CAD documents, which allow a direct treatment of graphic traces.

In this context, around the change of the century, from 2000 onwards, drawings are registered on digital support, under a DWG format, that we can import to a digital database. Despite of the progress in the treatment of drawings, some lacks have been discovered [Mato, 2014]. As an example, we can say that, in the past, when giving a work in paper, a quick look could be had only going through the pages which did not require specialized staff. Nowadays, as the papers are given in a digital support, usually a CD or DVD [Regulations, 2012], the content is unknown at a first glance. In this sense, a task of removing the content of those CDs and DVDs is being developed separating the valid material from the illegible one. With the pass of a maximum of 13 years, it is still possible to locate the authors in order to recover the contents if they have been kept in a safer computing support or in paper, which can mean an easy and safe although laborious reproduction.

## Results

The results can be seen from anywhere in the world. To develop this work, we have simplified much the information offered on the web in order to make the consultation easier. We have compiled many different sources and showed them on the SIG civil council web page [<http://sig.caceres.es/sig-de-caceres/>]. You need to surf with Internet Explorer for system requirements. You can click on "CARTOGRAFIA", after in "Visor de Cartoteca" (on the left), and finally on "VISOR", in the middle, Figure 4. Then click the layers you want to be active. I suggest one of "Cartografía del núcleo urbano", e.g., "Caceres 2003" and, of course, "Patrimonio Arquitectonico UEX" (Figure 5). Web presentation is changing in summer 2014, but the steps are the same.

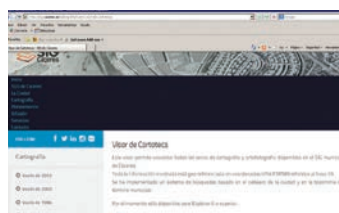


The minimum information suggested will start with the physical location on a digital cartography of reference (figure 6), usually organized in a GIS, where we can press "HERE" with a CLICK on the screen (see figure 7) and you can read the origin of the survey work (in this case, supplied by an architect, Viola, and with extra information in a Work End Degree by Redondo, from 1996, filed in the library of the University of Extremadura, with the code number TFC-AT-565, for further information).

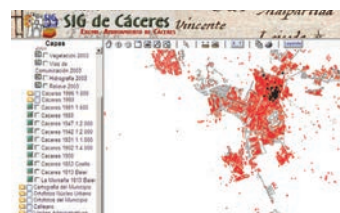
If we aware of details we come to the point of getting precise information on the building object of study; by now, the name, its location on a standard basis [INE, 2014], and the source where the information has been got and where to go for further information.

## Conclusion

The advantage of the system respecting a traditional search engine such as Google or similar is that you can locate physically the place and on it, you get the required information. In comparison with Google Maps or similar supports, the added value is that we have precise information at our disposal on the inside of the buildings and the reference about where to find further technical information. In the future that platform GIS will be compatible with the regional government with standards ISO/TC 211 [Norwegian, 2014] and OCG [Open Geospatial Consortium, 2014], with Google and its parallel competitors. As a matter of fact, this is an overlapping layers system and unifying the inserted database is required. In this way, either we or the Cadastre of Spain [Cadastre, 2014] are working or other portals run in other countries. [Geoportal, 2014] To finish with, we could talk about the dissemination of graphic documentation on the architectural heritage with academic support that guarantees the quality. In any case, it is an open process. On one side, the possibility of adding more information in the same database. On the other side, the integration of different platforms, regional or global. Finally, spreading this action to other towns in the region and to other parts of the country as the basis material and work system is available. This is one of the aims of a teaching visit arranged for the spring in 2015 in the cities of Ljubljana and Zagreb, to start working groups and agreements among the several institutions that keep the documentation on the architectural heritage or supervisor organisms on heritage conservation.



Slika 4: GIS Cáceres. Uvodna spletna stran.  
Figure 4: GIS Cáceres. Viewer acces.



Slika 5: GIS Cáceres. Grafični pregledovalnik.  
Figure 5: GIS Cáceres. Viewer.



Slika 6: Grafični pregledovalnik, nivo kataster.  
Figure 6: GIS Cáceres. Viewer's detail.



Slika 7: Grafična podatkovna baza.  
Figure 7: GIS Cáceres. Source's dates.

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**Poročila o projektih / *Project Reports***

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## TRAJNOSTNO OBLIKOVANJE KVALITETNEGA BIVALNEGA OKOLJA, POROČILO O DELU

SUSTAINABLE PLANNING FOR THE QUALITY LIVING SPACE, RESEARCH REPORT

PROGRAM ARRS št. P5-0068, 2013-2017

**Vsebina**

Vsebina raziskovalnega programa je bila razdeljena na tri vsebinsko različne tematske sklope:

**A)** Razvoj sodobnih konceptov arhitekture in urbanizma, vezanih na specifično arhitekturnega prostora in kulturno dediščino v Sloveniji. Raziskave v tem sklopu so predvsem povezovale in razvijale arhitekturno in urbanistično teorijo, pri čemer so bile v prvem letu raziskav v glavnem razdeljene na naslednje vsebine: a) poglobljanje poznavanje specifik arhitekturnega prostora v Sloveniji, b) spodbujanje razvoja kritičnega odnosa do naravne in kulturne dediščine, c) razvoj teoretskih interpretacij preteklosti za izzive sodobnosti in d) razvoj sodobnih konceptov projektiranja, ki temelji na trajnostni rabi, racionalnosti, varnosti in prepoznavnosti prostora. Posebno pozornost smo posvetili slovenski specifični razvoja metode reflektivnega projektiranja, ki združuje vse štiri navedene aspekte. Gre za razvoj arhitekturne prakse kot raziskovalnega laboratorija, za katerega je potrebno razviti metode eksplikacije oblikovalskega znanja, inherentnega v oblikovalskem procesu. Identifikacija spoznanj o prostorski inteligenci in o oblikovalskem delovanju v specifičnih socio-prostorskih kontekstih, ter metod, ki to eksplikacijo omogočajo, poteka v okviru konzorcija partnerjev projekta ADAPT-r, v katerega je programska skupina vpeta. Vloga programske skupine je v transformaciji in integraciji globalne metode v trans-regionalni prostor, z identifikacijo in upoštevanjem arhitekturne raziskovalne tradicije našega kulturnega okolja.

**B)** Raziskave, vezane na projektiranje in tehnologijo trajnostnih nizkoenergijskih hiš so bile vezane predvsem na zahteve Pravilnika o učinkoviti rabi energije v stavbah (Ur. l. RS 31/2010), ki zahteva gradnjo skoraj ničenergijskih stavb vseh javnih objektov že v nekaj letih. S povečevanjem debeline izolacije pa se pojavljajo številni problemi vezani na konstrukcijsko odpornost stikov vertikalnih in horizontalnih nosilnih elementov sklopov, ki se v praksi rešuje stihijsko brez pravih teoretičnih raziskav, predlagani koncepti pa pogosto podrejajo konstrukcijsko varnost drugim zahtevam podrejenim energetski učinkovitosti toplotnega ovoja stavbe. Popolnoma odrinjen problem pri tem predstavlja potresna varnost vseh objektov, ki so v Slovenijo prineseni iz drugih okolij, ki potresno niso ogrožena. V tem pogledu naše delo nadaljuje raziskave zaključenega raziskovalnega projekta ARRS iz prejšnjih let, v okviru dela na raziskovalnem programu P50068 pa smo izvedli bistveno natančnejše simulacije obnašanja konstrukcij na toplotni izolaciji, ki so temeljile na nelinearnem modelu zgornje konstrukcije, nelinearnem modelu toplotne izolacije in temeljnih tal (vertikalne in strižne vzmeti) ter dinamični analizi za različne potresne zapise značilne za Slovenijo. Ugotovili smo, da pri vgradnji toplotne izolacije pod temeljno ploščo pri močnem potresu lahko pride do stiskanja izolacije, zmanjšanja toplotnih karakteristik in nagibanja

**Content**

The proposed research program is divided in three thematically different parts:

**A)** Development of contemporary concepts of architecture and urban design in relation to the specific of Slovene architecture and protection of architectural and cultural heritage. Research in this section was focused in the following fields: a) indepth knowledge of Slovenian architectural characteristics, b) development of a critical creativity preserving natural and cultural heritage, c) development of theoretical interpretations of the past for the challenges of the future and d) development of contemporary concepts of rationality, security and space recognition. Special attention has been given to the development of the reflective design method, considering the Slovenian specifics. All four of the above aspects were considered. The method treats architectural practice as a research laboratory for which new procedures of design know-how, inherent in the design process, need to be considered. The identification of knowledge regarding spatial intelligence and design procedures for specific socio-spatial contexts takes place in a form of a consortium of the project ADAPT-r in which the research group is also included. The role of our research group is in transforming and integrating the global method into a trans-regional space with identification and implementation of the existing architectural research tradition.

**B)** Research related to design, technology and detailing of sustainable low energy houses were based on the Efficient energy in buildings guidelines (PURES, Ur. l. RS 31/2010). The guidelines impose a nearly zero energy building concept for all public buildings after 2018 and for all new buildings after 2020. Construction practice has already responded to these demands by increasing the thickness of the thermal insulation layer of building envelopes. It is obvious in these cases that the main component governing the overall building dimensions is not the loadbearing structure anymore. The initial design concepts of low energy structures originate from Northern Europe, where the seismic activity is low. Such buildings have therefore not been designed to withstand higher seismic loadings that are for instance typical for Slovenia. In this sense our work in the research group continues the research of the ARRS research project from previous years. In the scope of work performed in the research programme P50068 we have carried out detailed simulations of the behaviour of low-energy buildings that are founded on a layer of thermal insulation. The computer simulations are based on nonlinear behaviour of the superstructure and on a nonlinear model of the insulation layer, including soil conditions. Actual earthquake records have been used that simulate realistic

objekta. Poleg tega lahko pride tudi do povečanja potresnih vplivov na zgornjo konstrukcijo. Oboje je mogoče preveriti z ustreznim statičnim računom pri potresni obtežbi, v naših raziskovalnih in strokovnih člankih pa je točno opisano v katerih primerih in za kakšne stavbe je ta natančnejši račun potresne obtežbe potreben in v katerih ne, kot je tudi opisan predlagan računski statični model, ki ga mora uporabiti projektant v praksi. Navedeni rezultati se že prenašajo v prakso v obliki strokovnih izobraževanj za gradnjo pasivnih hiš, ki jih s sodelavci in partnerji iz gospodarstva organiziramo na FA. V tem tehnološkem sklopu raziskav je bila razvita tudi enostavna metoda za vrednotenje trajnostnih zasnov energijsko učinkovitih družinskih hiš. Ugotavljamo, da imajo stavbe negativne vplive na okolje v celotnem življenjskem ciklusu, torej od faze pridobivanja surovin ter proizvodnje gradiv in polizdelkov, do prodaje, vgradnje in uporabe do končne faze odstranitve, ko stavba odsluži svojemu namenu. Trenutna zakonodaja omejuje v glavnem rabo energije in emisije v obratovanju, manj pa ostale parametre, ki prav tako definirajo zasnovo sodobne trajnostne stavbe. Preverjanje trajnostne zasnove stavbe je smiselno že v začetnih fazah projektiranja, ko je še mogoče vplivati na rezultat. Rezultat raziskave je enostavna metoda, s pomočjo katere se z izbranimi petimi indikatorji ocenjuje kakovost trajnostnih zasnov. Področja ocenjevanja se nanašajo na energijsko učinkovitost, rabo primarne energije, emisije CO<sub>2</sub>, stroške ter na doseženo bivalno ugodje. Ocenjevanje s pomočjo indikatorjev poteka po treh načinih objektivnega in subjektivnega ponderiranja, s čimer se v skupno oceno vključijo vidiki neodvisnosti presojevalca ter vidiki nacionalnih in uporabniških zahtev.

C) Raziskave metod dialoga in izobraževanja o trajnostnem prostorskem razvoju v arhitekturi in urbanizmu. Ta sklop je obravnaval arhitekturno in urbanistično izobraževanje, ter med-disciplinarno in medgeneracijsko sodelovanje v procesu oblikovanja prostora. Cilj raziskav je bil v tem sklopu usmerjen predvsem v razvoj organizacijskega, med-disciplinarnega in medgeneracijskega dialoga o trajnostnem prostorskem razvoju. Med rezultati prvega leta izpostavimo razvoj novega sistema vizualnih digitalnih orodij za sodelovanje in izobraževanje javnosti v prostorskem načrtovanju (DSO). Sistem je razdeljen na več sklopov in sestavljen iz posameznih vizualnih digitalnih orodij, ki se med seboj dopolnjujejo ter tvorijo celoto: informiranje, komuniciranje, sodelovanje in izobraževanje. Povezava med sistemom arhitekturnega in urbanističnega načrtovanja s sistemom vseživljenjskega učenja je bila preverjena z razvojem novega sistema vizualnih digitalnih orodij za sodelovanje in izobraževanje javnosti v prostorskem načrtovanju (DSO).

Poročilo sestoji iz skupnega dela, ki opisuje potek in nekatere izbrane znanstvene in družbeno ekonomske dosežke dela na programu in sedmih individualnih delov, ki opisujejo raziskovalno delo udeleženca posameznika. Individualni prispevki predloženega poročila vključujejo:

- 1) Izzivi in priložnosti arhitekture modernizma (Tadeja Zupančič)
- 2) Raziskovanje poselitvenih vzorcev in 'mreženje' v prostoru (Alenka Fikfak),
- 3) Obalne preobrazbe (Lučka Ažman Momirski)
- 4) Sredozemska terasirana pokrajina: spremembe v rabi tal (Lučka Ažman Momirski)
- 5) Metode in orodja za ocenjevanje trajnostnih enodružinskih hiš (Martina Zbašnik-Senegačnik)

*seismic characteristic that are typical for Slovenia. It has been found out that by inserting a layer of thermal insulation under the foundation slab in a seismic event with a high magnitude, can lead to inelastic deformations of the insulation layer, thus reducing its insulation properties. Several research and professional papers that we have published in the scope of the programme describe in detail in which cases and for what types of buildings a more detailed seismic analysis is needed. A refined mathematical model for construction practice was also developed and is described in the aforementioned papers. The results have already been transferred to construction practice in the form of seminars on passive house construction that are organised in cooperation with partners from the industry. In this technological scope of research a new, simplified method for the valorisation of sustainable design concepts of family houses was developed. The results show that buildings produce a negative impact on the environment in their life-cycle – from the phase of raw material production, fabrication of materials and semi-manufactured elements to the marketing, usage and final removal after the building finished working life. The legislation is mainly focused to the energy consumption and emissions produced during the normal usage of the building, while energy consumption in other life cycles is often neglected. The results of conducted study is a simple method which uses five selected indicators to verify the sustainability of design of particular building structure. The areas to be evaluated are energy efficiency, use of primary energy, CO<sub>2</sub> emissions, costs, and the level of living comfort achieved. The evaluation using these indicators is carried out using three subjective and objective weighting methods, such that the final evaluation includes the viewpoints of an independent evaluator and the points of view of both the user and the state.*

C) *Research related to dialog methods and education in sustainable spatial development in architecture and urbanism. This section analysed the architectural and urban education and interdisciplinary and multigenerational cooperation in the process of spatial development. The goal of the research was aimed in the development of organisational, interdisciplinary and multigenerational dialogue aimed at sustainable spatial planning. From the results obtained in the first year we want to highlight the development of a new digital tool for cooperation and education of general public in spatial planning (DSO). The system is divided into multiple sections and comprises from specific visual digital tools which complement each other and form a uniform system for: information, communication, cooperation and education. The connection between architectural and urban planning with the system of lifelong learning was also investigated with the development of DSO.*

*This report comprises of a common part that describes the procedures and some selected scientific and socio-economic achievements of the programme. Seven individual contributions by programme members are also included, representing their individual research work. The following topics are presented:*

- 1) *Challenges and opportunities of modernist architecture (Tadeja Zupančič)*



- 6) Spremembe testa miselne rotacije (Domen Kušar)
- 7) Dialog in izobraževanje o prostorskih trajnostnih vprašanjih v arhitekturi in urbanizmu (Matevž Juvančič).

### Doseženi cilji in rezultati raziskovalnega projekta

Rezultati dela na programu se ne kažejo samo v obliki znanstvenih člankov, temveč tudi v velikem številu objavljenih strokovnih člankov, monografij, delov monografij, delavnic, seminarjev, izobraževanj in izdanih knjig, ki so razvidni iz bibliografije celotne skupine.

### Sodelavci / Participants

Vojko Kilar (vodja projekta), Martina Zbašnik-Senegačnik, David Koren, Domen Kušar, Tomaž Slak, Tadeja Zupančič, Lucija Ažman-Momirski, Simon Petrovčič, Srečko Vratuša, Edo Wallner, Boris Azinovič – mladi raziskovalec (UL-FA) Tatjana Isaković (UL-FGG) Milan Kuhta, Simon Šilih, Erika Kozem (UM-FG) Samo Gostič, Mihael Mirtič (Gradbeni Inštitut ZRMK d.o.o.)

### Nekateri izbrani rezultati pri katerih so sodelovali člani programske skupine / Selected bibliographical results

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- 2) *Researching settlement patterns and spatial 'networking'* (Alenka Fikfak)
- 3) *Waterfront redevelopment* (Lučka Ažman Momirski)
- 4) *Mediterranean terraced landscapes: Land use changes* (Lučka Ažman Momirski)
- 5) *Methods and tools for evaluation of sustainable single-family houses* (Martina Zbašnik-Senegačnik)
- 6) *Changes of Mental rotating test* (Domen Kušar)
- 7) *Dialogue and education about spatial sustainable issues in architecture and urban design* (Matevž Juvančič).

### Achieved goals and research results

Research results are not only presented in research papers, but also in professional papers, monographs, parts of monographs, workshops, seminars which are presented in the bibliography of the entire research programme group.

### Nekateri drugi pomembni rezultati programske skupine / Other important works

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Prispevki sodelavcev v okviru projekta

**Tadeja Zupančič**  
**IZZIVI IN PRILOŽNOSTI ARHITEKTURE**  
**MODERNIZMA**

**CHALLENGES AND OPPORTUNITIES OF MODERNIST**  
**ARCHITECTURE**

**POVZETEK**

Programska skupina Fakultete za arhitekturo se intenzivno povezuje v mednarodne raziskovalne tokove. V pričujočem prispevku izpostavljam rezultate razprav v programski skupini, ki so posledica sodelovanja v evropskem SEE projektu ATRIUM – 'Architecture of Totalitarian Regimes of the 20th century in Urban Management'. Ideja evropske kulturne poti, razvita kot eden ključnih rezultatov omenjenega projekta, je v programski skupini sprožila diskusijo o priložnostih, ki jih ta ideja ponuja za zaščito in razvoj arhitekture modernizma na Slovenskem, še posebej v luči kulturne dimenzije trajnostnega prostorskega razvoja. Kulturna pot v tem primeru povezuje tako bolj ali manj zapuščene kot tudi drugače 'problematične' prostore, bolj ali manj obremenjene z mnogoterostjo zgodovinskega spomina jugovzhodne Evrope. Po drugi strani pa se problem zaščite in razvoja povojne modernistične arhitekturne dediščine v Sloveniji kaže v pomanjkanju sredstev za obnovo, kar izhaja med drugim tudi iz pomanjkanja zavedanja o možnostih, ki jih ponuja kulturni turizem (slika 1).

V programski skupini smo torej razvili kritično-refleksivno raven omenjenega projekta, ki jo je izzvala priprava priročnika za upravljanje z obravnavano dediščino dvajsetega stoletja [Zupančič, T. et.al. – eds., 2013]. Prvi rezultati refleksije so bili objavljeni v reviji 'Architecture & Urbanism' [Ifko, S., Juvančič, M., Zupančič, T., 2013], kjer smo slovensko povojno modernistično dediščino obravnavali kot turistični produkt. Rezultati druge faze razmisleka pa so predstavljeni v reviji 'Architecture & Science' [Zupančič, T., 2014]. Tokrat je izhodišče razmisleka sama ideja kulturne poti. Kaj se zgodi s splošnim, idealiziranim konceptom ob soočenju s tako občutljivim socio-prostorskim kontekstom? Odgovor smo poiskali v specifikaciji uveljavljenih splošnih kriterijev za opredelitev kulturne poti. Rezultati nadgrajujejo sistem spremljanja in vrednotenja kulturne poti, razvit v projektu ATRIUM, in sicer tako, da postaja kontekst kulturne poti nova priložnost za razvoj dediščine slovenskega modernizma.

**UPORABNOST REZULTATOV**

Rezultati sodijo k prvemu ključnemu cilju programa: prispevajo k razvoju sodobnih zasnov arhitekture in urbanizma, ki izhajajo iz posebnosti slovenske kulturne dediščine. Usmerjeni so torej k poglobljenemu poznavanju specifik arhitekturnega prostora v Sloveniji in k razvoju kritično- kreativne raziskovalne projektantske praske.

**KLJUČNE BESEDE**

arhitektura, modernizem, urbanistično oblikovanje, upravljanje mesta

**SUMMARY**

*The programme members collaborate in diverse international research consortia. This contribution is intended to emphasize the research discourse arising from the interaction of the program framework with the recently finished European SEE project ATRIUM – Architecture of Totalitarian Regimes of the 20th century in Urban Management. The concept of a European cultural route, developed as the main result of the project mentioned, is discussed in the programme group as one of potentials to protect and develop the modernist cultural heritage. The new European cultural route is developed from the abandoned and problematic places, more or less intensively associated with the diverse notions of totalitarian regimes of the 20th century in the South-Eastern Europe. The problem of the post-war modernist architectural heritage is addressed, facing the lack of resources for its renewal, deriving from the lack of awareness of the above-mentioned potentials (figure 1).*

*The reflective meta-level to the project mentioned, developed in the programme, is challenged especially by the preparation of one of the key project deliverables: the Manual of wise management, preservation, reuse and economic valorisation of architecture of totalitarian regimes of the 20th century [Zupančič, T. et.al. – eds., 2013]. The first results of this reflection were published in the journal "Architecture & Urbanism" [Ifko, S., Juvančič, M., Zupančič, T., 2013], where the Slovenian post-war modernist architectural heritage was interpreted as a tourist product. The second stage of the development of this meta-level is presented in the magazine 'Architecture & Science' [Zupančič, T., 2014]. It is focused to the specification of the concept of the European cultural route. What happens to the general concept when faced with such sensitive challenges? The general criteria to develop a cultural route are taken as starting points for their re-interpretation within the sensitive context discussed. As a result, the key starting points for the monitoring and the evaluation system of the ATRIUM cultural route are upgraded and the cultural-route context as the opportunity for modernist architecture discussed.*

**ISSUES AND THEIR SIGNIFICANCE**

*The results fit to the following program key topic: the development of contemporary concepts in architecture and urban design based on particularities of cultural heritage in Slovenia. Directed towards the in-depth knowledge of Slovenian architectural characteristics, they challenge critical creativity in design practice research interpretations.*

**KEY WORDS**

architecture, modernism, urban design, urban management

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Slika 1: V mesto vtakane modernistične sledi 'revolucije' v Ljubljani (E. Ravnikar s sodelavci, 1960-1984, foto: T.Z.)

Figure 1: Modernist traces of 'revolution' in Ljubljana, interwoven with the city and its life (E. Ravnikar with collaborators, 1960-1984, photo: T.Z.)

Alenka Fikfak

## RAZISKOVANJE POSELITVENIH VZORCEV IN 'MREŽENJE' V PROSTORU

## RESEARCHING SETTLEMENT PATTERNS AND SPATIAL 'NETWORKING'

### POVZETEK

Številne študije o stanju in trendih prostorskega razvoja nudijo podporo razvoju politik v smeri uresničevanja ciljev teritorialne kohezije in skladnega razvoja ozemlja Evrope. Po drugi strani pa se v prostoru srečujemo z vprašanji vpliva globalizacije, socialnih in demografskih sprememb, ki nenadzorovano spreminjajo želje in potrebe prebivalcev in obiskovalcev. Zato je tudi v raziskovanju vse večji poudarek na oblikovanju scenarijev prostočasnih dejavnosti, rekreacije in turizma ter možnosti prilagajanja teh programov vse bolj spreminjajočemu povpraševanju. Vedno bolj se opušča tradicionalna organizacija poselitvene strukture na podeželju, ki se prilagaja sodobnemu načinu življenja, drugačnim poselitvenim strukturam, družbenim in demografskim spremembam [Mrak et al., 2013]. Prostorski posegi so vse bolj usmerjeni v trajnostno naravnane, bolj etične in odgovorne koncepte, ki ne vključujejo samo vprašanja varovanja okolja, ampak tudi kulturne, ekonomske in politične vidike trajnosti.

Raziskovanje in razumevanje raznolikosti poselitvenih vzorcev (slika 2) za nadaljnji razvoj, s poudarkom na trajnosti razvoja, je proces, ki se ne osredotoča samo na gospodarski razvoj, temveč vključuje uravnotežen ekološki in družbeno-socialni razvoj. Izpostavljena je misel, da sodobna družba gradi na občutku za skupnost in skupne dolžnosti, torej socialni kapital kot 'življenjskost' družbe danes. Pri zagotavljanju socialne vzdržnosti (več zaupanja in sodelovanja, manj neenakosti) ne gre le za zagotavljanje, da se ohranja sedanja oblika, temveč se zagotavlja stalno izboljšanje tudi z gradnjo novih oblik skupnosti. Le ob zavedanju vsestranskih vplivov med človekom, tehnologijo, grajenim okoljem in naravnimi potenciali, z dobrim poznavanjem vseh dejavnikov in aktivnim delovanjem, je mogoče graditi kakovostno bivalno okolje ter obenem upoštevati načela trajnostnega razvoja [Čok et al., 2013]. Zato iskanje

### SUMMARY

Policy development towards the realization of the objectives of territorial cohesion and coherent development of the European territory is supported by many studies exploring the situation and trends of spatial development. On the other hand, we are confronted with the impacts of globalisation, social, and demographic changes that uncontrollably affect the desires and needs of inhabitants and visitors. Hence, research, too, should devote more attention to scenario building related to leisure activities, recreation and tourism, and the possibility of adapting these programmes to the increasingly changing demands. The traditional settlement structure organisation in rural areas is increasingly being abandoned; it is adapting to the contemporary way of live, different settlement structures, social and demographic changes [Mrak et al., 2013]. Spatial interventions are increasingly focused on sustainable and ethical concepts, and concepts of accountability that address not only environmental protection, but also cultural, economic and political aspects of sustainability.

Research and understanding of the diversity of settlement patterns (figure 2) for further development, with an emphasis on sustainable development, is a process that focuses not only on economic development, but it also includes balanced ecological and social development. Notably, the modern society builds on the sense of community and collective duty, i.e. social capital as the 'vitality' of the society today. Ensuring social sustainability (more trust and participation, less inequality) is thus not only a matter of ensuring that the current situation is preserved, but to continuously provide improvements, also by building new types of community. It is only by acknowledging the different interactions between man, technology, the built environment and natural potentials, with good knowledge of all factors and action, that we can build a good quality living environment, and consider the principles of sustainable development at the same time [Čok et al., 2013].

koncepta stavbe zahteva celovito obravnavo sistema stavbe, njenih interakcij z okoljem in uporabnikom. Glede na velik delež in kakovost obstoječega stavbnega fonda mora koncept stavbe naslavljaliti novogradnje in obstoječe stavbe oziroma njihove preнове. Potreba po razvoju koncepta stavbe izhaja tudi iz nujnosti prilaganja na podnebne spremembe in spremljajoče pojave ter probleme, povezane z njimi.

### UPORABNOST REZULTATOV

Ob raziskovanju sodobnih prostorskih konceptov smo ugotavljali, da je na ravni načrtovanja širšega prostora možna vzpostavitev sistemov 'mreženja', ki ne slonijo več na klasični morfologiji in tipologiji vzorcev. Kot aplikativni primer navajamo idejo o nujni nadgradnji obstoječega sistema gorske arhitekture in vzpostavitvi povezanosti med posameznimi točkami poselitvenih vzorcev z umestitvijo centralne enote [Čerpes et al., 2014].

### KLJUČNE BESEDE

prostočasne dejavnosti, poselitveni vzorec, trajnostni razvoj, bivalno okolje, stavba

### REFERENCE

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GABRIJELČIČ, P., FIKFAK, A., GROM, J. P., KUGLER, N., LUŽAR, N., NEMEC, P. SOBOL TURINA, D., LEPŠINA, A. (2014): Raziskovanje poselitvenih vzorcev. Seminarsko-raziskovalna naloga. Fakulteta za arhitekturo, Ljubljana.

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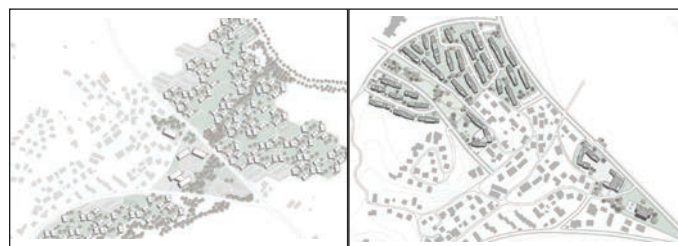
*In order to find a rethink the concept of the building we should first comprehensively examine the system of the building, and its interactions with the environment and users. With regard to the high proportion and quality of the existing building stock, the concept of the building must address both new buildings and the existing ones, or their renovations. The need to develop the concept of the building emerges from the necessity to adapt to climate change and associated phenomena, and the problems related to these changes.*

### ISSUES AND THEIR SIGNIFICANCE

*While researching contemporary spatial concepts we found that in the context of broader spatial planning, it is possible to set up 'networking' systems that are no longer based on conventional morphology and pattern typology. An example of application is the idea about the necessary upgrade of the existing system of alpine architecture, thus providing connectivity between the individual points of settlement patterns, along with introducing a central unit in the system [Čerpes et al., 2014].*

### KEY WORDS

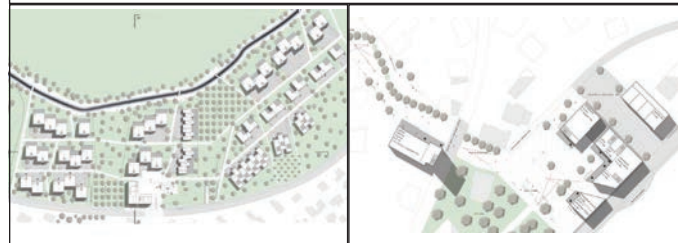
*leisure activities, settlement pattern, sustainable development, living environment, building*



Slika 2 a, b: Vključevanje novega poselitvenega vzorca v obstoječo strukturo.



Slika 2 c, d: Novi poselitveni vzorci, ki vključujejo sodobne motive prostočasnih in drugih dejavnosti.



Slika 2 e, f: Prepletanje različnih vzorcev, ki ustvarijo 'navidezni' kaos.

Slika 2: Raziskovanje poselitvenih vzorcev [Gabrijelčič et al., 2014].

Figure 2: Figure 2: Research in settlement patterns [Gabrijelčič et al., 2014].

## Lučka Ažman Momirski OBALNE PREOBRAZBE

## WATERFRONT REDEVELOPMENT

### POVZETEK

Obalni pas je izjemna lokacija, kjer se stikata dve prostorski prvini: kopno in vodna površina morja, reke ali jezera. Stik urbane strukture in vodne površine je rob ('... temeljna prvina, ki določi obliko celote ...' / Košir, 2006, str. 246/) in ločnica ('... ki določi prostor kot binom: znotraj in zunaj.' / Košir, 2006, str. 246/). Velik del svetovnega prebivalstva prebiva na obalnih območjih: v oddaljenosti 50 kilometrov od obale živi v Evropi 29,1% prebivalstva, v Aziji 27,1%, v Afriki 18,1%, v severni Ameriki 31,5%, v Južni Ameriki 24,4% in v Avstraliji z Oceanijo 79%. Preobrazbe obalnih ali rečnih robov so od leta 1980 dalje med najzanimivejšimi pojavi urbanih preobrazb. Odnos med pristaniščem in mestom, lociranima na obalnem pasu, se je postopoma spreminjal v nekaj fazah: najprej sta bila oba združena v celoto, kasneje sta se razdružila in sobivala drug ob drugem, v tretjem koraku je sledila funkcionalna in formalna ločitev obeh pojavov. V obdobju omrežij se ponovno združita. Pristaniško infrastrukturo, kot so pomoli in ladjedelnice, je potrebno prepoznati kot infrastrukturo, ki je neločljivo povezana z rabo in razvojem obalnih območij in ki bi jo bilo mogoče razvrstiti med območja imenovana bluefields. Razvoj, ki se nanaša, in ki povečuje od vode odvisne in zaradi vode okrepljene rabe, je mogoče obravnavati kot razvoj vodnih zemljišč. Pinch (2002) predlaga načrtovanje obalnih območij s stališča vodnih površin v nasprotju s prevladujočim kopenskimi vidikom. Resnična preobrazba degradiranih urbanih obmorskih območij bo mogoča samo z medsebojnim delovanjem javnih in zasebnih vlaganj, kar postavlja pod vprašaj tudi prostorsko in programsko prevelike spremembe na obalnih območjih. Izboljšanje kakovosti javnega prostora in programi, pomembni za družbeno rast, kot so izobraževanje in raziskovanje, ustvarjajo priložnosti za nizkstroškovno industrijo, male podjetnike in za mlade ljudi, generatorji območja pa postanejo stanovalci, ki tu bivajo vse dni v letu. K inovativnim prostorskim rešitvam prispeva upoštevanje naravne in kulturne dediščine. Vzporedno in enakovredno z razvojnimi projekti se z naravovarstvenimi ukrepi ohranja celovitost morskega in obalnega ekosistema ter biotska raznovrstnost.

Strateška načela za razvoj nekdanjih pristaniških območij se lahko oblikujejo podobno kot v primeru severnega dela pristanišča v Københavnu na Danskem. Preobrazbo urbanega waterfronta pa je potrebno obravnavati kot del celotnega urbanega sestava in ne samo kot poudarek ali ločen razvojni pojav.

### UPORABNOST REZULTATOV

Preobrazbe obalnih ali rečnih robov so med najbolj pomembnimi arhitekturnimi in urbanističnimi projekti konec 20. in v začetku 21. stoletja ter predstavljajo enega izmed osrednjih vprašanj evropske prostorske razvojne politike. S preučevanjem primerov obalnih območij so bile raziskane njihove prednosti in priložnosti ter ranljivosti in tveganja. Ugotovitve raziskave so izhodišča za poglobljeno, celovito in vsestransko predvidevanje obalnih preobrazb v prostoru severovzhodnega dela nekdanjega izolskega otoka. Lokacija, kjer so zavarovana območja naravne in kulturne dediščine ter deloma delujoča in deloma opuščena industrijska dejavnost,

### SUMMARY

*The coastal belt is an exceptional location, where two spatial elements come together: the mainland and the waters of the sea, rivers, or lakes. The contact between the urban structure and the water is an edge ('the basic element that defines the shape of the whole'; Košir 2006: 246) and a dividing line ('that defines a space as a binomial: outside and inside'; Košir 2006, 246). The majority of the world's population lives in coastal areas: in Europe, 29.1% of people live within 50 km of the coast, in Asia 27.1%, in Africa 18.1%, in North America 31.5%, in South America 24.4%, and in Australia and Oceania 79%. Coastal or river waterfront redevelopment has been among the most interesting features of urban renewal since 1980. The relationship between the ports and the cities located in the coastal belt gradually changed: at first both the port and the city were united into a whole, later they were separated and existed one next to the other, and in the third stage they were functionally and formally separated. They come together again in the network age. Port's infrastructure, such as piers and boatyards, need to be acknowledged as inextricably related to the use and development of waterfronts and could be reclassified as bluefield sites. The development which relates and enhances water-dependant and water-enhancing uses can be considered as a bluefield development. Pinch (2002) suggested planning of waterfronts from water based perspective in contrast to prevalent land based perspective. A true transformation of the degraded waterfront urban area is only possible through cooperation between public and private investors, which also brings into question the overly extensive changes in the former port's area in terms of space and the activities there. Improved quality of public space and activities important for social growth such as research and education create opportunities for low-cost industry, small business owners, and young people, and the year-round residents become the generators of the area's development. Taking into account natural and cultural heritage contributes to innovative spatial solutions. Through nature-conservation measures, the integrity of the marine and coastal ecosystems and biodiversity are preserved in parallel to and equally with the development projects. The strategic principles for the former ports area's development can be designed similarly to those in the northern part of the port of Copenhagen. The waterfront urban renewal should be treated as part of the entire urban composition and not only as a special feature or a separate development phenomenon.*

### ISSUES AND THEIR SIGNIFICANCE

*Waterfront redevelopment has been part of the most important architectural and urban-planning projects since the 1980s, representing a central issue in EU spatial-planning policy. Various coastal areas were studied in terms of their strengths, weaknesses, opportunities, and threats. The findings of this study provide the basis for detailed, comprehensive, and versatile prediction of coastal transformations in the northeastern part of what used to be Izola Island. The location—with its protected*

je namreč pod velikim kapitalskim pritiskom. Slovenski in tuji vlagatelji si prizadevajo, da bi dobili dovoljenje za izgradnjo otokov v Viližanskem zalivu in velikega turističnega naselja na obalnem območju. Če bi načrt uresničili, bi Izola popolnoma spremenila podobo in postala največje slovensko obmorsko turistično središče.

### KLJUČNE BESEDE

obalne preobrazbe, vodna zemljišča, razvoj vodnih zemljišč, pristanišče, mesto

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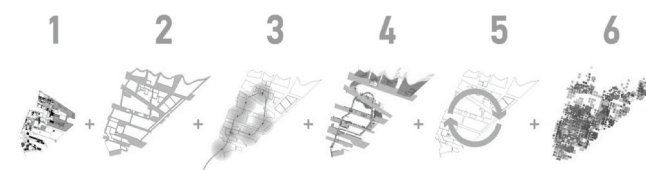
Slika 4: Območje severnega dela pristanišča (Nordhavn) v Københavnu, Danska (BY&HAVN).

Figure 4: The north area of the port (Nordhavn) in Copenhagen, Denmark (BY&HAVN).

natural and cultural heritage sites and industrial activity, some of which remains in operation and some partially abandoned—is under great capital pressure. Slovenian and foreign investors are seeking permission to build three islands in the Viližan Bay and a large tourist resort along the coast. If this plan were implemented, Izola would be entirely different; it would become the largest Slovenian seaside resort.

### KEY WORDS

waterfront redevelopment, bluefields, bluefield development, port, city



Slika 3: Šest strateških principov za razvoj severnega dela pristanišča v Københavnu na Danskem: otoki in kanali, identiteta in zgodovinski razvoj, mesto 'petih minut', 'plavo' in 'zeleno' mesto, nizkoogljično mesto in pametna mreža (BY&HAVN).

Figure 3: Six strategic principles for the development of the north area of the port in Copenhagen, Denmark: islands, canals, identity and historic development, the 'five-minute city', 'blue' and 'green' city, low carbon city and intelligent grid (BY&HAVN).



Slika 5: Vizija mesta prihodnosti za 40.000 ljudi in 40.000 delovnih mest v severnem delu pristanišča v Københavnu, Danska (BY&HAVN).

Figure 5: The vision of the city in the future for 40,000 inhabitants providing jobs in the north area of the port in Copenhagen, Denmark (BY&HAVN).

### Lučka Ažman Momirski

#### SREDOZEMSKA TERASIRANA POKRAJINA: SPREMEMBE V RABI TAL

### POVZETEK

Doslej so bile objavljene številne razprave, ki obravnavajo spreminjanje rabe tal v zadnjih 200 letih na ozemlju srednje Evrope. Osnovni vir vseh teh študij je franciscejski kataster, ki je bil izdelan v prvi polovici 19. stoletja na območju nekdanjega Avstrijskega cesarstva. V nekaterih raziskavah je pregledno prikazano spreminjanje rabe tal na območju celotnih sedanjih držav ali regij, najpogosteje so bile obravnavane Češka, Slovenija in Avstrija. V pričujoči študiji so raziskani vzorčni primeri iz sredozemskih pokrajin, za katere so značilna terasirana pobočja, s terasami pa so povezani posebni dejavniki sprememb rabe tal. Kot vzorčen primer je izbrana tudi vas Ostrožno Brdo, ki leži že na prehodu med sredozemskim

#### MEDITERRANEAN TERRACED LANDSCAPES: LAND USE CHANGES

### SUMMARY

A considerable number of papers have already been published on land use changes in the past 200 years on the territory of Central Europe. All these studies basically draw on the Franciscan Cadastre, made in the first half of the 19th century for the area of the then Austrian Empire. Some of them clearly present land use changes in the area of entire states or regions of today; the most often studied countries are Bohemia, Slovenia and Austria. Land use changes in the current research were studied on terraced terrains which predominantly mark the image of the Mediterranean landscape. Special factors of land-use changes are related exactly to terraces. The village Ostrožno Brdo,

in dinarskim svetom. Na rabo tal obravnavanega območja so pomembno vplivale politične spremembe, saj je bilo slednje po propadu Avstro-Ogrske sestavni del treh različnih držav. Območje teras v Ostrožnem Brdu obsega 10 % oziroma 93,6 ha zemljišč. Značilna prvina brkinskih teras je dolžina terasne ploskve oziroma celotne terase: običajno so terase dolge približno 150 metrov, medtem ko so na najbolj pokrajinsko izrazitih območjih terasne dolžine tudi preko 300 metrov. Teraso, predvsem pa njihove brežine, so v slabih 200 letih ostale povsem enakih oblik, torej enakih dolžin in širin terasnih ploskev ter enakih višin in širin terasnih brežin. Izrazito prepoznaven proces sprememb rabe tal v celotni katastrski občini je ogozdovanje. Danes je pokrovnost z gozdom kar 82%. Tudi na terasah se je delež gozda povečal iz 1% na 8%, ta podatek pa prikazuje zaraščanje kulturnih teras. Zaradi sprememb v demografiji se je v času od franciscejskega katastra do danes več kot štirikrat zmanjšala zemljiška kategorija travinja, pa tudi njiv in vrtov je danes le še 2%. Sadovnjaki na terasah so pomembna zemljiška kategorija, saj zajema 12% delež. Dobri dve tretjini terasne rabe tal so v preteklosti obsegale njive in vrtovi, ki imajo v sodobnosti malenkost manjši delež kot sadovnjaki. Poleg sadovnjakov in gozda se je skoraj trikrat povečal delež travinja. Pomemben podatek za rabo je tudi osončenje teras, saj je največ teras orientiranih na sever. Tudi v Ostrožnem Brdu na razporeditev teras vplivajo predvsem reliefne razmere, zaradi katerih so terase na severnem pobočju dobro osvetljene, za izbor kmetijskih kultur pa je odločilna tudi nadmorska višina.

## UPORABNOST REZULTATOV

Podatki za današnjo dejansko rabo tal sicer opredeljujejo rabo posamezne parcele bolj natančno kot franciscejski kataster, kljub temu pa ni današnji Interpretacijski ključ za določanje rabe povsem natančen pri upoštevanju terasiranih območij. Pravila za določanje rabe tal na terasnih brežinah v Evidenci dejanske rabe kmetijskih in gozdnih zemljišč (RABA) niso bila oblikovana dosledno. V primeru vinogradov, intenzivnih sadovnjakov in oljčnikov, velja določilo, da so v rabo tal vključene tudi zatravljene brežine, medtem ko v primeru njiv velja določilo, da so v rabo tal vključene brežine teras med njivami, katerih florisna širina ne presega 2 m. V primeru drugih vrst zemljišč bi bilo potrebno v skladu z navodili rabo tal na terasnih brežinah kartirati ločeno. Znanе metodologije kartiranja in evidentiranja terasnih območij in njihove rabe izključevanja dela teras ne omogočajo.

## KLJUČNE BESEDE

terasirana pokrajina, raba tal, spremembe rabe tal, franciscejski kataster, Ostrožno Brdo, Sredozemlje

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Slika 6: Po prepoznavnosti v naselju Ostrožno Brdo izstopa terasirano območje na severozahodu vasi, ki je tudi največja sklenjena površina kmetijskih zemljišč na terasah (Matevž Lenarčič).

Figure 6: Terraced terrain in Ostrožno Brdo at the northwestern part of the village, representing the largest coherent farming area on terraces (Matevž Lenarčič).

*which is located in the transition zone between the Mediterranean and the Dinaric world, was one of the villages selected for the case study. Land use of the studied area was significantly influenced by political changes, since after the collapse of Austria-Hungary, the studied area was, in turn, part of three different states. The terraced area in the cadastral municipality of Ostrožno Brdo accounts for mere 10% of the total area or 93.6 ha of land. A typical feature of the Brkini terraces is the length of terrace platform or the whole terrace; terraces are usually about 150 m long, while in the landscape most expressive areas, terraces are even longer than 300 meters. During almost 200 years the terraces and their slopes have preserved the same forms. Afforestation is an explicitly recognizable process of land-use changes in the entire cadastral municipality. The present forest cover amounts to as much as 82%. The percentage of woodland increased even on terraces, i.e. from 1% to 8%; the data show the overgrowing of cultural terraces. Due to the changes in demography, the land-use category of grassland has decreased more than four times since the Franciscan Cadastre, and also fields and gardens do not exceed 2% today. The present terrace orchards represent an important land category, since they amount up to 12%. In past times, more than two-thirds of terraced land were used for fields and gardens, but their percentage is now slightly lower than that of orchards. In addition to the increase in orchards and woodland, the percentage of grassland also increased, almost three times. Insulation of terraces is important information with regard to land use, since most of the terraces are oriented towards the north. At Ostrožno Brdo landforms mainly influence the distribution of terraces, and altitude above sea level influences the selection of farming cultures.*

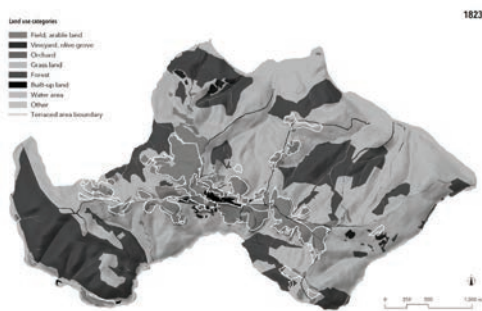
## ISSUES AND THEIR SIGNIFICANCE

*Though the data on the current actual land use determine the utilisation of individual parcels more precisely than the Franciscan Cadastre did, the present interpretation key for determining the use in terraced areas is not completely accurate. The rules for specifying land use on terrace slopes in the Register of Actual Utilisation of Farming and Woodland have not been formulated consistently. In the case of vineyards, intensive orchards and olive groves, the provision applies that overgrown and grassed terrace slopes are also included in land use, while in the case of fields the provision says that it only relates to terrace slopes with the maximum ground plan width of 2 metres. In the case of other types of utilisation, land use on terrace slopes should be mapped separately in accordance with instructions. With the known methodologies of mapping and inventorying terraced areas and their use, any exclusion of parts of terraces is all but impossible.*

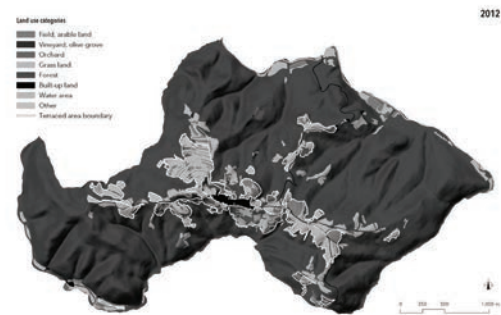
## KEY WORDS

*terraced landscape, land use, land use changes, Franciscan Cadastre, Ostrožno Brdo, Mediterranean*





Slika 7: Raba tal v naselju Ostrožno Brdo v letu 1823 (Arhiv Republike Slovenije, GURS).  
Figure 7: Land use in the village Ostrožno Brdo, 1823 (Slovenian National Archive, GURS).



Slika 8: Raba tal v naselju Ostrožno Brdo v letu 2012 (Arhiv Republike Slovenije, GURS).  
Figure 8: Land use in the village Ostrožno Brdo, 2012 (Slovenian National Archive, GURS).

## Martina Zbašnik-Senegačnik METODE IN ORODJA ZA OCENJEVANJE TRAJNOSTNIH ENODRUŽINSKIH HIŠ

## METHODS AND TOOLS FOR EVALUATION OF SUSTAINABLE SINGLE-FAMILY HOUSES

### POVZETEK

Stavbe imajo negativne vplive na okolje v celotnem življenjskem ciklusu, torej od faze pridobivanja surovin ter proizvodnje gradiv in polizdelkov, do prodaje, vgradnje in uporabe do končne faze odstranitve, ko stavba odsluži svojemu namenu. Trenutna zakonodaja omejuje v glavnem rabo energije in emisije v obratovanju, manj pa ostale parametre, ki prav tako definirajo zasnovo sodobne trajnostne stavbe. Preverjanje trajnostne zasnove stavbe je smiselno že v začetnih fazah projektiranja, ko je še mogoče vplivati na rezultat.

V raziskavi je bila med drugim izdelana enostavna metoda, s pomočjo katere se z izbranimi petimi indikatorji ocenjuje kakovost trajnostnih zasnov: energijska učinkovitost, raba primarne energije, emisije CO<sub>2</sub>, stroški ter na doseženo bivalno ugodje. Ocenjevanje s pomočjo indikatorjev poteka po treh načinih objektivnega in subjektivnega ponderiranja, s čimer se v skupno oceno vključijo vidiki neodvisnosti presojevalca ter vidiki nacionalnih in uporabniških zahtev.

Na osnovi rezultatov, zbranih v raziskavi na velikem statističnem vzorcu enodružinskih pasivnih hiš, je bil izdelan tudi računski model za ocenjevanje energijskih tokov v stavba. V praksi se uporablja veliko število računskih orodij za izračunavanje energijskih tokov. Njihova uporaba prinaša natančne rezultate, zahteva pa vnos velikega števila parametrov v zapletenih računskih postopkih. Vrednost teh parametrov je znana šele na koncu načrtovalskega procesa. Razvita je bila enostavna metoda za ocenjevanje energijske učinkovitosti enodružinske hiše, ki je vključevala čim manjše število parametrov in enostavne računske postopke.

### UPORABNOST REZULTATOV

Sodobna stavba mora torej ustrezati številnim zahtevam, zato pa mora biti ustrezno zasnovana. Z enostavnimi metodami in orodji se predvsem zagotovi, da jo uporabijo projektanti v fazi idejnega načrtovanja in s tem takoj na začetku načrtovanja poiščejo najoptimalnejšo zasnovo stavbe.

### KLJUČNE BESEDE

energijska učinkovitost, trajnostni koncept, enodružinska hiša, enostavna metoda, enostavno orodje

### SUMMARY

*Buildings have negative effects on the environment throughout their life cycle, i.e. from the phase of obtaining raw materials and manufacturing materials and components up to the sale, building and use through the final phase of removal when the building is decommissioned. In general, current legislation limits both the use of energy and the emissions allowed during operation, but do not limit the other parameters that define the design of contemporary sustainable buildings. Determining the sustainability of buildings should take place in the planning phase of the project, when it is still possible to influence the outcome.*

*In a research study, a simplified method using five chosen indicators was elaborated to evaluate the level of sustainability. The areas to be evaluated are energy efficiency, use of primary energy, CO<sub>2</sub> emissions, costs, and the level of living comfort achieved. The evaluation using these indicators is carried out using three subjective and objective weighting methods, such that the final evaluation includes the viewpoints of an independent evaluator and the points of view of both the user and the state.*

*On the basis of results obtained in a research study conducted on a large statistical sample of Slovenian single-family houses the calculation model was created, which calculate the energy flows in buildings. In practice a number of calculation tools are used to calculate annual energy flows. Their use yields accurate results but requires the input of a large number of parameters in the complex calculation procedures involved. The values of these parameters are usually known only after the planning process of a building has been completed. A simplified evaluation method for energy efficiency in single-family houses has been developed with the aim of using as few building parameters as possible with the simplest calculation procedures possible.*

### ISSUES AND THEIR SIGNIFICANCE

*A contemporary building must answer to a number of demands and therefore must be designed accordingly. The simplicity of the new*



## REZULTATI

### Izvirni znanstveni članki

PRAZNIK, Miha, BUTALA, Vincenc, ZBAŠNIK-SENEGAČNIK, Martina. Simplified evaluation method for energy efficiency in single-family houses using key quality parameters. Energy and buildings, ISSN 0378-7788. [Print ed.], Dec. 2013, vol. 67, str. 489-499.

PRAZNIK, Miha, BUTALA, Vincenc, ZBAŠNIK-SENEGAČNIK, Martina. A simple method for evaluating the sustainable design of energy efficient family houses. Strojniški vestnik, ISSN 0039-2480, Jun. 2014, vol. 60, no. 6, str. 425-436

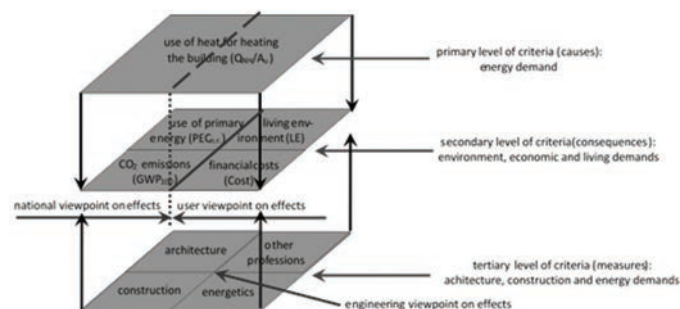
### Mentorstvo pri doktoratu

PRAZNIK, Miha. Kvalitativni parametri za energijsko učinkovite enodružinske hiše : doktorska disertacija = Quality parameters for the energy single-family houses : doctoral thesis. [Ljubljana: M. Praznik], 2014. XVII, 171 str.

methods and tools ensures that planners use it in the idea phase so that they seek the most optimal design for the building from the beginning.

### KEY WORDS

energy efficiency, sustainable concept, single family house, simplified method, simplified tool



Slika 9: Prikaz prvih dveh nivojev zahtev oz. kriterijev za vrednotenje, s petimi ključnimi indikatorji.

Figure 9: Representation of the first two levels of demand or the criteria for evaluation using 5 key indicator.

## Domen Kušar

### SPREMEMBE TESTA MISELNE ROTACIJE

#### POVZETEK

Ena izmed inteligenc, ki med drugim zajema lingvistično, matematično, glasbeno, gibalno itd., je prostorska inteligenca. Sestavni del slednje je prostorska predstava. Ta sposobnost je ključna za vse osebe, vpletene v proces oblikovanja in upravljanja s prostorom. Proučevanje prostorske predstave je relativno mlada disciplina. Za začetnika raziskav s tega področja se smatra Sir Francis Galton, ki je leta 1880 poročal o svojih eksperimentalnih raziskavah na področju miselne predstavljalivosti. Hkrati s preučevanjem prostorske predstave so se razvijali tudi različni instrumenti – testi za njeno vrednotenje. Eden izmed standardnih splošno razširjenih testov je test miselne rotacije (Mental rotation test – v nadaljevanju MRT), ki pa je tudi povzržen razvijanju, zlasti na Japonskem. Na Fakulteti za arhitekturo MRT uporabljamo za ugotavljanje prostorske predstave študentov in vrednotimo tudi sam test. Na osnovi rezultatov smo skupaj s kolegi iz Budimpešte predlagali spremembe točkovanja MRT. Rezultati obstoječega sistema točkovanja namreč niso ustrezali pričakovani normalni razporeditvi. S predlagano rešitvijo smo odpravili anomalijo obstoječega testa in to dokazali z rezultati testiranja študentov v Ljubljani in Budimpešti (tabela 1). Rezultati raziskave so bili predstavljeni v članku: Bölcseki, A., Kovács, A. Z., Kušar, D. (2013): New ideas in scoring the Mental rotatin test. V: Ybl Journal of built environment, 2013/1, str.: 59-69 in na znanstvenih konferencah v Innsbrucku ter v Supetru poleti 2014.

#### UPORABNOST REZULTATOV

MRT je splošno uporabljan test po vsem svetu. Rezultati predlagane spremembe načina ocenjevanja pomenijo novost

### CHANGES OF MENTAL ROTATING TEST (MRT)

#### SUMMARY

Spatial intelligence is one of the human intelligences (other abilities are linguistic, mathematical, musical, physical, etc...). An integral part of spatial intelligence is spatial ability. This ability is crucial for all parties involved in the process of creating and managing space. Spatial ability is a relatively young discipline. For the originator of the research in this area is considered Sir Francis Galtna. He reported about his experimental research in the field of mental visualization in 1880. Parallel with the study of spatial ability, they have also developed various testing instruments. One of the widely used standard test is Mental rotation test (MRT). Nevertheless, it has been developing, especially in Japan. At the Faculty of Architecture, we use MRT to determine the spatial ability of students. At the same time, we also evaluate the test itself. Based on our results, and together with colleagues from Budapest, we proposed changes to the scoring system of MRT. The results of the current scoring system did not fit to the expected normal distribution. We eliminated the anomaly of existing test in proposed the solution. This was proven by the results of students in Ljubljana and Budapest (Table 1).

The survey results were presented in the article: Bölcseki, A., Kovács, AZ, Kušar, D. (2013): New ideas and scoring the Mental rotatin test. In: Ybl the Journal of the built environment, 2013/l, p.: 59-69 and on scientific conferences in Innsbruck and in Supetar on summer of 2014.

#### ISSUES AND THEIR SIGNIFICANCE

MRT test is widely used around the world. The results of the proposed changes in scoring system means a novelty in this

na tem področju, kar je bilo opaziti po predstavitev rezultatov v Innsbrucku in Supetru. Rezultati raziskave bodo tako pripomogli k optimizaciji MRT. To pa bo vodilo k bolj realnemu ugotavljanju prostorske predstave.

### KLJUČNE BESEDE

prostorska predstava, test miselne rotacije

*field. This was observed after the presentation in Innsbruck and Supetar. The survey results will also help to optimize the MRT. This will lead to a more real determining of spatial ability.*

### KEY WORDS

*spatial ability, mental rotation test*

Slika 10: Rezultati ustreznosti normalni porazdelitvi pri starem in novem sistemu točkovanja.

Figure 10: Normality test by  $\chi^2$  distribution at old and new scoring system.

Group of students	Old scoring system		New scoring system	
	Computed $\chi^2$ statistic	Answer to $H_0$ (at 95% $\chi^2 \approx 52.19$ )	Computed $\chi^2$ statistic	Answer to $H_0$ (at 95% $\chi^2 \approx 52.19$ )
Overall – Ybl Faculty of SzLU	71.23	NO	35.50	YES
Men – Ybl Faculty of SzLU	73.25	NO	69.90	NO
Women – Ybl Faculty of SzLU	35.81	NO	20.42	YES
Overall – UL FA	74.61	NO	46.50	YES
Men – UL FA	55.48	NO	47.99	YES
Women – UL FA	68.99	YES	34.37	YES

Matevž Juvančič

### DIALOG IN IZOBRAŽEVANJE O PROSTORSKIH TRAJNOSTNIH VPRAŠANJIH V ARHITEKTURI IN URBANIZMU

### DIALOGUE AND EDUCATION ABOUT SPATIAL SUSTAINABLE ISSUES IN ARCHITECTURE AND URBAN DESIGN

#### POVZETEK

Na področju dialoga in izobraževanja o trajnostnem prostorskem razvoju v arhitekturi in urbanizmu, gre izpostaviti nekaj raziskav in iz njih izhajajočih prispevkov ki so v zadnjem času obravnavale med-disciplinarno in medgeneracijsko sodelovanje v procesu oblikovanja prostora. Pri vprašanih vzgoje za trajnostni prostorski razvoj, nas je zanimalo predvsem, kako mlajše generacije razumejo ta pojem in kaj si pod njim predstavljajo, saj slednje postavlja temeljna izhodišča za nadaljnje delovanje na tem področju. Študija [Svetina et al., 2013] prinaša interdisciplinarni pristop k preučevanju razumevanja trajnostnega razvoja grajenih okolij s strani otrok in mladostnikov. Koncept trajnosti implicira zapletene odnose med etičnimi, ekonomskimi, socialnimi, tehničnimi in drugimi lastnostmi. Koncept je težko razumljiv za otroke, ki še nimajo razvitih sposobnosti abstraktnega in večdimenzionalnega mišljenja. Za preverjanje razumevanja trajnostnih konceptov s strani otrok in adolescentov smo razvili in uporabili metodo vizualnega jezika in jo aplicirali na vzorcu preko 2000 sodelujočih, starih od 6 do 19 let. Vsesplošno razumevanje in interpretacijo prostorskih informacij o urbanih okoljih je obravnavalo več prispevkov, ki so se ukvarjali z uvajanjem novega pristopa k razumevanju kompleksnih informacij in delovanja urbanih prostorov s strani ne-strokovne javnosti. Verovšek, Juvančič in Zupančič [2013a] opisujejo koncept modela za interpretacijo kvalitet urbanih prostorov. Cilji modela so trije: prvič, oblikovanje enotnih, veljavnih in uporabnih metod, za ocenjevanje značilnosti oblikovanja prostora; drugič, navesti razvojne lastnosti prostorov, ki bistveno vplivajo na uporabnikovo izkušnjo, ki - kot posledica - izhaja iz preudarnih oblikovalskih rešitev ali pomanjkljivega urbanističnega oblikovanja; tretjič, razviti generični jezik vizualne predstavljivosti urbanih prostorov za komunikacijske namene (slika 10). Model predstavlja identifikacijsko metodo in je namenjen prepoznavanju ključnih informacij oziroma 'zgodbe',

#### SUMMARY

Several recent studies and scientific contributions have addressed the dialog methods and education in sustainable spatial development in architecture and urbanism, which at the same time also dealt with interdisciplinary and inter-generation communications and lifelong learning on the process of urban design. For education purposes on the topic of sustainable spatial development, we were interested in how the younger generations come to understand this notion. This fundamental understanding will direct further efforts in that segment. The study [Svetina et al, 2013] provides an interdisciplinary account determining how children and adolescents understand urban and architectural aspects of sustainable development. The concept of sustainability implies complex relations between ethical, economic, social, technical and other qualities of our environment. The concept is difficult to understand for children who lack the abilities of abstract reasoning and multi-dimensional thinking. A new measure of sustainability understanding was formed based on pictorial rather than textual format and was applied to a large sample of over 2000 participants aged 6–19 years. The general understanding and interpretation of spatial information on urban environments were addressed by several contributions, which dealt with a novel approach to understanding the complex information and logics of urban spaces by the non-expert public. Verovšek, Juvančič in Zupančič [2013a] propose a model for interpretation of qualities in urban space. The objectives are threefold: first, to form common, valid and applicable measures to assess features of space design, second, to indicate the developmental trait that considerably affect user's spatial experience which – taken as a consequence – derives from either sustainable/prudent or poor design decisions; and third, to generically recreate and visually represent urban spaces for communicative purposes (figure 4).

ki je del določene prostorske danosti. Izbrani izsledki študije so opisani tudi v Verovšek, Juvančič in Zupančič [2013b]. Model sledi izvorni ideji izobraževalnega vmesnika za širšo javnost, ki je udeležena v procesu prostorskega soodločanja, s katerim se je podrobneje ukvarjala doktorska disertacija z naslovom Sistem vizualnih digitalnih orodij za participacijo splošne javnosti pri prostorskem načrtovanju [Jutraž, 2013] pod mentorstvom prof. dr. T. Zupančič.

#### **UPORABNOST REZULTATOV (teoretična, praktična)**

Medtem, ko je bil poudarek predvsem na raziskovanju metod dialoga in izobraževanja o trajnostnem prostorskem razvoju v arhitekturi in urbanizmu, pričujoče raziskave posredno prispevajo tudi k rasti prostorsko-kulturne ozaveščenosti prebivalstva, ki dolgoročno prispeva k razvoju sodobnih konceptov arhitekture in urbanizma, vezanih na specifično arhitekturnega prostora in kulturno dediščino v Sloveniji. Od novih teoretičnih dognanj nas rezultati usmerjajo tudi k povsem praktičnim implikacijam, kako nagovarjati posebne starostne, interesne ali drug podobno grupirane podskupine v procesu arhitekturnega in prostorskega načrtovanja. Na primer: raziskava z mladostniki je pokazala, da se razumevanje trajnostnih problematik povečuje s starostjo, zlasti pri mladostnikih, ki živijo oziroma izvirajo v urbanih okoljih. V raziskavi o razumevanju in interpretaciji prostorskih informacij smo dopolnili védenje o tem, kateri elementi prostora so kot nosilci pomena v svoji izkustveni obliki močnejši od drugih, kako generični smejo biti po svoji obliki, kdaj je pozornost gledalca smiselno usmerjati postopno in v katerih točkah in kakšnih okoliščinah je izkustveni vidik prostorskega sporočila smiselno dopolniti ali celo nadomestiti z bolj strnjeno obliko sporočanja. Nova znanja bodo pripomogla, da bodo slikovna gradiva pripravljena tako, da bodo predstavitev sporočilnostno učinkovitejše in hkrati racionalnejše za pripravo v danih okoliščinah.

#### **KLJUČNE BESEDE**

trajnostni prostorski razvoj, arhitektura, urbanizem, otroci, ne-strokovna javnost, sporazumevanje, izobraževanje, interpretacija, participacija

#### **REFERENCE**

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- SVETINA, M., ISTENIČ STARČIČ, A., JUVANČIČ, M., NOVLJAN, T., ŠUBIC KOVAČ, M., VEROVŠEK, Š., ZUPANČIČ, T. (2013): How children come to understand sustainable development : a contribution to educational agenda. V: Sustainable development, 21, 4: 260-269.
- VEROVŠEK, Š., JUVANČIČ, M., ZUPANČIČ, T. (2013a): Understanding and interpreting urban space (in)formation. V: International journal of architectural computing, 11, 2: 135-155.
- VEROVŠEK, Š., JUVANČIČ, M., ZUPANČIČ, T. (2013b): Vidni jezik za predstavitev interdisciplinarnih vsebin na področju urbanega razvoja : izbrani izsledki študije = Using visual language to represent interdisciplinary content in urban development : selected findings. V: Urbani izziv, 24, 2: 65-77, 144-155.

*The model represents an identification method and is intended as a pragmatic instrument for recognizing crucial information, narrative, embedded in spatial scene. The selected results are described also in Verovšek, Juvančič in Zupančič [2013b]. The model is following the initial idea for an educational digital interface for the general public, participating in the process of urban decision-making, which was later addressed by a doctoral thesis [Jutraž, 2013] under the mentorship of prof. dr. T. Zupančič.*

#### **ISSUES AND THEIR SIGNIFICANCE**

*While the research efforts primarily focused on methods and education in sustainable spatial development in architecture and urbanism, the presented studies indirectly contribute to the growth of the spatio-cultural awareness of the inhabitants, which in the long term contribute to the development of sustainable concepts of architecture and urban design in relation to the specific of Slovene architecture and protection of architectural and cultural heritage. From new theoretical findings the results also direct us to the practical implications of how to address special age, interest and other sub-groups in the architectural and urban design process.*

*For example: the results of the youths study indicated that understanding of sustainability issues increased progressively with age, particularly with adolescents from urban environments. The study on understanding and interpretation of spatial information has added to existing knowledge by ascertaining which elements in space are stronger information carriers than others, how generic they may be, when it makes sense to guide the viewer's attention sequentially, and when and where is it suitable to add to the experiential expression or even replace it with a more compact, abstract form of communication. The gained insights will assist in preparing visual materials in a more effective and economical way under specific circumstances.*

#### **KEY WORDS**

*sustainable spatial development, architecture, urban design, children, non-experts, communication, education, interpretation, participation*



Slika 11: Primer slikovnega gradiva v nalogi iz presojanja sporočilnostne moči dodanih informacij v obliki (a) prereza in (b) grafikona (ilustracija: M. Juvančič).

Figure 11: An example of an illustration in the research that surveyed the communication potential of additional information in the form of (a) added section and (b) bar chart (illustration: M. Juvančič)



**Poročila o kongresih / *Congresses***

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**Peter Marolt**

**VZPODBUJANJE LIKOVNE OBČUTLJIVOSTI  
IN OBČUTKA ZA PROSTOR NA PRVI STOPNJI  
UNIVERZITETNEGA ŠTUDIJA URBANIZMA  
ENCOURAGEMENT OF FINE ARTS SENSITIVITY  
AND SENSE OF SPACE ON THE FIRST LEVEL OF  
UNIVERSITY STUDY OF URBAN PLANNING**

**International Scientific Conference and Workshop**

**Smart Urbanism - Teaching Sustainability**

**Ljubljana, Slovenia, 19. - 21.6.2014**

[http://www.fa.uni-lj.si/filelib/obvestila/2014/pametni\\_urbanizem\\_2014\\_090614.pdf](http://www.fa.uni-lj.si/filelib/obvestila/2014/pametni_urbanizem_2014_090614.pdf)

Gibanje po prostoru je eden temeljnih vidikov spoznavanja s prostorom. Poleg risbe, različnih računalniških predstavitev in modela prostora, za bodoče oblikovalce prostora, obstajajo tudi manj ustaljeni načini dojemanja in predstavitve prostora, ki se navezujejo na širše področje likovne umetnosti. Pri kolažu ali trganki se sicer ne obremenjujemo z realno obstoječim prostorom, a lahko predstavljata koristno orodje tudi bodočega arhitekta urbanista. V kontekstu pedagoškega procesa gre za vajo, ki glede na minimalne omejitve in kolikor toliko svoboden pristop h kompoziciji, študente posredno navaja k boljši orientaciji v dvodimenzionalnem prostoru.

Pri določenih vajah gre za način, kako študente napeljati k opazovanju in izluščiti takšne sestave elementov, ki v sebi nosijo nek likovni smisel. Pri tem je pomembno vzpodbujanje slušateljev, da celo v navideznem neredu prepoznajo skrito urejenost. Namen tovrstnih likovno-kompozicijskih vaj je pri študentih vzbuditi radovednost, inventivnost in kreativnost. S tovrstnimi vajami jih seznanjamo tudi s tipnim vidikom likovne umetnosti in posredno razvijamo ročne spretnosti. Predvsem pa s tem lahko v oblikovanje prostora vnesemo sočnost, domiselnost in nekonvencionalni pristop likovnega ustvarjalca.

Vzdušje v prostoru je na neverbalni ravni mogoče predstaviti s pomočjo likovnega izraza. Smisel vaj, ki se sicer bolj kot ne tičejo slikarskih tehnik, pa je posredno razvijati občutek za elemente, ki prostor soustvarjajo, od svetlobe do teksture na primer, kar bi študentom kasneje koristilo pri oblikovanju prostora. Likovno razmišljanje pa lahko dejansko predstavlja abstraktno metodo, ki posredno usmerja k nekemu splošnemu modelu kako pristopati k vsaki kompleksni oblikovalski nalogi.

*Movement across space is one of the fundamental aspects of discovering space. In addition to the drawings, different computer presentations and model, for future space designers there are existing also less conventional methods of perception and representation of space, which are related to the broader field of fine arts. In a collage or torn paper technique we do not worry over the real existing space, but can be a useful tool for the future architect urban planner. In the context of a pedagogical process, it is the practice, which considering the minimum limits as far as free approach to composition gets students indirectly accustomed to better orientation in two-dimensional space.*

*In certain tutorials, it goes more for the way to bring students to the point of observation and to distinguish elements in the composition that have an art meaning. In the process, it is*

*important to encourage listeners to identify hidden orderliness in an even seeming mess. The purpose of such fine arts compositional tutorials is to raise a curiosity, inventiveness and creativity in students. In such a manner, we familiarize them with the tactile aspect of the fine arts and indirectly we develop hand making skills. But mainly with that we may bring in the space design field the juiciness, imagination and unconventional approach of fine arts creator.*

*The atmosphere in the space is possible to represent on the nonverbal level by the means of fine art expression. The meaning of tutorials, which are more than not pertinent to painting techniques, however, are developing indirectly a sense of components that are co-creating a space, from the light to the textures as example, what would later benefit students in the space design field. Fine arts thinking can actually represent an abstract method which indirectly leads to some general model of how to step in any task of complex design.*

MAROLT, Peter. Encouragement of Fine Arts Sensitivity and Sense of Space on the First Level of University Study of Urban Planning. V: FIKFAK, Alenka (ur.), Smart Urbanism: Teaching Sustainability: Book of Proceedings. (Scientific Meeting from the Field of Urbanism, Ljubljana, 19th-21st June 2014.) Faculty of Architecture, Ljubljana, 2014, str. 133-145, ilustr. [COBISS.SI-ID 3050884]

**Lara Slivnik**

**THREE-HINGED STRUCTURES IN A HISTORICAL PERSPECTIVE.**

**Second International Conference Structures and Architecture, ICSA 2013**

**University of Minho, School of Architecture**

**Guimarães, Portugalska, 23. - 26.7.2013**

<http://www.icsa2013.arquitectura.uminho.pt/>

Portugalsko mesto Guimarães je ponovno gostilo Mednarodno konferenco o konstrukcijah in arhitekturi. Tematika povezovanja obeh področij je pritegnila skoraj 400 arhitektov in gradbenih inženirjev iz več kot 40 večinoma evropskih in severnoameriških držav. Udeleženci konference so konstruktorji, arhitekti ali gradbeniki, ki delujejo v praksi, so raziskovalci in znanstveniki ali pa poučujejo na univerzah.

V štirih dneh smo se udeleženci dobro spoznali. Vsako dopoldne smo začeli z dvema uvodnima predavanjema, ki sta nakazala glavne teme dneva. Čast prvega predavatelja je pripadla španskemu profesorju Félixu Escrigu, ki je predstavil delo Emilia Péreza Piñere, manj znanega rojaka, arhitekta in inovatorja različnih paličnih konstrukcij. Profesor Andrea Deplazes s Zürichške ETH je kritično razmišljal o Arhitektoniki in arhetipih konstrukcije, torej o področju, ki je postalo zelo aktualno po izidu Framptonove knjige leta 1995. Profesor Ulrich Knaack s Tehnične univerze v Delftu se ukvarja z materiali in je predstavil različne možnosti inovacij fasad glede na različna gradiva, energijsko učinkovitost in njihovo funkcijo. Zaslužni profesor Mario A. Chiorino s Politehniko v Torinu je celovito predstavil življenje in delo inženirja Pier Luigi Nervija

v predavanju Arhitektura kot izziv. Ameriški profesor Randolph Langenbach, ki se ukvarja z analizo objektov po potresih, je predstavil samosvoj in nekoliko kontroverzen pogled na potresno odporno gradnjo v predavanju z naslovom Ponovna presoja tradicionalne in moderne gradnje.

Ob konferenci so bili organizirani trije mini simpoziji in posebne sekcije. Splošne sekcije so zajemale obširne vsebine različnih vrst konstrukcij (betonske, jeklene, kompozitne, lesene in zidane, poleg tega pa še membranske ter posebne konstrukcije), Uporabo novih gradiv, Kompleksne oblike in Fasadni ovoj. Z več predavanji je bila predstavljena Uporaba digitalnih pripomočkov, razloženo je bilo Interdisciplinarno delo, Tektonika arhitekturnih rešitev, včasih tanka Meja med arhitekturo in konstrukcijo ter Poučevanje študentov arhitekture in gradbeništva. Sama sem v sekciji Inovativna arhitektura in oblikovanje konstrukcij predstavila prispevek Zgodovinski razvoj tročlenskih konstrukcij.

**Lara Slivnik**

**HRADECKEGA MOST NA TRETJI LOKACIJI**  
**35. zborovanje gradbenih konstruktorjev Slovenije**  
**Slovensko društvo gradbenih konstruktorjev**

**Ljubljana, Slovenija, 22.11.2013**

<http://www.sdgk.si/?id=80>

Letošnje leto je bilo Zborovanje gradbenih konstruktorjev Slovenije močno okrnjeno. Gospodarska kriza, ki je posebej močno prizadela gradbeništvo, je prisilila organizatorje, da so tokratno zborovanje organizirali v Ljubljani, brez tujih vabljenih predavateljev, prispevkov pa se je nabralo le za en dan.

Vabljeni predavanji sta imela dva priznana slovenska strokovnjaka. Marjan Pipenbaher je (skupaj z zagrebškim profesorjem Juretom Radićem) pripravil predstavitev načrtov za most med kopnim in polotokom Pelješcem. Gorazd Humar nam je prikazal originalni Stari most v Mostarju, med vojnim obstreljevanjem in opozoril na pomanjkljivosti ponovne izgradnje.

Sledilo je 18 prispevkov, ki so bili razdeljeni na štiri tematske skupine: Mostovi, Konstrukcije, Eksperimentalna in numerična analiza konstrukcij ter Gradbeni materiali. V sekciji Mostovi sem predavala o prestavitvi konstrukcije prefabriciranega mostu na že njegovo tretjo lokacijo. Prispevek obravnava Hradeckega most v Ljubljani, delo inženirja Johanna Herrmanna. V uvodnem delu je predstavljena zgodovina lokacije prvega mostu. Sledi opis mostu na treh lokacijah: na mestu Šuštarškega in Mrtvaškega mostu ter današnja lokacija. Osrednji del je namenjen podrobnemu opisu litoželeznega ločnega mostu: prefabrikacije sestavnih delov, tročlenskega konstrukcijskega sistema, rezultatov preizkusov obtežbenega testa iz leta 1867 ter arhitekturnih, oblikovalskih in urbanističnih značilnosti. Prispevek je zaključen z opisom fragmentov iz življenjepisa inženirja Herrmanna in z dejstvom, zakaj je Hradeckega most izredno pomemben za evropsko industrijsko dediščino.

SLIVNIK, Lara. Hradeckega most na tretji lokaciji = Hradecky bridge at its third location. V: LOPATIČ, Jože (ur.), MARKELJ, Viktor (ur.), SAJE, Franc (ur.). Zbornik 35. zborovanja gradbenih konstruktorjev Slovenije, Ljubljana, Fakulteta za gradbeništvo in geodezijo, 22. november, 2013. Ljubljana: Slovensko društvo gradbenih konstruktorjev, 2013, str. 45-52, ilustr. [COBISS.SI-ID 2952580]

**Lara Slivnik**

**ARCHITECTURE, COMPETITION, PAVILON:**  
**YUGOSLAV PAVILION AT MONTREAL EXPO 67**

**Ephemeral architecture in Central-Eastern Europe in the 19<sup>th</sup> and 20<sup>th</sup> centuries. The Research Centre for the Humanities, Institute of Art History; Hungarian Academy of Sciences in cooperation with CentrArt Association - New Workshop for Art Historians**

**Budimpešta, Madžarska, 28. - 29.11.2013**

<http://www.arthist.mta.hu/index.php/en/esemenyek-2/277-ephemeral-architecture-in-central-eastern-europe-in-the-19th-and-20th-centuries>

V Budimpešti smo se zbrali raziskovalci, predvsem umetnostni zgodovinarji in arhitekti, ki se ukvarjamo z začasno arhitekturo Srednje in Vzhodne Evrope. Tema konference je bila začasna arhitektura, predvsem začasni paviljoni na industrijskih razstavah, tako na lokalnih, mednarodnih ali svetovnih razstavah. Po uvodnih nagovorih smo poslušali prvo uvodno predavanje z naslovom Utopia of Transparency: 19th-Century Exhibition Pavilion Architecture as Mythological Project. Program se je nadaljeval s skupno sekcijo, ki pa je sledila zgodovinskemu razvoju: Architecture, origins, materials; The Hungarian Millennium at the Crossroad of Nation Buildings; 'Western Venues, Eastern Nations.' in 'Eastern Venues, Eastern Nations.'. Drugi dan smo začeli z uvodnim predavanjem, naslov tokratnega je bil Shaping Ephemeral Architecture by the Media. Sledilo je nadaljevanje skupne sekcije z razvojem začasne arhitekture po prvi svetovni vojni: Rise, Fall and Shift of Ideologies; Bridges over the Iron Curtain I; Bridges over the Iron Curtain II in Contemporary Reception of Ephemerality. V sekciji Bridges over the Iron Curtain II sem predstavila Jugoslovanski paviljon na svetovni razstavi v Montrealu leta 1967.

*Yugoslavia built its own pavilions at four World Exhibitions only: in Barcelona (1929), Paris (1937), Brussels (1958), and Montreal (1967). After a short description of the political situation in Yugoslavia in the late 1960s, all six entries awarded at the architectural competition for the pavilion at Montreal EXPO 67 are presented. The first prize and the realization went to Miroslav Pešić. The other awards went to architects Vjenceslav Richter (2nd) and Ivan Štraus (3rd), and the teams of Sima Miljković and Nikola Milutinović (4th), Marko Mušič, Jernej Kraigher and Lojze Drašler (5th) and Ivo Filipčić and Berislav Šerbetić (6th). The analysis of all awarded pavilions is made from the architectural and the political perspective. The Montreal pavilion is described in depth. Pešić designed it as a prefabricated structure made of seven steel triangle prisms with some help from Oscar Hrabovski who took care*



*of the prefabricated construction. The prisms were strung together one beside another in a straight line, but the fourth, sixth and seventh prisms were twisted. The interior, designed by Vjenceslav Richter, was dedicated to four main themes: the role of Yugoslavia in the world, the Yugoslav culture, the Yugoslav economy and tourism, and finally, the political and social organization in Yugoslavia. In its afterlife the pavilion was reconstructed as the Seamen's Museum in Grand Bank, Newfoundland, Canada. The pavilion is analyzed in terms of architectural history, architectural criticism, and political history. A report on how the pavilion was mentioned in Yugoslav and other architectural journals at that time is included as well. Thus, the paper shows the Yugoslav pavilion at Montreal EXPO 67 as an interaction between architectural concepts and politics, i.e., competition entries and national representation in a troubled multi-ethnic country.*

SLIVNIK, Lara. Architecture, competition, pavilion [!]: Yugoslav pavilion at Montreal Expo 67. V: *Ephemeral architecture in Central-Eastern Europe in the 19th and 20th centuries*: Budapest, 28-29th November 2013, Conference hall of Budapest City Archives: [program and abstracts]. Budapest: [s. n.], 2013, str. 35. [COBISS.SI-ID 2957188]

**Andrej Mahovič**  
**RIAS International Convention 2014**  
**UIA Sports & Leisure Group Meeting & Venue Visits**  
**Glasgow, Velika Britanija 15. - 17.5.2014**

V mesecu maju 2014 so v Glasgowu v Veliki Britaniji potekali letna konvencija The Royal Incorporation of Architects in Scotland (RIAS), ki je največji dogodek organizacije in je hkrati največja arhitekturna konferenca v Evropi, strokovna ekskurzija po objektih XX. iger Commonwealtha (Glasgow, Velika Britanija) in sestanek mednarodne skupine International Union of Architects, Sports and Leisure Programme (UIA Sports & Leisure Programme Group). V dvodnevni konvenciji so se zvrstila različna predavanja strokovnjakov s celega sveta, ki so predstavili svoje poglede in razmišljanja o umeščanju in zasnovi objektov za šport in prosti čas, med njimi: Tom Jones (Populous) in Alessandro Zoppini (Studio Zoppini asociati). Predavanja so imela poudarek na dosedanjih izkušnjah arhitektov pri zasnovi športnih centrov za izvedbo mednarodnih športnih prireditev večjih dimenzij ter reševanje problemov projektnih skupin pri načrtovanju in izvedbi tako obsežnih športnih središč in objektov.

Na konvenciji smo prisostvovali tudi člani mednarodne skupine UIA Sports & Leisure Programme, ki smo se udeležili predavanj in sodelovali v razpravah.

Na strokovni ekskurziji smo si mednarodni strokovnjaki programa UIA Sports & Leisure Programme pod vodstvom Iana McKenzieja, člana organizacijskega odbora XX. iger Commonwealtha, pristojnega za razvoj in integracijo prizorišč iger, ogledali objekte in inovativne tehnološke rešitve prenovljenih in novo zgrajeni športnih objektov za namen XX. iger Commonwealtha: nastanitvena vas udeležencev iger (Commonwealth Games Athletes' Village), stadion za hokej na travi (Glasgow National Hockey), plavalni

bazen (Tollcross International Swimming Centre), dvorano in velodrom (Emirates Arena & Sir Chris Hoy Velodrome), stadion (Hampden Park Stadium) in večnamensko dvorano (SSE Hydro). Od zgoraj omenjenih objektov je potrebno še posebej izpostaviti Hampden Park Stadium, ki se ponaša z inovativno tehnološko zasnovano začasne spremembe nogometnega stadiona v atletski stadion. Celotna prireditvena površina je dvignjena s kovinsko podporno konstrukcijo za 2 metra, kar je omogočilo, da se nogometni stadion spremeni v atletski stadion. S to rešitvijo se pridobi večja prireditvena površina, sicer na račun zmanjšanja kapacitete sedežev za gledalce, vendar njihovo število še vedno ostaja znotraj normativa za izvedbo dogodkov, kot so otvoritev iger in tekmovanja v atletiki. Vzporedno z ogledom objektov je potekala strokovna razprava o zasnovi in tehnoloških rešitvah pri načrtovanju in prenovi objektov. Udeleženci smo predstavili poglede na razvoj športnih objektov v prihodnosti, pri čemer smo izhajali iz lastnega znanstveno-raziskovalnega in strokovnega dela. Sestanek skupine UIA Sports and Leisure Programme je potekal v prostorih Glasgow 2014 Board Room, Commonwealth House, Glasgow. Na sestanku mednarodne skupine so prisostvovali člani skupine: Ian McKenzie; Ruth Pujol Blume; Conrad Boychuk; Phillipe Capelier; Benjamin Flowers; Harald Fux; Shlomo Gendler; Meidad Gendler; Mike Hall; Gar Holohan; Geraint John; Tom Jones; Rene Kural; Xinggang Li; Andrej Mahovič; Denes Patonai; Agustin Garcia Puga; Filipp Ramirez; Karin Schwarz-Viechtbauer; Bill Stonor in Pino Zoppini. Na sestanku smo izrekli dobrodoščilo novim članom skupine, naredili krajši povzetek konvencije, seminarja in strokovne ekskurzije, obravnavali izvolitev in predloge za izvolitev novega predsednika skupine, delo in prihodnje aktivnosti skupine ter imeli predstavitev dosežkov posameznih članov skupine s področja načrtovanja objektov za šport in prosti čas. Svoje delo so predstavili: Xinggang Li; Ruth Pujol Blume in Filipp Ramirez; Benjamin Flowers; Agustin Garcia Puga in Meidad Gendler. Na sestanku smo se dogovorili o tesnejšem sodelovanju članov skupine na področju izmenjave znanja in izkušenj med člani pri načrtovanju športnih objektov, meduniverzitetnem sodelovanju in sodelovanju članov v novi mednarodni skupini za posodobitev normativov za načrtovanje objektov za šport in prosti čas ter doseganje večje prepoznavnosti skupine v mednarodnem okolju.

*In May 2014, a three-part event took place in Glasgow (UK): the annual convention of The Royal Incorporation of Architects in Scotland (RIAS), a study excursion of the XX. Commonwealth Games facilities, and a meeting of the International Union of Architects, Sports and Leisure Programme (UIA Sports & Leisure Programme Group). The two-day convention hosted many renowned experts from around the world who shared their views and thoughts on the placement and design of sports and leisure facilities. The study excursion focused on innovative technological solutions of the renovated and newly constructed sports facilities for the XX. Commonwealth Games. The main purpose of the final meeting of the UIA Sports & Leisure Programme Group was to present achievements of individual members of the group in the design of sports and leisure facilities, and to discuss the future orientation and activities of the group.*

**Andrej Mahovič**  
**ŠPORTNI CENTRI, IGRISČE ZA VSE LJUDI**  
**Ljubljana, Slovenija, 26.9.2012**

Seminar 'Športni center, igrišče za vse ljudi' je del izobraževalnega programa 'Mednarodna šola managementa infrastrukture za šport in prosti čas'. Program je razvil konzorcij, v katerem sodelujejo univerze, podjetja, izobraževalni centri in združenja upravljavcev infrastrukture. Pri razvoju vsebine seminarja so sodelovali: Spolint, Inštitut za šport, Univerza v Ljubljani, Fakulteta za šport in Fakulteta za arhitekturo, Univerza na Primorskem, Pedagoška fakulteta Koper, Znanstveno-raziskovalno središče, Ministrstvo za infrastrukturo in prostor, Direkcija Republike Slovenije za ceste, Inštitut za športne inovacije Flisek d.o.o., Koren Sports, Agencija za športne avanture in potovanja, Športni center Ilirija in Fit Camp PrejPotem.

Seminar je potekal v Ljubljani 26. Septembra 2012. Udeležilo se ga je štirideset predstavnikov univerz, občin, javnih zavodov, podjetij in drugih upravljavcev infrastrukture za šport in prosti čas.

Predavatelji in organizatorji seminarja so bili: prof. dr. Milan Žvan, dekan Fakultete za šport, Univerza v Ljubljani; prof. dr. Rado Pišot, Univerza na Primorskem, Pedagoška fakulteta Koper, Znanstveni – raziskovalno središče; dr. Milan Hosta, Spolint, Inštitut za razvoj športa; Mojmir Flisek, Flisek d.o.o., Inštitut za športne inovacije; asist. Andrej Mahovič, Univerza v Ljubljani, Fakulteta za arhitekturo; Gregor Pečovnik, direktor Športnega centra Ilirija; Jože Jenšterle, direktor Združenja športnih centrov Slovenije in Tatjana Janežič, poslovna sekretarka Združenja športnih centrov Slovenije.

Vsebina seminarja je bila usmerjena v spreminjanje filozofije / paradigme športa, prostega časa ter infrastrukture v državi. Od načrtovanja in izgradnje novih velikih prireditvenih objektov se bo razvoj v prihodnosti usmeril v:

- rekonstrukcije in obnove obstoječih športnih centrov, objektov in površin,
- zagotavljanje pogojev za trajnostni razvoj,
- razvoj sistema 'socialnega upravljanja',
- uvajanje novih energetsko učinkovitih in ekološko sprejemljivih tehnologij ter
- razvoj inovativnih programov za vse ljudi.

Seminar je bil namenjen:

- ministrstvom in državnim institucijam, ki oblikujejo državne politike in pripravljajo zakonodajo na področju športa, prostega časa ter infrastrukture,
- občinam, ki so lastnice in investitorice v infrastrukturo,
- upravljavcem infrastrukture ter
- podjetjem, ki poslujejo na trgih športa, prostega časa ter infrastrukture (urbanisti, projektanti, gradbeništvo, industrija opreme in rekvizitov, turistična industrija, organizatorji prireditev, ponudniki programov in storitev na področju športa in prostega časa).

Na seminarju so potekala predavanja s področja:

- Filozofija športa in športna etika.  
Tema: Zdravje, vseživljenjsko izobraževanje, uspeh,

zaupanje, igrivost, veselje in sproščenost; Predavatelj: dr. Milan Hosta, Spolint, Inštitut za razvoj športa.

- Filozofija športa in športna etika / Vrste programov in storitev  
Tema: Gibalni razvoj otroka in gibalne navade ljudi skozi vse življenje; Predavatelj: prof. dr. Rado Pišot, Univerza na Primorskem, Pedagoška fakulteta Koper, Znanstveno-raziskovalno središče Koper.
- Standardi in normativi načrtovanja in gradnje infrastrukture za šport in prosti čas objektov in vadišč / Prenova športnih objektov / Drugi športni objekti / Vrste programov in storitev  
Tema: Sodobna zasnova športnih centrov; Predavatelj: Mojmir Flisek, Inštitut za športne inovacije, Flisek d.o.o.  
Tema: Vsebinska in tehnološka prenova športnega centra Ilirija; Predavatelj: Gregor Pečovnik, direktor Športnega centra Ilirija.  
Tema: Urbanistično načrtovanje infrastrukture za šport in prosti čas; Predavatelj: asist. Andrej Mahovič, Univerza v Ljubljani, Fakulteta za arhitekturo.  
Tema: Rekonstrukcije, obnove in posodobitve obstoječe infrastrukture za šport in prosti čas; Predavatelj: asist. Andrej Mahovič, Univerza v Ljubljani, Fakulteta za arhitekturo.

Po predstavitvi posameznih tem na seminarju se je razvila razprava. Predavatelji so odgovarjali na vprašanja in predloge slušateljev. Oblikovali smo naslednja priporočila za razvoj infrastrukture za šport in prosti čas:

- Država (ministrstva, direktorati, državni zavodi, Fundacija za financiranje športa), občine (lastnice ter investitorice), upravljavci in uporabniki infrastrukture (javni zavodi in podjetja, občinske uprave, društva, klubi in zveze, Olimpijski komite) ter gospodarstvo (urbanisti, projektanti, gradbeništvo, industrija opreme in rekvizitov, turistična industrija, organizatorji prireditev, ponudniki programov in storitev na področju športa in prostega časa), potrebujejo standarde in normative za načrtovanje, gradnjo, upravljanje, vzdrževanje in uporabo infrastrukture za šport in prosti čas. Pri pripravi standardov in normativov morajo sodelovati občine, upravljavci in uporabniki infrastrukture ter gospodarstvo.
- Demografsko smiselni in ekonomsko učinkovit razvoj regij ter razvoj športa in prostega časa potrebujeta mrežo športnih centrov, ki bo v prostoru opredelila mrežo lokalnih, regijskih, nacionalnih panožnih in olimpijskih športnih centrov.
- Izobraževani program 'Mednarodna šola managementa infrastrukture za šport in prosti čas' ter strokovno usposabljanje upravljavcev infrastrukture se mora vključiti v nacionalni izobraževalni sistem ter zagotoviti finančna sredstva za njegovo pripravo in izvedbo.
- Upravljavci in uporabniki infrastrukture za šport in prosti čas bodo sodelovali v mednarodnem projektu

SMART, v katerem mednarodni partnerji razvijajo nove tehnologije reciklaže gum ter razvoja novih proizvodov iz umetnih trav in športnih podov.

**Andrej Mahovič**  
**UIA Sports & Leisure Group**  
**Sustainable Architecture and Legacy Strategy Seminar**  
**London, Velika Britanija 17. - 19.4.2012**

Sto dni pred otvoritvijo XXX. poletnih olimpijskih iger v Londonu je mednarodna skupina International Union of Architects, Sports and Leisure Programme (UIA Sports & Leisure Programme Group) organizirala tridnevni seminar na temo Trajnostne arhitekture in strategija zapuščine (Sustainable Architecture and Legacy Strategy).

Na seminarju, ki je potekal v Royal Institute of British Architects (RIBA), so sodelovali mednarodni strokovnjaki s področja načrtovanja športnih objektov in objektov za prosti čas, ki so predstavili najnovejše dosežke pri načrtovanju in zasnovi športnih in drugih objektov za poletne olimpijske igre v Londonu 2012. Izvedene so bile naslednje predstavitve: Delivering the Games and Legacy, Ian Crockford, Olympic Delivery Authority (ODA); Designing the Games, Kevin Owens, London 2012 Organising Committee (LOCOG); Designing for Legacy, Tom Jones, Populous Architects; The Olympic Velodrome, Chris Bannister, Hopkins Architects; The Olympic Aquatic Centre, Barbara Bochnak, Zaha Hadid Architects; The Olympic Stadium, Tom Jones, Populous Architects; The Olympic White Water Centre at Lee Valley, Michael Hall, FaulknerBrowns Architects. Udeleženci so dobili vpogled v zakulisje načrtovanja in informacije o poteku izvedbe olimpijskih objektov ter prisluhnili izkušnjam strokovnjakov pri načrtovanju objektov in njihovi izvedbi. Vsakemu predavanju je sledila razprava z udeleženci.. Po zaključku predavanj prvega dne so se v prostorih RIBA zbrali udeleženci seminarja in predstavniki inštituta RIBA ter izmenjali izkušnje in znanja s področja načrtovanja športnih objektov. Razpravi so se pridružili tudi različni strokovnjaki in predstavniki gospodarstva, ki so navezali stike s slušatelji ter izmenjali izkušnje pri načrtovanju, gradnji in umeščanju športnih objektov v prostor.

Drugi dan seminarja je sledila strokovna ekskurzija po olimpijskih objektih, ki smo si jih udeleženci ogledali še pred njihovo javno otvoritvijo. Najprej se je skupina odpravila v olimpijski park, kjer smo si pod vodstvom organizatorja ogledali priprave in izgradnjo celotnega parka. Med predstavljenimi objekti so bili olimpijski plavalni center (The Olympic Aquatic Centre, Zaha Hadid), Velodrom (The Olympic Velodrome, Chris Bannister, Hopkins Architects), olimpijska košarkarska dvorana (The Basketball Arena; Wilkinson Eyre Architects & KSS Design Group), olimpijski stadion (The Olympic Stadium, Populous Architects) ter spremljajoči objekti. Ena največjih zanimivosti pri zasnovi olimpijskih objektov za XXX. Olimpijske igre je, da je bilo kar 40% sedežev za obiskovalce montažnih, prav tako tudi skoraj tretjina objektov, ki so bili po zaključku olimpijskih in paraolimpijskih iger odstranjeni iz prizorišč in je prostor, ki

so ga v času organizacije olimpijskih iger zasedali, bil vrnjen svojemu osnovnemu namenu ali pa so na njem nastali drugi mestotvorni programi. Po ogledu olimpijskega parka smo se podali v Lee Valley White Water Centre, kjer smo si ogledali celotni kompleks novo zgrajenega vodnega parka za potrebe tekmovanj v kajaku in kanuju na divjih vodah. Ta je bil v celoti zgrajen v prostoru rekreacijskega parka kot dodatna ponudba parka po zaključku olimpijskih igre ter za izvedbo svetovnega prvenstva slaloma v kanuju 2015. Nazadnje smo si ogledali tudi O2 Indoor areno v središču Londona, ki je bila nadgrajena za potrebe organizacije olimpijskih in paraolimpijskih iger.

Po ogledu olimpijskih objektov je v popoldanskih urah potekal sestanek mednarodne skupine UIA Sports & Leisure Programme Grup, na katerem sem sodeloval kot zunanji član. Pred pričetkom sestanka sem imel individualne razgovore in predstavitev svojega znanstveno-raziskovalnega, strokovnega in pedagoškega dela za sprejetje v mednarodno skupino UIA Sports & Leisure Group z vodilnima članoma Geraint Johnom in Billom Stonerjem ter predsednikom skupine Ianom McKenziem. Na sestanku se je s položaja predsednika skupine UIA Sports & Leisure Programme poslovil Ian Mckenzie, predstavil pa se je novi direktor Joreg Joppien. Ta je pred potrditvijo članov predstavil svoj program vodenja skupine ter vizijo razvoja in prepoznavnosti skupine v mednarodnem prostoru, kot telesa z mednarodnim članstvom strokovnjakov s področja načrtovanja športnih objektov in objektov za prosti čas. Nato sem imel kratko javno predstavitev svojega dela pred vsemi člani skupine, ki so me po priporočilu izr. prof. dr. Borisa Leskovca ter častnih članov Geraint Johna, Billa Stonerja in dosedanjega predsednika Iana Mckenzija soglasno izvolili za novega člana mednarodne organizacije UIA Sports & Leisure Programme. Ob zaključku seminarja je skupina UIA Sports & Leisure Programme sestavila deklaracijo o planiranju, načrtovanju in konstruiranju glavnih športnih objektov za športne dogodke, pri kateri smo sodelovali vsi člani skupine in jo nato tudi javno objavili in posredovali Mednarodnem olimpijskemu komiteju.

Zadnji dan seminarja je člane mednarodne skupine UIA Sports & Leisure Programme gostil svetovno znani biro za načrtovanje športnih objektov Populous. Predstavili so nam nekaj svojih zadnjih projektov, med njimi The Olympic Stadium (London, Velika Britanija), Silverstone Circuit (Silverstone, Velika Britanija) in Aviva Stadium (Dublin, Irska).

### **Resolutions**

#### **Declaration of the UIA Sports & Leisure Programme Group (London 2012)**

*This results from the group's seminar, 'Sustainable Architecture and Legacy Strategy for London 2012' on 17th April 2012, and the experience of visits to the Olympic Park, Lee Valley White Water Centre, and the O2 Indoor Arena on 18th April 2012*

*In the brief-making, planning, design and construction of facilities for major sports events, the UIA Sports & Leisure Programme Group (the Group) supports limiting the gigantism of Olympic and Paralympic Games. It urges the IOC to review and evaluate the actual sustainability levels of recent Olympic*

and Paralympic facilities during the long legacy periods following the Games and it would be pleased to assist in this exercise. The Group endorses the following principles:

1. To apply and incorporate legacy considerations into all stages of brief-making and design: to build permanent facilities only where there is a proven need and there are sound prospects of realistic after-use; to use existing and temporary facilities wherever possible; to carefully consider the scale of spectator numbers which are appropriate to the sport and to limit the increasing and unrealistic demands of sports bodies and federations.
2. To seek a high standard of design which successfully balances aesthetics with construction budget and with costs in use during the long legacy period: to use architectural competitions where appropriate - but always ensure that the Games' mode is as architecturally satisfying as the legacy mode.
3. To produce sustainable designs with environmental awareness: to follow the principles of reuse, reduce and recycle.
4. To incorporate considerations of accessibility, comfort and friendliness for all with special needs - participants, spectators and all other users.
5. To employ a forward - planning programme which has an appropriately generous timescale.

The group congratulates the organisers of the London 2012 Olympic and Paralympic Games in seeking to achieve and apply these principles. London now has a wide range of existing, new and temporary venues which contain facilities which are either permanent, permanent-but adaptable, temporary and relocatable, or temporary and disposable. At the same time it has used the opportunity of the 2012 Olympic and Paralympic Games to produce a catalyst for the regeneration of one of its poorest developed areas. Hopefully, the London facilities in their Games mode and during the long legacy period which follows, will establish positive guidelines for future major event venues.

**Andreja Benko**  
**WOMEN OF TUM 2013 – STAY CONNECTED**  
**WORLDWIDE**  
**München, Tutzing, Nemčija, 9. - 14.10.2013**

V mesecu oktobru 2013, je Tehniška univerza v Münchnu organizirala seminar z osnovnim naslovom Stay connected worldwide, namenjen promociji žensk v znanosti, ki so študirale na TUM in po študiju z njo tudi aktivno sodelujejo. Seminar, pod pokroviteljstvom Deutsche akademische austausch dienst (DAAD), je trajal pet dni.

Kot vsako leto, je tudi v letu 2013, bila skupina udeleženk izbrana na podlagi priporočil, poročil o delu, promocije in aktivnosti, sestavljale pa so jo udeleženske z različnih strokovnih profilov s področja, medicine, biologije, kemije, ekonomije, matematike, strojništva, managementa, agronomije, kemije, gradbeništva, arhitekture in še nekaterih drugih ved, pri čemer je poseben poudarek na mednarodni udeležbi (Nemčija, Egipt, Grčija,

Bolgarija, Romunija, Indija, Čile, Rusija, Hrvaška, Kazahstan, Turčija, Iran, Kitajska in Slovenija) in na povezovanju med različnimi državami in strokami.

Tema v letu 2013 je bila Go in and win, čemur so bile namenjene različne delavnice za motivacijo, predstavitve dela ipd.

V sklopu petdnevnega programa smo se udeležile tudi dvodnevne seminarja v Tutzingu, Evangeličanski akademiji, ki vsakoletno organizira posebne seminarje namenjene ženskam. Tema v letu 2013 je bila Welt-Raum-Mensch (Svet-prostor-človek), kjer so bila na vrsti predavanja z interakcijo v obliki okrogle mize. Teme so bile naslednje:

- 'Politische Räume: Arenen der Öffentlichkeit' Prof. Dr. Ursula Münch (Direktorin der Politischen Akademie)
- 'City of the Future' Dr. Katharina Beumelburg (Siemens)
- 'Eine Welt, viele Welten' Okrogla miza z Juliano von Krause, Barbaro Lochbihler in Hannah Wettig

Za zaključek so bile organizirane različne delavnice s področja: Alexandertechnik: Jana M. Dobrick, Improtheater: Dorothea Anzinger, Spiraldynamik: Carolyn Ohnesorge, Zeitmanagement: Dr. Stephanie Hann.

Moja izbrana delavnica je Zeitmanagement pri Dr. Stephanie Hann. Skupina je štela 14 udeleženk. Zadnji dan seminarja v Tutzingu je vsaka skupina predstavila svoje delo tudi ostalim skupinam. Posebej zanimivo je bilo to, da je bila vsaka delavnica organizirana po principu brainstorminga in sodelovanja ter spoznavanja različnega principa dela v različnih državah po svetu in širjenju znanja.

Na podlagi predstavitve je vsaka udeleženka prejela tudi certifikat o udeležbi in doprinosu pri reševanju strokovne problematike. Po seminarju v Tutzingu, smo se udeleženke TUM Alumnae vrstile v München, kjer smo obiskale v gradu Nympehnburg, klasični koncert Vivaldija - 4 letni časi. Zjutraj pa nadaljevali delo v prostorih Tehniške univerze v Münchnu, in sicer na temo TUMnet Community, kako ohraniti stike in kako ta nova znanstva in vezi prenesti v skupno sodelovanje delo, na princip osnovnega združevanja, študija na Tehniški univerzi v Münchnu.

Skozi vseh pet dni je bilo delo zastavljeno zelo resno, predvsem pa s poudarkom na mreženju in promociji Tehniške univerze v Münchnu in našem doprinosu k izboljšavi aktivne mreže in povezavi med nami (teambuildingu).

**Andreja Benko**  
**ArchTheo 13-THEORY OF ARCHITECTURE CONFERENCE**  
**Sources of creativity, autonomy & function**  
**Istanbul, Turčija, 4. - 5.12.2013**

V začetku decembra 2013, je v Istanbulu/Turčija, potekala mednarodna konferenca Archtheo 2013, namenjena arhitekturni teoriji in razvoju arhitekture. Konferenco je gostila Mimar Sinan fine arts University, potekala pa je v organizaciji DAKAM (Eastern Mediterranean Academic Research Center) in MSFAU (Mimar Sinan Fine arts University). Konferenca je bila namenjena teoriji, razvoju in pregledu bivanjske arhitekture, saj je bilo vodilo leta 2013 Sources of creativity, autonomy &

function. Konferenca je bila sestavljena iz treh različnih sklopov, tako da so si znanstveni prispevki sledili po vnaprej določenemu vrstnemu redu.

Na konferenci je sodelovalo mnogo strokovnjakov in tudi profesorjev s področja arhitekture na različnih fakultetah za arhitekturo. Tako so bile zastopane države: Egipt, Turčija, Južnoafriška republika, Kanada, Nemčija, Brazilija, Italija, Avstralija, ZDA, Slovenija, Bosna in Hercegovina... Konferenca je potekala vsak dan od 10 ure pa vse do 6 ure popoldan v glavnem avditoriju Mimar Sinan Univerze. Predstavljeni različni pogledi na arhitekturo, arhitekturno teorijo, razvoj teorije, kot tudi prikaz praktičnih primerov iz prakse. Prav tako so organizatorji dali možnost virtualnih predstavitev avtorjev oz. možnost udeležbe na delavnici s študenti. Rezultati delavnice so bili predstavljeni zadnji dan konference. Svoj članek z naslovom *Role of the architect in the building process/Architects' influence on the economical site of building* sem predstavljala drugi dan konference, ki je v celoti objavljen v zborniku konference.

***Role of the architect in the building process / architects' influence on the economical site of building.***

***Architects with their work represent special junction for a user, especially in the design of residential buildings. This paper focuses on work from economic point of view, among the architect and investor who is also user of the house.***

*The emphasis and importance of the responsible architect are shown throughout the whole process of construction of the facility (design + construction). Recently financial side of the planner investment is exceptional important. Users, who decide to build, primarily see just a short-term financial plan. The architect's responsibility in this case is to present also a long-term investment value. The architects' decisions have also a significant impact on the economic side of the investment, which is often quite important to a user. It is thus possible to optimize a construction, with a planned reasonable design and collaboration with user from the beginning of the whole process. Here needs to be mentioned also investors - who are not limited with financial funds but that kind of investors are relatively rare. For the most common investor, it makes sense that he does the outset to determine the investment budget. The importance of the budget defines not only the design but also makes possible to complete the whole building process. As a result of poorly estimated budget are not finished facilities. In this way, the architect and the user bundle trusting bond that is quite important.*

*Unfortunately common practice of Slovenian investors is all too often trying to save a bit of funds by choosing the cheapest design offer. But as a rule, in the process of building a house, it always turns out to be the money twice lost. Often the result of such decision is problematic as active collaboration with architect can provide quality work, thought through design and also economical completion of building. In view of the entire process of construction of a facility, the clients often do not realize that a well chosen architect will be the one, that will draw the plans for individual house, will also get them the permit to build the*

*object, but at the same time he will economically optimize the construction and maintenance of the facility.*

*The architects' aim of this process is indisputably large, as he helps the user to make his future home useful. But he – the architect, should also be aware, that he will not be the user of a designed architecture. The customers' wishes have to be included in a facility, where he primarily has to allow his own expression of creativity, autonomy, but as an expert he has to ensure the functionality of the building and involvement of the building to the traditional architectural landscape. Architect therefore should be familiar with fields of psychology, a sociology, communication, organization, economy and in particular, a consultant, who follows the specific of the chosen environment and satisfies the needs of future user of the facility.*

*This is important for new construction, such as for the renovation of the building - the architect must actively participate and interact with future users of the facility. A responsible architect with a sense of architecture understands and knows what the identity of the landscape is and has integrated approach to the design. Any interference in the landscape is public and with inappropriate intervention in space can affect many people. This is the point, where the profession gets more value and is important, that architects interfere more in the outer coat of the object and leave more creativity, autonomy to the user inside of the house.*

BENKO, Andreja. Creativity : role of the architect in the building process. V: ÇATAK, Neslihan (ur.), DUYAN, Efe (ur.). ARCHITHEO '13 : conference proceedings, December 4-6 2013, Mimar Sinan Fine Arts University, [Istanbul], Creativity, autonomy, function in architecture. Istanbul: Mimar Sinan Güzel Sanatlar Üniversitesi Yayınları, cop. 2013, str. 293-299, ilustr. [COBISS.SI-ID 2955652]

**Andreja Benko  
ISG Graz 2013. Mitten am Rand  
Graz, Avstrija 21.6.2013**

V Grazu (Avstrija), se je tudi leta 2013 že tradicionalno odvijal 4. mednarodni simpozij ISG Graz, namenjen arhitektom in urbanistom. V letu 2013 je potekal pod temo *Mitten am Rand/ On the Fringe*. Simpozij je trajal tri dni, in sicer je bil razdeljen na prvi dan, ko se je odvijala ekskurzija, drugi dan, ki je bil v celoti namenjen predavanjem in zaključni tretji dan, ko je bil organiziran sprehod po mestu.

Udeležili smo se drugega dneva, ki je bil namenjen predavanjem. Glede na tematiko tega leta, je bilo precej predavanj vezanih na temo, izpostavljenih pa je bilo precej podobne problematike iz preostalega evropskega prostora, kot jo zasledimo tudi v Sloveniji. Čez dan se je zvrstilo več predavanj, in sicer:

- Mit einer neuen Raumplanungspolitik gegen die Zersiedlung, Dr. Raimund Rodewald, Stiftung Landschaftsschutz Schweiz
- Zwischenstadt – Städtebauliche Zumutung oder notwendiges Übel in der automobilen Gesellschaft?, Dr. Martin Gegner, Soziologe, Sao Paulo
- Lage, Lage, Lage: Stadt und Konsum im digitalen

Zeitalter, Univ. Prof. Arch. Dr. Wolfgang Christ, Bauhaus-Universität Weimar

- Warum es ums Ganze geht. Baukultur im ländlichen Raum, DI Arch. BDA Manfred Brennecke, ARC Architekten, München
- Bürgerbeteiligung – das Ende von Architektur und räumlicher Entwicklung? Dorfentwicklungsprojekte in Tirol, DI Nikolaus Juen, Land Tirol, Abteilung Bodenordnung
- Dornbirns Dörfer – Städtische Siedlungsgebiete im Bregenzerwald, DI Johann Peer, Architekt und Denkmalpfleger, Wolfurt
- HISTCAPE – Ländliche Baukultur und Landschaft, GF Christian Gummerer, Landentwicklung Steiermark
- Bauen in Welterbe-Regionen und schützenswerten Landschaften, DI Herbert Bork, Büro StadtLand, Wien
- Zürich West – Stadtentwicklung im Randbereich (angefragt)
- Graz Reininghaus – Stadt am Rand und in der Mitte, Stadtrat Univ.DoZ. DI Dr. Gerhard Rüscher, Graz
- Ländliche Regionen inwertsetzen und in eine neue verheißungsvolle Zukunft transformieren, Landtagsabgeordneter Ing. Josef Ober, Land Steiermark

Predavatelji so mnogokrat izpostavili problematiko etike v arhitekturnem načrtovanju in predvsem neprimerne posege v prostor in s tem rušitev tradicionalne arhitekturne krajine. Namen simpozija je bil tudi navezava kontaktov, med udeleženci, čemur je bil namenjen čas med različnimi predavanji.

V reviji, ki jo ISG Graz izdaja, in je bila na isto temo (Mitten am Rand/On the Fringe), sva ob tej priložnosti objavili tudi dva prispevka na to temo.

BENKO, Andreja. Die Identität der Architekten bestimmt die Identität der architektonischen Landschaft = The architects' identity determines the identity of the architectural landscape. ISG Magazin, ISSN 2309-1215, 2013, [H.] 2, str. 9-12, ilustr. [COBISS.SI-ID 2868612]

**Domen Kušar**

**Mateja Volgemut**

**IZPOLNJEVANJE ZAHTEV VARSTVA PRED POŽAROM IN ZAŠČITE PRED HRUPOM NA PRIMERU VEČSTANOVANJSKIH OBJEKTOV OD A-M V DOLU PRI LJUBLJANI**

**UL FKKT – oddelek za tehniško varnost**

**Klinični inštitut za medicino dela, prometa in športa**

**Združenje za medicino dela, prometa in športa**

**Zbornica varnosti in zdravja pri delu**

**RS MDDSZ – Inšpektorat RS za delo**

**Portorož, Slovenija, 13. - 14.5.2014**

Posvet je bil namenjen strokovnim delavcem za varnost in zdravje pri delu ter požarno varnost, izvajalcem medicine dela, vodstvenim strukturam v podjetjih ter upravnim organom ter drugim zainteresiranim, ki si prizadevajo za varno in zdravo delo. Letošnji osnovna tema je bila podpora trenutni aktualno kampaniji 2014/2015 EU: 'Obvladajmo stres za zdrava delovna mesta' za spodbujanje učinkovitega obvladovanja psihosocialnih

tveganj in stresa, povezanega z delom, kar postaja eden najpomembnejših problemov, tudi pri nas.

Najin prispevek je prikazoval izpolnjevanje zahtev s področja varstva pred požarom in zaščite pred hrupom, ki sta dve od bistvenih zahtev skladno z Zakonom o graditvi objektov. Obravnaval je projekt 13 večstanovanjskih objektov v občini Dol pri Ljubljani kot primer celovitega urejanja prostorske enote od prostorskega načrtovanja do izvedbe objektov.

Projekt se je začel z izdelavo izvedbenega prostorskega načrta in nadaljeval s projektno dokumentacijo, ki je še podrobneje določila zahteve s področja varstva pred požarom in zaščite pred hrupom, ki sta jih morala tako prostorski načrtovalec kot projektant smiselno vključiti v projekt.

Prostorski akt je določil tudi ukrepe, ki se nanašajo na urbanistično zasnovo območja in ukrepe za zaščito pred naravnimi in drugimi nesrečami. Študija požarne varnosti, kot sestavni del projektne dokumentacije, je določila ukrepe za zagotovitev predpisane ravni požarne varnosti v objektih.

V elaboratu zaščite pred hrupom, je bilo predvideno, da bo objekt ob klančini v podzemno garažo bolj izpostavljen hrupu in bodo zato potrebni dodatni ukrepi zniževanja ravni hrupa. Navedeni ukrepi so bili predstavljeni z načrti, detajli arhitekture in fotografijami.

KUŠAR, Domen, VOLGEMUT, Mateja. Izpolnjevanje zahtev varstva pred požarom in zaščite pred hrupom na primeru večstanovanjskih objektov od A-M v Dolu pri Ljubljani. V: Varstvo pri delu, varstvo pred požari in medicina dela : dvodnevni posvet z mednarodno udeležbo, Portorož, 13.-14. 5. 2014. Ljubljana: Fakulteta za kemijo in kemijsko tehnologijo, Oddelek za tehniško varnost, 2014, str. [1-38]. [COBISS.SI-ID 3068036]

**Domen Kušar**

**Mateja Volgemut**

**THIRTEEN YEARS OF MRT – RESULTS, OPTIONS AND DILEMMAS**

**The 16<sup>th</sup> International Conference on Geometry and Graphics, Unit for Geometry and CAD**

**University of Innsbruck**

**Innsbruck, Avstrija, 4. - 8.8.014**

<http://geometrie.uibk.ac.at/icgg2014/>

Konferenca, ki jo je organiziralo Mednarodno združenje za geometrijo in grafiko (ICGG) je bila namenjena strokovnjakom, raziskovalcem in pedagogom, ki se ukvarjamo s širokim področjem geometrije in grafike. Na konferenci je sodelovalo preko 200 udeležencev z vsega sveta (večina je bila iz Japonske, Kitajske in Avstrije), ki smo predstavili svoje novosti na področju geometrije in grafike ter si izmenjali pedagoške in strokovne izkušnje.

*During the 2013-2014 academic year, the 13th annual test of spatial ability is being performed at the Faculty of Architecture of the University of Ljubljana.*

*The first goal of the test is to obtain information about spatial ability of first-year students. Thus, the test is performed at the beginning of the academic year and covers the population of first-year students. Several ways of checking spatial ability exist, since this is a complex field that contains various aspects of spatial ability. At*

the Faculty of Architecture, we use the Mental Rotation Test which is one of generally recognized tests for checking spatial ability. The conditions of the test have stayed the same throughout the years (time, exam papers etc.) which enables us to objectively compare different generations.

Considering the structure of the test, its primary goal is to check the capability of mental rotation, which is an integral part of spatial ability. More than 2000 ( $n=2094$ ) students have performed the test up to now. Besides basic data about generations, for the past three years we have also been comparing the differences in terms of left-handedness and right-handedness. The results show no statistically provable differences. But it is true that the tested population of left-handed students is, despite the above, relatively small ( $n=66$ ) even though it proportionately does not deviate from the share of the entire population. An interesting phenomenon is also the poorer results of each third generation, which has been appearing throughout the years. This difference has been statistically proven for 2009 and 2012, while the difference for 2003 and 2006 has not yet been statistically proven.

Processing of results with the help of statistical software makes it possible to check various hypotheses from the area of spatial ability and provides interesting conclusions, presented in the article. A large digital database also makes it possible to evaluate the test and the students' approach towards solving it. This opens up new possibilities in the area of comprehensively treating spatial ability and, at the same time poses new questions and dilemmas. One such dilemma is the existing scoring system.

Results obtained in the joint project of the Faculty of Architecture of the University for Technology and Economics in Budapest, Ybl Miklos University for Architecture and Civil Engineering of the Szent Istvan University of Budapest and the Faculty of Architecture of the University of Ljubljana namely show that the existing scoring system is not the most appropriate since it does not provide the envisaged normal distribution of the sample. Based on obtained data, a new scoring system has been proposed which enables a normal sample distribution.

KUŠAR, Domen, VOLGEMUT Mateja: Thirteen Years of MRT – Results, Options and Dilemmas. V: SCHROCKER, Hans Peter, HUSTY Manfred. The 16th International Conference on Geometry and Graphics, Innsbruck, August 4-8, 2014. Program and Abstracts. Innsbruck, University of Innsbruck, 2014, str 269.

**Martina Zbašnik-Senegačnik**  
**Boris Azinović**  
**SEISMIC SAFETY OF PASSIVE HOUSES FOUNDED ON THERMAL INSULATION**  
**17th International Passive House Conference 2013**  
**Passive House Institute**  
**Frankfurt (Main), Nemčija, 19. - 20.4.2013**  
[http://passiv.de/former\\_conferences/siebzehnte/Englisch/index\\_eng.html](http://passiv.de/former_conferences/siebzehnte/Englisch/index_eng.html)

The inserting of soft thermal insulation (TI) layers under the foundation of a building increases its period of vibration, what could result (in the case of very stiff structures) in larger earthquake forces acting on the building. The presented paper deals with the seismic response of passive buildings founded

on TI layer made of extruded polystyrene (XPS). In order to obtain the material characteristics of XPS thermal insulation boards, the axial compressive and shear tests were carried out. The obtained data were then used in a numerical parametric study. The research has shown that in general the seismic safety of passive houses with the height up to 2 or 3 stories is not of critical concern. For higher (or slenderer) buildings, however, the negative effects of TI layer under foundation slab are more important and can lead to overstress in the TI layer itself, or to the increase of stresses and top displacement of the building.

KOREN, David, KILAR, Vojko, ZBAŠNIK-SENEGAČNIK, Martina. Seismic safety of passive houses founded on thermal insulation. V: 17th International Passive House Conference 2013, 19-20 April, Frankfurt am Main. FEIST, Wolfgang (ur.). Conference proceedings. Darmstadt: Passive House Institute, 2013, str. 573-574, ilustr. [COBISS.SI-ID 2842244]

**Boris Azinović**  
**SEISMIC SAFETY OF LOW-ENERGY BUILDINGS**  
**Erasmus izmenjava za pedagoge in zaposlene na FA**  
**Escola Tècnica Superior d'Arquitectura de Barcelona**  
**Barcelona, Spain, 5. - 10.10.2013**  
<http://www.etsab.upc.edu/web/frame.htm?i=2&m=inicio&c=inicio>

Predavanje je bilo osredotočeno na predstavitev koncepta energijsko učinkovitih stavb, med katere štejemo tudi pasivne hiše. V obravnavani predstavitvi je bil največji poudarek posvečen zahtevi o sklenjenemu toplotnoizolacijskemu ovoju, ki je ena izmed zahtev takšnih stavb. V osrednjem delu predavanja pa je bil predstavljen vidik njihove potresne varnosti. Izpostavljena je bila problematika temeljenja na toplotni izolaciji, ki je eden izmed detajlov z največjim vplivom na potresni odziv. Podani so bili kratki zaključki in priporočila za projektiranje energijsko zelo učinkovitih stavb na potresno ogroženih območjih.

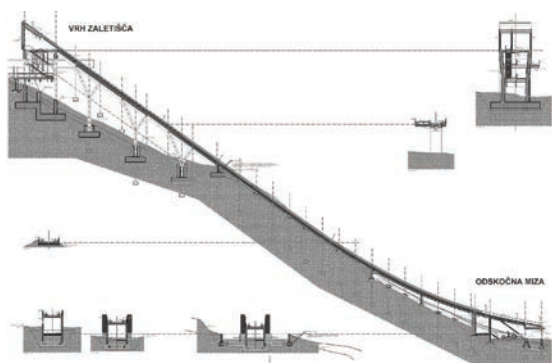
AZINOVIĆ, Boris. Seismic safety of low-energy buildings : [predavanje na Escola Tècnica Superior d'Arquitectura de Barcelona (ETSAB), Španija, 8. 11. 2013]. 2013. [COBISS.SI-ID 2933636]

**Vojko Kilar**  
**Boris Azinović**  
**GRADBENA KONSTRUKCIJA NOVE LETALNICE HS225 V PLANICI**  
**35. zborovanje gradbenih konstruktorjev Slovenije**  
**Slovensko društvo gradbenih konstruktorjev**  
**UL, Fakulteta za gradbeništvo in geodezijo**  
**Ljubljana, Slovenija, 22.11.2013**  
<http://www.sdggk.si/index.php>

V prispevku je opisana načrtovana gradnja nove letalnice bratov Gorišek v okviru novega Nordijskega centra v Planici, ki vključuje odstranitev obstoječih objektov, poglobitev in razširitev obstoječega doskočišča in izgradnjo novega zaletišča, ki poteka kot mostna konstrukcija na treh parih Y stebrov visoko nad obstoječim terenom. V obravnavani 1D fazi se gradnja še

dva nova RTV stolpa (mali in veliki), trenerska tribuna, vetrna zaščita, ogrevalni objekt na vrhu zaletišča, konstrukcija za TV zaslon ter rekonstrukcija stavbe Kavka in sanacija obstoječega sodniškega stolpa. Prispevek prikazuje lokacije načrtovanih novih objektov in kratke opise konstrukcijsko najbolj zanimivih detajlov.

LOPATIČ, Jože (ur.), MARKELJ, Viktor (ur.), SAJE, Franc (ur.). Zbornik 35. zborovanja gradbenih konstruktorjev Slovenije, Ljubljana, Fakulteta za gradbeništvo in geodezijo, 22. november, 2013. Ljubljana: Slovensko društvo gradbenih konstruktorjev, 2013, str. 79-88, ilustr. [COBISS.SI-ID 2947460]



Zaletišče HS225 – vzdolžni in prečni prerezi.

**Larisa Brojan**

**CREATIVITY, ALTERNATIVE WAYS OF DESIGNING AND CONSTRUCTING: STRAW BALE WALL DESIGN ALTERNATIVES**

ArchTheo 13-THEORY OF ARCHITECTURE CONFERENCE  
Istanbul, Turčija, 4. - 5.12.2013

Mednarodna konferenca je organizirana v okviru združenja DAKAM (Eastern Mediterranean Academic Research Center) in Mimar Sinan Fine Arts University. Na konferenci je bilo veliko predstavitev s področja arhitekture, teorije načrtovanja in snovanja prostorskega oblikovanja. Poleg javnih predstavitev prispevkov so bile organizirane tudi razprave. S kolegi smo sodelovali pri tematiki socialne vloge arhitekture in vplivom arhitekture na bivanjske navade ljudi. Vsi prispevki so objavljeni v zborniku z naslovom 'Sources of creativity, autonomy & function', kamor je vključena tudi spodaj predstavljena študija. Koordinator konferenca je bil Efe Duyan.

*This paper focuses on the straw bale wall functionality. It is evident from analyses of straw bale houses, how diverse the design of straw bale building can be. Straw bale building has many advantages especially in sense of ecological aspect which is many times also the main reason to build with straw bales.*

*Floor plan design doesn't need any special treatment; there are many possibilities especially when straw bales are used as an infill which is in most projects. But when it comes to building, at first special attention needs to be devoted to bales stacking, bales alignment and finally, the crucial segment of plastering. Since most of builders apply the plaster by hand, extreme precision is needed especially when flat surface is needed.*

*When bales are stacked, alignment is done by pushing and hammering the bales into right position. Next step is straw trimming which makes the wall smooth. Well aligned wall insures the static safety but also many builders decide to increase the safety with mesh which also makes the plaster application easier. Plaster can be applied in case of straw building by hand or by machine. Manual, hand application is most common way though. Functionality is supplemented with appropriate furniture. In case of straw bale walls special attention needs to be devoted to pre-determination of hanging furniture like cupboards or just wall decoration as pictures or other accessories. Since the plaster itself is not thick enough to hold all the weight and straw itself is to 'soft' to hold added item additional substructure is needed. Final image of straw bale plastered wall depends on application precision. Roughly, surface finish can be divided into three groups:*

1. Organically shaped surface
2. Semi leveled surface
3. Completely leveled surface

*Based on the diversity of design that straw bale building offers many requests can be realized. Straw bale building itself does not represent any functional disadvantages if details are carefully planned and delivered.*

BROJAN, Larisa. Straw bale wall design alternatives. V: ÇATAK, Neslihan (ur.), DUYAN, Efe (ur.). ARCHTHEO '13: conference proceedings, December 4-6 2013, Mimar Sinan Fine Arts University, [Istanbul], Creativity, autonomy, function in architecture. Istanbul: Mimar Sinan Güzel Sanatlar Üniversitesi Yayınları, cop. 2013, str. 43-50, ilustr. [COBISS.SI-ID 2956164].

**Larisa Brojan**

**ADVANTAGES AND DISADVANTAGES OF STRAW BALE AS BUILDING MATERIAL**

**The Constructed Environment**

**Lizbona, Portugalska, 4. – 5.10.2013**

Mednarodna konferenca je organizirana v okviru združenja Constructed Environment. Tematika konferenca je bila odnos človeka do naravnega in grajenega okolja. Udeleženci konferenca so bili s celega sveta (ZDA, Evropa, Azija, Južna Amerika itn.). Poleg javnih predstavitev prispevkov so bile organizirane tudi razprave na vodilno temo.

*Paper is focused on general properties of straw bale as a building material which is proven by numerous buildings to be an appropriate material choice in several aspects. The research is divided on to two parts in which advantages and disadvantages of such a building are discussed.*

*The building techniques are relatively easy to learn and performance of straw bale structures has a high value in terms of several aspects as long as the general guidance is considered. The primary benefit of straw bale as building material is its low embodied energy. Therefor the impact on the environment is low which is important since the awareness of building negative impacts on the environment. Above all, the isolation properties are on a high level as thermal as well as sound isolation.*



*Many researches on straw bale building done so far were focused on discovering moisture content in straw bales which is one of the major issues in straw bale building. Therefore special attention needs to be devoted to details such as separation of straw bales of ground and selection of appropriate render material. Render selection is crucial and extremely important step in straw bale building not just in moisture matter but it is the important part as fire protection there for it has to be poorly flammable. In comparison with other building materials straw bale disadvantages is its lack of material research. Regardless the advantages that such a building offers, straw as a building material still is not being recognized as it could be.*

BROJAN, Larisa, CLOUSTON, Peggi L.: Advantages and disadvantages of the straw bale as building material : [predavanje na Fourth International Conference on the Constructed Environment Universidade Nova de Lisboa Lisbon, Portugal 4-5 October 2013]. 2013. [COBISS.SI-ID 2919044]

**Domen Zupančič**  
**SPATIAL PLANNING IN TOURIST CENTRES OF SLOVENIA, EARNINGS BEFORE IDENTITY**  
**ISG Das Internationale Städteforum Graz**  
**4th International Symposium 2013**  
**Graz, Avstrija, 21.6.2013**

Mednarodno združenje zgodovinskih mest in občin je strateški forum strokovnjakov na področju vodenja mest in upravljanja s prostorom; k tem dejavnostim so pridruženi še prostorski načrtovalci, raziskovalne organizacije in arhitekti. Cilji združenja so usmerjeni k temu, da promovirajo procese oblikovanja prostora po načelu soodločanja z upoštevanjem

zgodovinskih danosti okolja. Združenje se ne ukvarja zgolj z mestnim prostorom, posega tudi na področje urejanja naselij in prostora med naselji – krajino.

Redno organizirajo letni večdnevni tematski simpozij, ob tem dogodku izdajo tematsko izredno številko ISG Magazin (ISSN 2309-1215) z izbranimi prispevki. Besedila so dvojezična: NEM in ANG. V letu 2013 je bil simpozij usmerjen gradnjo ob robu naselij. Tematika zajema rob naselja, ločnico med pozidanim in nezazidanim prostorom. Prispevki simpoziju so bili kakovostni in so zajemali teorijo načrtovanja, prakso iz ZDA, Švice, Slovenije in Avstrije.

### **To better spatial solutions**

*It is not just the investor that carries the weight of responsibility, we architects and project planners bear greater responsibility, since we have not succeeded in stemming these wasteful spatial failures or reorienting them into quality. There would have been fewer spatial difficulties if municipalities had introduced the institution of municipal architect or strengthened the municipal spatial planning office with an architect. Many dilettante interventions would have been better managed in this way. Urban planning and architectural workshops are another possible contribution to a rise in quality of the design of space and identity. Market oriented planning offices have limited means (time and money) for dealing with an individual region for the purpose of spatial development. Means are determined by a number of factors, the municipal budget is explicit, the legal framework (existing and newly created legislation) and the capacities of the selected planner. Architectural workshops in this regard are a sensible supplement in planning spatial interventions and shaping guidelines (Zupančič, 2008). Spatial planning has always been part of wider public debate. In the past few years, the major property investment trend*



*An example of an apothecary with housing in Kranjska Gora; the object respects all the given features of the location and all deviations. The roofs are cut-off so that it satisfies the conditions of too small a land plot for such a program.*



*Identity and city.*

*has been exhausted and emptied. Objects were built that were created under the influence of striving for high economic profit. Identity was taboo or only a caricature presentation. Density of building was the essence. It was frequently a combination of maximisation of the exploitation of surface areas and, at the same time, following the minimum standards of design of space.*

ZUPANČIČ, Domen. Raumgestaltung in slowenischen Tourismuszentren, Ertrag vor Identität = Spatial planning in tourist centres in Slovenia, earnings before identity. ISG Magazin, ISSN 2309-1215, 2013, [H.] 2, str. 23-26, ilustr. [COBISS.SI-ID 2872196]

**Domen Zupančič**

**WORKERS DWELLINGS IN AUSTRO-HUNGARIAN MONARCHY: TRZIC SLOVENIA**

**Function: Architectural and Social Function of Space  
ARCHTEO 2013 - Theory of Architecture  
Istanbul, Turčija, 4. – 6.12.2013**

Mednarodna konferenca je organizirana v okviru združenja DAKAM (Eastern Mediterranean Academic Research Center) in Mimar Sinan Fine Arts University. Na konferenci je bilo veliko predstavitev s področja arhitekture, teorije načrtovanja in

snovanja prostorskega oblikovanja. Udeleženci so bili s celega sveta (Japonska, Kitajska, Bližnji Vzhod, Evropa, Egipt,...). Poleg javnih predstavitev prispevkov so bile organizirane tudi razprave. S kolegi smo sodelovali pri tematiki socialne vloge arhitekture in vplivom arhitekture na bivanjske navade ljudi. *The paper presents the possible way to observe development of spatial structures from urban scale to architectural scale through the eyes of prediction of possible social events. There will be presented some examples of working settlements built in Austro-Hungarian Monarchy.*

*The industrial revolution has brought social changes and has changed a whole set of habits of citizens. The role of workers dwellings has been constantly at the edge of decent spatial organization. Generally the workers class was not concerned as an integral part of business management. Those general ideas may seem to be correct but there are several examples prove the opposite. In example one of the oldest set of dwellings for workers is Tell el Amarna in Egypt.*

*Organizing the site and setting dwellings on plot played a key role how social life is going to develop. Rectangular array with quite narrow streets is an optimized composition of a squared plot. The factor of build vs non build area reveals rather dense habitation. This density has an effect on social habits of settlers. The idea that the place was meant for slaves could not be taken as granted, the*

*precise look on plans could expose open fire places, communal rooms and some private rooms. We could set a hypothesis that houses were built not for single persons but for families or some kind of community. Narrow streets in-between the houses with one square at the entrance expose that this community had restricted access or exit of the settlement. Here the idea is the opposite: controlling the community. Narrow streets are helpful for controlling the traffic of people on the streets; they could reduce the speed of moving the people. Those are the benefits for security.*

*The general question is: house units provide a quality of life with fire places and streets are provide quality of mass controlling for the ruler. This is some kind of 'must to do' symbiosis.*

*In Austro-Hungarian Monarchy those working settlements were organized the same as described before. This formula helped both groups: the owners and the workers. In terms of economy this could be named: win - win combination. Here the story of architecture and spatial organization starts.*

ZUPANČIČ, Domen. Workers dwellings in Austro-Hungarian Monarchy : Trzic Slovenia. V: ÇATAK, Neslihan (ur.), DUYAN, Efe (ur.). ARCHTHEO '13 : conference proceedings, December 4-6 2013, Mimar Sinan Fine Arts University, [Istanbul], Creativity, autonomy, function in architecture. Istanbul: Mimar Sinan Güzel Sanatlar Üniversitesi Yayınları, cop. 2013, str. 36-42, ilustr. [COBISS.SI-ID 2955908]

**Borut Juvanec**

**LES GLACIERES DE SLOVENIE**

**La foire de la glace**

**Musee archeologic de Le Van,**

**Mazaugues, Marseilles, February 2013**

*Historical background of the ice houses is well known from the 3rd Millennium BC. The oldest objects can be found in Iran, made of the stone and clay in circular shape of stepped cone. Water is the main material for maintaining the proper temperature: it has three aggregations – water, steam and ice.*

*Needs for chilling the goods and producing ice are close connected to the life of mankind: low temperature lasts the food quality, and the quick cooling stops deterioration of the milk. On the other hand, ice can be used for cooling itself as well as for direct use, icecream for instant or frape. Icecream is not the invention of our days.*

*Appearance of ice houses can be found in the natural underground caves, and as built objects, using the air streams, fresh water; or isolation facilities of the ground materials for retardation of losing temperature. Economy of the ice production can be: for individual use, as craftsmanship and for industrial use.*

*Function of the ice house is keeping the cool air inside: but the basic activity for this is collecting the ice. It can be gathered in free nature, collected with the sort of funnels, in the basins nearby, from the far ponds, or can be 'produced' with beating the snow.*

*Objects for ice houses are built almost under the ground: some of them can be seen as the roof only, or as the monument (the pyramide, for instance). Elements of the objects are as follows: roof, body (sunk into the ground), entrances and outbuildings (as basins,*

*ponds, canals). Ice house can be build in stone, with elements in wood, but smaller objects can be found almost in stone. Stone constructions are made mostly in dry stone walling system, with corbelling or they are vaulted, roofed with straw or reed (leaves), clay tiles or stone plates.*

*Architecture of ice houses can be several, especially their elevations outside, with characteristics of the environment, and in local materials (slopy thached roofs, almost flat roofs in stone plates, circular shapes or leaned to the hill or to other objects). The simplest objects are real cylinders with spyral staircases down to the bottom, but professional built objects have the bodies narrower at the bottom, are made of double walls, with airation and straining canals, corbelled balkonies and sofisticated transport gears for digging out the ice.*

*Examples of ice houses: Spain, France, Switzerland, Italy, Slovenia. Informative material consists sketches, plans, photos and reconstructions of some typical ice houses.*

*Instalation into the environment shows all the possibilities: ice house could be hidden, deep under the fortress (Monza), leaned to the house, in distance from the homestead – but on the sight control, or far at the source of the ice, high on the mountains. Location depends of the source, and of the traffic possibilities (roads, paths: rack waggons, mules), but distance depends on reach to the final user. The names of ice houses depend on locations, languages, local slangs. They are based on the words for snow and ice: neve (neviere in Castillian, also in Italian), ghiaccio, led (ghiacciaia Italian, ledenica Slovene), or the well (pou de sa neu Catalanian), ice and eis (ice house in English, eishaus in German), cellar (eiskeller German, ijskelder in Dutch).*

*Situation today shows all the possibilities of the state, age and the use: original state, destroyed or ruined, use as the cellar (the closest use to the origin), renovation and restauration, use as cultural object (museum), or just as the memory only (In Hungary there are a lot of guesthouses named as 'jegverem', ice houses). This is just understood: the roof collapsed in time, and the hole is dangerous: filling up is the simplest possibility to avoid the risks.*

*Bibliography of ice houses is pretty rich, but very rare shows the system and comparison between several solutions in function, materials, construction and in shape.*

*Ice house as an architectural object is undoubtedly very interesting object, built in local materials, in local styles, full of individual contribution of the builders, but every time in the most usable mode.*

*Today is out of use, it is only the reminder of our past, but because of its rich culture would be preserved for next generations.*

**Borut Juvanec**

**TWO SQUARES AND ONE KOZOLEC**

**ISIS Congress**

**BJ member of ISIS Congress Scientific Committee**

**Hersonisos, Crete Grčija, September 2013**

*A kozolec (plural kozolci: unproper translation into English is 'hayrack' – because the original use of kozolec was drying and storing cereals or corn, only in the last years it is hay) is a free-standing, open, wooden and always covered device for drying and storage. While wheat was formerly stored and dried in it, it is now*

only used for hay and other products, such as corn and maize straw. Kozolec is the most typical Slovene architecture, the only ethnic architecture that I know. It stands in all the Slovene ethnical territory, except on the Karst and in Pannonian plain.

In central Slovenia and above all in Gorenjska, there are most elongated kozolci - around Škofja Loka, they can even be as long as 24 bays. While a low kozolec is the most recent form, the double kozolec is the most characteristic, with the most derivatives in its design (Juvanec, B 2007:45). There are thus two types of double kozolec: those above the river Sava and those below. Those above are slender; below are stocky.

A double kozolec is a composition of two gables and at least one internal bay. The gables have braces, a relatively dense pattern of crossing beams, which primarily resist the wind, prevent the contents from falling out and, with their depth, create shade, which maintains as constant a temperature as possible, which is very necessary for both wheat and hay.

The essence of the erection of a kozolec is that it is longitudinal to the wind and transverse to the sun's rays.

The roof of a kozolec is always symmetrical, always at an inclination of one to one or 45 degrees, almost everywhere - except with new, small kozolci - it is hipped. The hip derives from the thatched roof, by which the problem of wind in the gable is solved. Sadly, there have long been no more thatched roofs.

The most important element of construction of a kozolec is bound to a square and its diagonal. Insofar as the sides of a square equal one, its diagonal is the square root of two. The proportion system, used in a kozolec, shows two squares: the slender one has two squares, one above another, and the stocky one has one square into another. We learn this in primary school and it may seem too much learned. With a kozolec it is essential: it simplifies construction and, with simplicity, prevents possible mistakes. The angle created, 45 degrees, is also essential in details (Juvanec, B 2007:67), since the construction principle of a kozolec is in the cutting the circular trunk of a tree, and beams mainly have a square profile.

A kozolec is today too big, too clumsy and too expensive. But, it represents our culture, which developed over many centuries and always in the order by which it was received with heritage. Not by recipe: each master added something of his own, but within the framework of rules created by nature, by the materials, by need. So all kozolci in Slovenia are uniform but no two are identical. A kozolec is a monument to the culture of our nation and it is today still in use.

**Borut Juvanec**  
**THE STONE ARCHITECTURE IN CORBELLING:**  
**SYSTEM OF DOCUMENTATION**  
**VERSUS Congress, Restapia, Mediterra**  
**ICOMOS CIAV**  
**Cerveira, Portugalska, October 2013**

Threatened dry stone walling system exists as the origin of architecture, in its simplest construction. The first aim was sheltering mankind. Corbelling means construction without cement, in layers, with overhangs, for some ten metres high compositions. The wall consists of constructional layer, the frame and filling inbetween.

These constructions serve as: tomb (nawamis Synai, naveta Minorca), storing for the tools, herdmen's shelter, stalls for livestock, transhumance architecture (Extremadura), temple (Hal Saflieni Malta, Gallarus Oratory Ireland), treasury (Atreus treasury in Micene), control (mantarah Palestine, weinbergshaeuschen Germany, vrtujak Croatia), storing (tazota Morocco, paghliaia Apulia), drying (fiskbirgi Iceland), chilling (crot or scele CH, giazera I), icehouse (nevera Spain, France, Italy, Switzerland, Germany, Great Britain, Slovenia), information transfer (nuraghe Sardinia), palace (Deir el Bahri Egypt) and waterwell (Sardinia, with the miracle - Sant'Anastasia).

Construction is always the same - corbelling, but the several shapes occur, with different details. The main typics is use of square root of three, divided by two. It is composed of three sticks: height of equilateral triangle is by Pythagoras  $\sqrt{3}/2$ . This can be used for restoration of collapsed monuments, constructed in corbelling.

The proposed CIAV project consists of inventarization, documentation, comparison, evaluation, with propositions for the use today. It opens the doors for all the collaborators, to improve the matter and to open - on scientific way - this rich heritage in stone to the public in all the media.

There is an extensive but isolated worldwide research in vernacular architecture (M. Correia). Ljubljana University has work in different cooperation projects with municipalities and local communities, both in Slovenia, Italy, Croatia, Bosnia, Austria, Great Britain, and in some research project of EU.

The Conference ALPS ADRIA on Vernacular Architecture has been organized for 12 years.

The accomplished results during the last tens of years shows important relevance in connecting traditional methods with technological innovations in computing presentations (some thousands of documentation files in FA).

Surveying methods in researches on UL FA reflect good results in publishing (articles, books), in education (lectures, workshops, restoration works) and in science. FA researcher's works had been translated into 12 languages and published in 23 countries. Dry stone walling system and its constructions in corbelling represent the origins of architecture, concerning vernacular heritage. Its contribution to knowledge intends to establish synergies and consistent strategies for disclosure, documentation, evaluation and appreciation of vernacular architecture in the world. It is especially important for the CIAV, and would be highly appreciated for the whole UNESCO mission.