

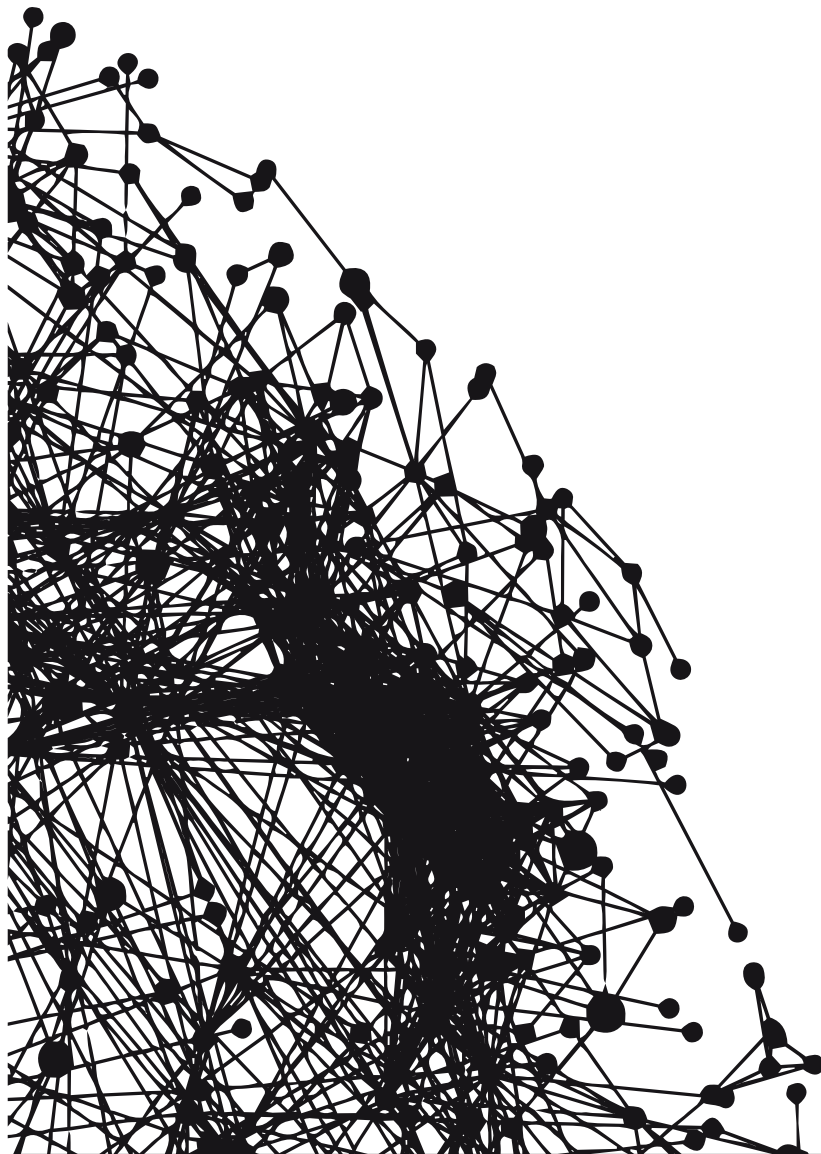
1ST INTERNATIONAL ACADEMIC CONFERENCE
PLACES AND TECHNOLOGIES 2014

BELGRADE, 3-4. APRIL 2014 | KEEPING UP WITH TECHNOLOGIES TO IMPROVE PLACES

editors:

Eva Vaništa Lazarević, Aleksandra Đukić,
Aleksandra Krstić - Furundžić, Milena Vukmirović

conference proceedings



ISBN 978-86-7924-114-6

www.placesandtechnologies.eu

Proceedings of INTERNATIONAL ACADEMIC
CONFERENCE ON PLACES AND
TECHNOLOGIES

APRIL 3-4, 2014, BELGRADE, SERBIA

PLACES AND TECHNOLOGIES 2014

PROCEEDINGS OF FIRST INTERNATIONAL ACADEMIC CONFERENCE ON PLACES AND TECHNOLOGIES

International Academic Conference on Places and Technologies, Places and Technologies 2014, will be the first conference organized by University of Belgrade – Faculty of Architecture, Professional association Urban Laboratory and University of Belgrade – Faculty of Philosophy.

Editors: Dr Eva Vaništa Lazarević, Dr Aleksandra Krstić-Furundžić, Dr Aleksandra Đukić and Dr Milena Vukmirović

For publisher: Dr Vladan Đokić

Publisher: University of Belgrade – Faculty of Architecture

Design: Stanislav Mirković

Place and year: Belgrade 2014

ISBN 978-86-7924-114-6

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

711.4.01(082)(0.034.2)
711.4:005.591.6(082)(0.034.2)

INTERNATIONAL Academic Conference on Places
and Technologies (1st ; 2014 ; Belgrade)

Places and Technologies 2014 [Elektronski
izvori] : keeping up with technologies to
improve places : conference proceedings : 1st
international academic conference, Belgrade,
3-4. April 2014 / [organized by University
of Belgrade - Faculty of Architecture,
Professional Association Urban Laboratory and
University of Belgrade - Faculty of
Philosophy] ; editors Eva Vaništa Lazarević
... [et al.]. - Belgrade : Faculty of
Architecture, 2014 (Belgrade : Faculty of
Architecture). - 1 USB fleš memorija ; 1 x 2
x 14 cm

Sistemska zahtevi: Nisu navedeni. - Nasl. sa
naslovnog ekrana. - Tiraž 150. -
Bibliografija uz svaki rad.

ISBN 978-86-7924-114-6

1. Vaništa Lazarević, Eva, 1961- [urednik]
2. Faculty of Architecture (Belgrade)
a) Градови - Мултидисциплинарни приступ -
Зборници b) Урбанистичко планирање -
Технолошки развој - Зборници

COBISS.SR-ID 206380812

ORGANIZERS



University of Belgrade
Faculty of Architecture

URBANLAB
PROFESSIONAL ASSOCIATION URBAN LABORATORY



ФИЛОЗОФСКИ
ФАКУЛТЕТ
1838

GENERAL SPONSOR



SPONSORS



Inženjerska komora Srbije

**INSTITUT
FRANÇAIS**
SERBIE



Gradska opština Savski Venac

Arhi.pro

PHILIPS



Foundation
Dokukino

DONATORS



Република Србија
МИНИСТАРСТВО ПРОСВЕТЕ,
НАУКЕ И ТЕХНОЛОШКОГ РАЗВОЈА



TONDACH
Krov za sva vremena!



SUPPORTERS



ISOCARP
Knowledge for better Cities



CAB
CENTAR ZA ARHITEKTURNU
ISTRAŽIVANJE



SIUP
Državni institut za
gradnju i opštinu



SUPER
PROSTOR
Portal za
arhitekturnu i
kulturnu praksu

CONTENTS

PART I: URBANISM

Urban planning and technologies

OVERCOMING BARRIERS TO GROWTH

Stephen Platt 16

URBAN CHALLENGES OF ENERGY EFFICIENCY AND CONTEXT-SENSITIVE PLANNING APPROACHES IN BULGARIA

Elena Dimitrova 25

NEW URBAN PROTOCOLS FOR FRAGMENTED TERRITORIES _ THE EXAMPLE OF WESTERN THESSALONIKI

Styliani Rossikopoulou-Pappa, Valia Fragkia 33

A FEASIBILITY STUDY FOR A TECHNOLOGICAL PARK IN FALCONARA MARITTIMA AN, ITALY

Giovanni Sergi 41

SAVING URBAN PLANNING FROM ANOTHER UTOPIAN MODEL

Danijela Milojkić, Marija Maruna 48

THE IMPLICATIONS OF DIGITAL TECHNOLOGY ON THE PERCEPTION OF CENTRALITY

Mihai Alexandru, Cătălina Ioniță 56

TECHNOLOGY AND LANDSCAPE: REDUCE, REUSE AND RECYCLE THE MINING DROSSCAPES

Nicola Martinelli, Francesco Marocco, Alessandro Reina, Maristella Loi, Federica Greco 63

THE ILLEGAL SETTLEMENTS IN BELGRADE VS. TAMING CITY GROWTH: CASE STUDY OF BELGRADE

Biserka Mitrović, Miodrag Ralević, Branislav Antonić 71

IMPACT OF CLIMATE CHANGE IN URBAN PLANNING

Tamara Tošić 78

CONCEPT OF URBAN VILLAGE: THE APPLICATION OF THE CONCEPT AS A FOUNDATION FOR NEW TYPOLOGY OF URBAN VILLAGES

Branislav Antonić 85

RESILIENCE AND VULNERABILITY OF URBAN SYSTEMS. A METHODOLOGICAL PROPOSAL FOR SEISMIC RISK MITIGATION

Rigels Pirgu 94

Urban design and technologies

PUBLIC PLACES AND SPLIT DEVELOPMENT MODEL Višnja Kukoč	103
AGILE LANDSCAPES: REDESIGNING URBAN SPACE Anastasios Tellios, Despoina Zavraka	110
PLANNING AND DESIGNING SAFE AND SECURE OPEN PUBLIC SPACES IN SERBIA Svetlana Stanarević, Aleksandra Djukic	118
SPATIAL AND FUNCTIONAL TRANSFORMATION OF BUSINESS AREAS UNDER THE IMPACT OF INFORMATION TECHNOLOGIES – CASE STUDY OF NIŠ ADMINISTRATIVE DISTRICT Aleksandar Ristić, Petar Mitković	130
THE IMPACT OF NEW TECHNOLOGIES ON CITY ACUPUNCTURE METHODOLOGY AND INTERVENTIONS Kristina Careva, Rene Lisac	138
COMFORT OF OPEN PUBLIC SPACES: CASE STUDY NEW BELGRADE Aleksandra Djukic, Nevena Novakovic	145
005 PUBLIC ART IN BERLIN Biljana Arandjelovic	151
PROTECTION OF PERSON WHIT DISABILITIES: IMPLEMENTATION OF ACCESSIBILITY STANDARDS Dragana Vasiljevic Tomic, Radojko Obradović	160
VERTICAL PUBLIC SPACE Sorana Cornelia Radulescu, Roger Riewe	167
READY-AVAILABLE HYBRID METHODOLOGIES FOR CONTEMPORARY PUBLIC SPACE RESEARCH Milena Ivkovic, Berit Piepgras, Robin van Emden	175
RETAIL – NEW TECHNOLOGIES AND URBAN CENTRALITY Martin Brabant	181
TECHNOLOGY AND NEOLIBERAL URBAN PLACES Marija Cvjetković	191
NEURAL CITIES OR HOW CITIES TEACH US TO DESIGN THEM BETTER Angelica Stan	198
MORPHOLOGICAL AND TYPOLOGICAL CLASSIFICATION OF GREEN STREET FORMS: MLADEN STOJANOVIC STREET IN BANJA LUKA Tanja Trkulja	206

Urban regeneration and technology

PROPERTY ISSUES IN THE TURKISH URBAN REGENERATION PROJECTS

Mehmet Çete, Yunus Konbul 215

URBAN ENERGY AND URBAN REGENERATION STRATEGIES: EVALUATION OF IZMIR-UZUNDERE URBAN REGENERATION PROJECT

Yakup Egercioğlu, Çilem Türkmen 222

THE EMPTY URBAN SPACES AS AN OPPORTUNITY FOR THE CITY TO REINVENT ITSELF: THE CASE OF THE INDUSTRIAL TECHNOLOGICAL OBSOLETENESS

Cătălina Ioniță, Mihai Alexandru 230

ENHANCEMENT OF URBAN LIFE QUALITY IN URBAN REGENERATION PROJECTS: IZMIR-BAYRAKLI URBAN REGENERATION PROJECT

Yakup Egercioğlu, Tuğçe Ertan 238

THE INDUSTRIAL BUILDINGS WHICH USED IN SAUDI ARABIA AND SUSTAINABILITY

Wael Al-Buzz 246

AN OVERVIEW OF URBAN REGENERATION PROJECTS IN TURKEY

Yunus Konbul, Mehmet Çete 257

ART AND CULTURE AS INITIATORS OF ARCHITECTURAL AND URBAN TRANSFORMATION IN SAVAMALA

Ksenija Pantović, Iva Čukić, Jasna Kavran 265

Smart cities/regions and network protocols

SMART CITY GRAZ: FROM THE VISION TO THE ACTION

Carlos Varela Martín, Ernst Rainer, Hans Schnitzer 276

RESIDENTS INTERACTION WITH HOME RESOURCES

Cerasela Dinu, Constantin-Daniel Oancea 285

RENEWABLE AND DISTRIBUTED SOURCES WITHIN SMART ENERGY REGIONS

Jovan Todorovic 293

THE SMART CITY FOR THE FUTURE. HOW A SPATIALLY ENABLED AFFECTED BY THE URBAN POPULATION?

Shahryar Habibi 300

PERFORMANCE EVALUATION OF ROUTING PROTOCOLS FOR AD-HOC NETWORKS

Ledina Karteri, Valma Prifti 306

SMART CITIES AND CHALLENGES OF SUSTAINABILITY	
Rigels Pirgu	315
A FUZZY BASED CALL CONTROL SYSTEM IN MOBILE NETWORKS, CONSIDERING PRIORITY COMMUNICATIONS	
Valma Prifti, Ledina Karteri	323
Historical centers, Building heritage and Technologies	
ICT AND VGI TO PROMOTE MINOR HISTORIC CENTRES AND THEIR LANDSCAPE	
Pierangela Loconte, Francesco Rotondo	331
THE SUSTAINABILITY AND CULTURAL HERITAGE MANAGEMENT	
Christian Kersten Hofbauer, Elham Madadi Kandjani, Jean Marie Corneille Meuwissen	339
CONCEPTS OF FORMING OF URBAN SOLUTIONS IN HOUSING SETTLEMENTS IN BELGRADE BUILT IN PRECAST INDUSTRIALIZED SYSTEMS IN SECOND HALF OF XX CENTURY	
Dragana Mecanov	346
NEW ARCHITECTURE IN HISTORICAL CENTRES	
Alessandro Bruccoleri	355
INFORMATION AND COMMUNICATION TECHNOLOGIES TO IMPROVE THE KNOWLEDGE OF PLACES. THE ROME HISTORICAL CENTRE AS A CASE STUDY	
Francesca Geremia	363
CONTEMPORARY INTERVENTIONS IN HISTORIC PLACES _ THE EXAMPLE OF THESSALONIKI METRO	
Stavros Apotsos	372
Image and Identity of place	
THE IMAGE OF TRIFKOVIĆ SQUARE (NOVI SAD, SERBIA) THEN AND NOW	
Ivana Blagojević, Ksenija Hiel	380
IDENTITY OF NEW MEDIA SPACES	
Jelena Brajković, Lidija Đokić	388
THESSALONIKI: A MULTICULTURAL ARCHITECTURAL DESTINATION	
Niki Manou-Andreadis, Maria Milona	400
ELEMENTS OF IDENTITY AND UNUSED POTENTIALS OF CENTRAL ZONE IN NOVI SAD	
Milena Krklješ, Dijana Apostolović, Aleksandra Milinković	408

BELGRADE SKYLINE: CONTINUITY, PARADOXES & DESIRES Vladimir Milenković, Snežana Vesnić, Tatjana Stratimirović	416
CITY OF THE MIND - INVISIBLE IN THE MAP Jelena Stankovic, Milenko Stankovic	424
WHAT MAKES A PLACE? Saskia I. de Wit, Denise Piccinini	432
SUSTAINABILITY, IDENTITY AND ROLE OF TRADITIONAL MATERIALS Olivera Ilić Martinović, Mirjana Miletić	441
IDENTITY OF URBAN SPACES; ASSESSMENT AND EVALUATION Elham Madadi-Kandjani, Christian Kersten Hofbauer, Jean Marie Corneille Meuwissen	448
IMAGE OF SUSTAINABLE PLACES Vladimir Parežanin, Miloš Mihajlović	456
PRESERVATION OF IDENTITY OF SPACE WITHIN RAPID ECONOMIC AND TECHNOLOGICAL DEVELOPMENT OF TOURIST DESTINATIONS IN THE EXAMPLE OD JIJOCA DE JERICOACOARA IN BRAZIL Maja Momirov	469
 PART II: ARCHITECTURE AND TECHNOLOGIES	
Sustainability, Sustainable buidings and technologies	
SUSTAINABLE RETROFITTING OF EXISTING AND HISTORIC BUILDINGS Marina Traykova, Tanya Chardakova	477
OSMOTIC LANDSCAPES - RECOVERED IDENTITIES Venetia Tsakalidou, Anastasia Papadopoulou	485
DESIGN SCENARIOS FOR AN OFFICE BUILDING – ENERGY AND ENVIRONMENTAL ASPECTS Aleksandra Krstic-Furundzic, Tatjana Kosic	493
TECHNOLOGICAL AND ENVIRONMENTAL ASPECTS OF RAPID HOUSING CONSTRUCTION Nikola Macut, Bojana Stanković, Nataša Ćuković-Ignjatović	507
ENERGY ANALYSIS AND REFURBISHMENT STRATEGY FOR ZAGREB UNIVERSITY BUILDINGS: FORMER FACULTY OF TECHNOLOGY IN ZAGREB BY ALFRED ALBINI Stanka Ostojić, Zoran Veršić, Iva Muraj	515

SUSTAINABLE REUSE OF OLD STRATEGIC INFRASTRUCTURE CANAL DANUBE-TISA-DANUBE	523
Mirjana Jočić, Nataša Kuburović	
PLACE ATTACHMENT AS POTENTIAL FOR SUSTAINABLE LOCAL DEVELOPMENT IN SERBIA	533
Anđelka Mirkov	
LOW ENERGY BUILDINGS: CONCEPT OF ENERGY PERFORMANCE OPTIMIZATION OF SINGLE-FAMILY HOUSES	540
Katarina Slavković	
TECHNOLOGY AND PRODUCTIVE PROCESS: MINING REJECTIONS FROM WASTE TO SUSTAINABLE RESOURCE	549
Vincenzo Paolo Bagnato, Giovanna Mangialardi, Silvana Milella, Michele Mundo	
ADAPTATION OF AN INDUSTRIAL BUILDING INTO HIGHER EDUCATION INSTITUTION IN ACCORDANCE WITH IMPROVED ENERGY PERFORMANCE	557
Branko Slavković, Komnen Žižić, Danilo Dragović	
FUNCTION OF A DESOLATE SPACE	565
Aleksandra Pešterac, Daniela Dimitrovska	
ENVIRONMENT CERTIFICATION OF REHABILITATION DESIGN PROJECTS: PUT AND SHU BUILDINGS AS CASE STUDY	570
Florian Nepravishhta, Gerta Veliu, Ramadan Alushaj	
Green strategies and technologies	
GREEN URBAN STRATEGIES IN THESSALONIKI IN THE CONTEXT OF CRISIS	580
Evangelia Athanassiou	
GEOSCIENTIFIC EDUCATIVE CENTRE AS SUSTAINABLE COMMUNITIES BUILDING MODEL – POSITIVE COOPERATION EXAMPLE OF LIKA-SENJ COUNTY (CROATIA) AND UNA-SANA COUNTY (BIH)	587
Ivan Brlić, Anita Bušljeta-Tonković, Katarina Milković	
THE OCCUPANTS' PERSPECTIVE AS CATALYST FOR LESS ENERGY INTENSIVE BUILDINGS	597
Lucia Martincigh, Marina Di Guida, Giovanni Perrucci	
THE COLLECTIVE SELF ORGANIZED HOUSING EXPERIENCE IN ITALY	605
Silvia Brunoro, Giacomo Bizzarri	

APPLICATION OF ROOF GARDENS IN THE DEFINING IMAGE OF THE CITY	
Mirjana Sekulić, Bojana Stanković, Ljiljana Dosenović	613
STRATEGY FOR NATIONAL DEFINITION OF NEARLY ZERO ENERGY BUILDINGS	
Milica Jovanović Popović, Bojana Stanković, Jasna Kavran	621
ENERGY OPTIMIZATION OF THE BUILDING ENVELOPE OF THE REPRESENTATIVE SAMPLE OF THE EXISTING RESIDENTIAL BUILDING IN BANJA LUKA	
Darija Gajić, Aleksandra Krstić – Furundžić	629
BLUE GREEN DREAM AND DAYLIGHT	
Srdjan Stankovic, Cedo Maksimovic, Milenko Stankovic	637
POSSIBILITIES FOR ENERGY REHABILITATION OF TYPICAL SINGLE FAMILY HOUSE IN BELGRADE – CASE STUDY	
Bojana Stanković, Dušan Ignjatović, Nataša Ćuković-Ignjatović	646
BLUE-GREEN INTEGRATED MODELING SOLUTIONS IN URBAN PLANNING AND ARCHITECTURAL DESIGN	
Miloš Mirosavić, Ivana Mirosavić, Srđan Stanković, Čedo Maksimović, Ranko Božović	654
POTENTIALS AND LIMITATIONS FOR ENERGY REFURBISHMENT OF MULTI-FAMILY RESIDENTIAL BUILDINGS BUILT IN BELGRADE BEFORE THE WORLD WAR ONE	
Ljiljana Đukanović, Ana Radivojević, Aleksandar Rajčić	661
FROM BUILDING INFORMATION MODELS TO SIMPLIFIED GEOMETRIES FOR ENERGY PERFORMANCE SIMULATION	
Daniel Ladenhauf, René Berndt, Eva Eggeling, Torsten Ullrich, Kurt Battisti, Markus Gratzl-Michlmair	669
ENERGY CITY GRAZ - REININGHAUS: FIRST RESULTS FROM AN ENERGY SELF-SUFFICIENT QUARTER	
Heimo Staller, Ernst Rainer, Carlos Varela Martín	677
ENERGY EFFICIENCY AS ADVANCED TECHNOLOGY FOR A SOLUTION TO THE PROBLEM OF DEPOPULATION OF RURAL AREAS IN SERBIA	
Jovana Stanišić	684
THE ENERGY EFFICIENT CITY	
Ivan Dochev	692

Innovative materials, systems and technology

INVESTIGATION OF FLY ASH INFLUENCE ON CEMENT MORTARS PROPERTIES

Dragica Jevtić, Aleksandar Savić 701

INFLUENCE OF GLASS COMPONENT JOINTS ON THE STRUCTURAL GLASS FACADE DESIGN

Aleksandra Krstic-Furundzic, Tatjana Kosic, Jefto Terzovic 709

QUANTIFYING THE THERMAL BRIDGING EFFECT WITH REGARD TO THE FAÇADE'S CONFIGURATION

Katerina Tsikaloudaki, Theodore Theodosiou, Dimitris Aravantinos, Karolos Nicolaos Kontoleon, Dimitrios Bikas 720

THE INFLUENCE OF NEW TECHNOLOGIES ON MODERN CITY FACADES

Jasna Čikić Tovarović, Jelena Ivanović Šekularac, Nenad Šekularac 728

DYNAMIC APPEARANCE OF URBAN AND ARCHITECTURAL SURFACES

Tihana Hrastar, Tamara Marić, Bojana Bojanić 736

TOWARDS GENERATIVE CONVERGENCE IN DESIGN OF ARCHITECTURAL STRUCTURES

Jelena Milošević, Zoran Šobić, Miodrag Nestorović 744

APPLICATION OF WOOD AS AN ELEMENT OF FACADE CLADDING IN CONTEMPORARY ARCHITECTURE OF BELGRADE

Jelena Ivanović Šekularac, Jasna Čikić Tovarović, Nenad Šekularac 752

COMPARISON OF INSULATION APPLIED ON SURFACES OF MODEL PLACED IN THE AREA OF SKOPJE

Aleksandar Petrovski, Todorka Samardzioska, Ana Trombeva Gavriloska 758

APPLICATION AND EFFECTS OF PHASE CHANGE MATERIALS IN A MODERN ARCHITECTURAL AESTHETICS

Vladana Stanković, Goran Jovanović, Mirko Stanimirović 766

INTEGRATED DESIGN OF STRUCTURAL SYSTEMS

Aleksandra Nenadović 772

NEW COMPOSITE SLAB SYSTEM – LIGHTWEIGHT CONCRETE, STEEL SHEETING AND REINFORCEMENT

Zoran Šobić, Jelena Milošević, Miodrag Nestorović 780

MODERN METHODS OF STRENGTHENING MASONRY WALLS

Nenad Šekularac, Jasna Čikić Tovarović, Jelena Ivanović Šekularac 788

NEW PERSPECTIVES FOR FERROCEMENT

Ornela Lalaj, Yavuz Yardim, Salih Yilmaz 796

Cultural patterns, Architecture and technologies

SPATIAL AND SOCIAL ASPECTS OF THE ARSENAL TRANSFORMATION, MILITARY PORT IN TIVAT INTO NAUTICAL – TOURISM SETTLEMENT AND PORT „PORTO MONTENEGRO“ Goran Radović	805
DIGITAL FABRICATION IN THE FIELD OF ARCHITECTURE Roberto Vdović, Morana Pap	816
THE IMPACT OF SMART HOME TECHNOLOGIES ON ARCHITECTURAL DESIGN Goran Petrović, Marko Aleksendrić	822
BETWEEN THE PLACE AND NON-PLACE: ARCHITECTURE AND TERRITORY ON THE EXAMPLE OF SKOPJE Saša Tasić, Mitko Hadzi Pulja, Minas Bakalchev	830
INTEGRATED ARCHITECTURAL COMPLEXITY - FROM ABSTRACTION TO TECHNOLOGY AND MATERIALISATION Rada Čahtarević, Dženana Bijedić, Amra Taso	838
EVOLUTION DIGITIZED: ARCHITECTURE OF THE SUBLIME DREAM Mihailo Popović, Vladimir Milenković	846
MONOCHROMATIC IN THE ARCHITECTURAL COMPOSITION: WITH SPECIAL REFERENCE TO THE APPLICATION OF WHITE COLOUR Dragana Vasiljevic Tomic, Rifat Alihodzic, Dragana Mojsilovic	853
(RE)GENERATION & REFLECTIONS OF THE SCHOOL OF ARCHITECTURE – BANJALUKA IN THE CENTURY OF KNOWLEDGE AND SKILLS Milenko Stanković, Una Umićević	864
QUANTUM ARCHITECTURE, NON-PLACE AND ACCULTURATION Dubravko Aleksić	873
PLACES AND PRACTICES OF CONSUMPTION IN THE POST-SOCIALIST CONTEXT Dejana Nedučin, Dušan Ristić, Vladimir Kubet	880
INTERACTIONS BETWEEN LIGHT AND ARCHITECTURE: AN EXPERIMENT USING MODELS AND PHOTOGRAPHS Anita Stoilkov-Koneski	888
THE INTERPLAY OF MUSIC AND ARCHITECTURE: LAYERING OF SOUND AND SPACE Anja Kostanjšak, Morana Pap	895
CULTURAL PATTERNS AND SENSITIVITY TODAY: FROM THE PHILOSOPHY TO THE TECHNOLOGY IN ARCHITECTURAL DESIGN PROCESS	

Małgorzata Kądziela, Anna Sachse-Rynkowska	904
PART III: PLACES, TECHNOLOGIES AND RELATED FIELDS	
Big data, apps, social networks and microblogs in urban planning and design	
PLACE COMPETITIVENESS EXPRESSED THROUGH DIGITAL DATA. MEASURING THE PLACE ATTRACTIVENESS TRACKING THE GEOTAG DATA VISUALS	
Milena Vukmirovic, Eva Vanista Lazarevic	914
ROOM BOOK 2.0 – BRING BACK THE INFORMATION TO ITS PLACE	
Christoph Breser, Stefan Zedlacher	926
THE INTERCONNECTED OBJECT: ARE YOU AT HOME IN A NETWORK?	
Kalina Ntampiza, Polina Zioga	936
THE INTERACTION TIME IN A NETWORKED SOCIETY	
Danijel Baturina	944
GOOGLE EARTH AS A MICROWORLD	
Milena Zindović	962
TRANSPARENCY OF SCALE: GEOGRAPHICAL INFORMATION PROGRAM (GOOGLE EARTH) AND THE VIEW FROM BEYOND	
Pavle Stamenović, Dunja Predić, Davor Ereš	970
Geodesy and modern cartography	
ROBUST ESTIMATION APPLIED TO GEODETIC DATUM TRANSFORMATION USING A METAHEURISTIC ALGORITHM	
Mevlut Yetkin	979
THE STATE OF THE ART SURVEYING BY TECHNOLOGY OF THE TERRESTRIAL LASER SCANNING	
Marko Pejić, Branko Božić, Verica Erić, Jelena Pandžić	987
ROLE OF CARTOGRAPHY IN MAKING A “SMART CITY”: CASE STUDY OF INDIJA	
Dragutin Protić, Ivan Vučetić, Ivan Nestorov	995
MODERN CARTOGRAPHY IN PROJECT OF CENSUS	
Maja Kalinić, Dragoljub Sekulović	1002

Mobility and technologies

PERSONAL RAPID TRANSIT – A SUSTAINABLE URBAN TRANSPORT SYSTEM

Ljupko Šimunović, Luka Novačko, Mario Ćosić 1011

FLIGHTPATH TO AN ENVIRONMENTAL FRIENDLY AIR TRANSPORT

Ivana Čavka, Olja Čokorilo, Slobodan Gvozdenović 1020

PRESERVATION OF PLACE-IDENTITY THROUGH URBAN TRANSFORMATIONS BASED ON SUSTAINABLE FORMS OF TRANSPORT

Miloš Kopic 1029

BELGRADE RIVERSIDE TRAFIC INTERCHANGES

Ksenija Stevanović, Milena Stevanović 1037

SUSTAINABLE URBAN MOBILITY PLANS IN EUROPE

Davor Brčić, Ljupko Šimunović, Marko Slavulj 1045

URBAN DEVELOPMENT IN BELGRADE IN THE CONTEXT OF GLOBAL TRENDS: CHANCES OF ILLEGAL HOUSING INTEGRATION

Biserka Mitrović, Miodrag Ralević, Branislav Antonic 1051

RE-THINKING INFRASTRUCTURE PROJECT FOR THE METROPOLIS: LABORATORY GRANADA

Juan Luis Rivas Navarro, Belén Bravo Rodríguez 1059

Public participation, e-governing and tehcnology

COMMUNITY PARTICIPATION AND GREEN INFRASTRUCTURES: A DELIBERATIVE EVALUATION METHOD

Saverio Miccoli, Fabrizio Finucci, Rocco Murro 1067

RESULTS OF INTRODUCTION OF PARTICIPATORY TOOLS IN URBAN PLANNING IN SERBIA – 7 CASE STUDIES

Ratka Čolić, Harald Mueller 1075

WAYS TOWARDS A CITY OF NEW TECHNOLOGIES

Miodrag Ralevic, Tatjana Mrdjenovic, Natasa Krstic, Djemila Beganovic 1083

PARTICIPATION OF CITIZENS IN TOWN PLANNING PROCEDURES IN NEIGHBOURHOODS WITH FORMER REFUGEE AND DISPLACED POPULATION IN PRIJEDOR, BOSNIA AND HERZEGOVINA

Rada Latinović 1090

THE ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGY IN A VIRTUAL ORGANIZATION

Jelena Lukić 1098

STRATEGY FOR NATIONAL DEFINITION OF NEARLY ZERO ENERGY BUILDINGS

Milica Jovanović Popović

Full professor, Faculty of architecture University of Belgrade, King Aleksandar Boulevard 197, Belgrade, milicajp@arh.bg.ac.rs

Bojana Stanković,

PhD candidate, Faculty of architecture University of Belgrade, King Aleksandar Boulevard 197, Belgrade, stankovicarch@gmail.com

Jasna Kavran

PhD candidate, Faculty of architecture University of Belgrade, King Aleksandar Boulevard 197, Belgrade, jasna.kavran@gmail.com

ABSTRACT

Due to very intensive energy rehabilitation and retrofitting process of buildings in the past decade, EU countries reduced energy spent in buildings from 50% to less than 40% of total energy production. At the same time, at the moment, buildings account for around 36% of CO₂ emission. The recast Directive on the energy performance of buildings (EPBD 2010) stipulates that by 2020 all new buildings in European Union shell reach nearly zero- energy levels (nZEB). At the same time, public buildings should reach this goal till 2018. Introducing the new obligations for public buildings (from 2019 on) and other buildings (from 2021 on) to become nearly zero-energy buildings. This Directive does not give very precise definition of nZEB. According to this directive nZEB is: " building that has a very high energy performance... The nearly zero or very low amount of energy required should, to a very significant extent, be covered by energy from renewable sources, including renewable energy produced on-site or nearby". Accepting the differences in climate, building heritage, socio-technical levels of development, Directive does not prescribe the common methodology for implementation strategy and calculation methods, giving the opportunity to each country to define its own criteria and model. Serbia, as the candidate country, started the process of harmonization with EU regulations in the field of energy efficiency by introducing the Law on rational use of energy (2013) and in the field of buildings by introducing the Law on planning and construction (2009) and Regulations on energy performance of buildings and energy certification of buildings (2011) and in the future time has to prepare its own goals, definition of nZEB and strategies of accomplishing them. In the paper, principles for Serbian nZEB definition are elaborated taking into account national specifics:

- *existing building stock whose characteristics are elaborated in National building topology,*
- *climate diversity,*
- *economic potential,*

- *renewable energy sources.*

Keywords: Nearly zero energy buildings, national definition, energy efficiency, building stock retrofit, new buildings standard

INTRODUCTION

At the end of 20th century in most of the developed countries in Europe and in USA about 50% of total production of energy was spent in buildings, while 25% was spent in traffic and remaining 25% in industry. Accepting the fact that fossil fuel stock is limited and that greenhouse gases emission caused climate changes, developed countries set up goals for upgrading energy efficiency of buildings, introducing also the use of renewable energy sources.

Due to the extensive effort in retrofitting and rehabilitation of existing stock and new regulations for new buildings, there was a significant reduction in both: energy consumption and GHG emission. Therefore, the reduction of energy consumption as well as substitution of fossil fuels with renewables is defined as goals in several European Directives and in national regulations of country members. As a result of these efforts, at the moment, buildings account for 40% of the total energy consumption and about 36% of CO₂ emission.

EU REGULATIONS

During the past decade the EU regulations, concerning energy efficiency, have been significantly strengthened. After the Directive from 2002, the recast of the Energy performance of buildings (EPBD, 2010/31/EU)¹⁵¹ and the Renewable energy Directive (RED 2009/28/EC)¹⁵² were issued defining the nZEB characteristics.

According to Article 2 of the recast Energy performance of buildings Directive “nearly zero energy building means a building that has a very high energy performance, as determined in accordance with Annex 1. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby.” In article 9 of the same Directive it is stipulated that after 31 December 2018, new buildings occupied and owned by public authorities should be nearly zero –energy buildings and by 31 December 2020, all new buildings should be nearly-zero energy buildings. Also, the members of EU should make national plans for increasing the number of nearly-zero energy buildings including:

¹⁵¹ Directive 2010 2013/31/EU of the European parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast)

¹⁵² Directive 2009/28/EU of the European parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directive 2001/77/EC and 2003/77/EC

- a definition of nearly-zero energy buildings which reflects national, regional or local conditions and include
- a numerical indicator of primary energy use (in kWh/m2a), intermediate targets for improving the energy performance of new buildings by 2015,
- information on policies, financial or other measures adopted for promotion of nZEB including the use of renewable energy sources in new and existing buildings in the process of major renovation.

Although the Renewable Energy Directive (RED), well known as 20-20-20 Directive, set targets by 2020 for:

- 20 % reduction in greenhouse gas emission from levels 1990 ,
- 20% reduction in energy consumption and,
- increase the share of renewable energy sources in energy consumption to 20%,

it also set requirements for buildings, parallel to those in EPBD recast, stipulating that:

- by 31 December 2014 EU states shall, in their own regulations and codes, require the use of minimum levels of energy from renewable sources in new buildings but also in existing buildings that are subject to major renovation,
- the new and existing public buildings that are subject to major renovation, at national, regional and local level, should fulfil an exemplary role from 1 January 2012.

SERBIAN REGULATIONS

Serbia started the process of harmonization with EU regulations in the field of energy efficiency by introducing the Law on rational use of energy (2013) and in the field of buildings by introducing:

- the Law on planning and construction (2009)
- Regulations on energy performance of buildings and energy certification of buildings (2011).

During the process of defining those regulations, it was estimated that the requirements set in EPBD recast are too demanding and taking into account the situation in Serbia, post war period and economy crisis, the new regulations were based on EPBD Directive 2002. Those regulations were first regulations setting requirements for thermal protection of buildings after 1990, introducing at the same time calculation methodology for energy needed for heating (kWh/m2a), primary and final energy needed for heating, CO2 emission (kg) and introduced EPC (energy performance certificate). Although the requirements for thermal characteristics of building envelope elements were drastically raised, they are still behind the values set in most EU countries.

During 2013, Ministry of energy, development and environmental protection of Republic of Serbia prepared the Action plan, Strategy for development of energy of

republic of Serbia by 2015 with projections by 2030¹⁵³.¹⁵⁴ It is stated that, among other obligations, Serbia is accepting all the obligations from Energy community treaty and Directive 2009/28/EU as its basis. In this document national energy sector was analysed in details and requirements and goals concerning energy are defined including energy efficiency of buildings. As one of the principles and goals for the development of Serbia, further harmonization with EU regulations was established.

When renewable energy sources are in question, it is planned, according to the scenario that takes into account the measures of energy efficiency, that by 2018 in housing, public and commercial sector, transportation and industry could save up to 9% final energy. It is estimated that the participation of renewable energy sources in gross final energy consumption can reach 27% by 2020 and that, by full applications of energy efficiency measures in new buildings and in major rehabilitation of building stock, up to 16% of final energy consumption can be saved.

DEFINITIONS OF LOW ENERGY BUILDINGS AND NEARLY ZERO ENERGY BUILDINGS INS IN EU

As there is no unique definition for highly energy efficient buildings, generally it is considered that the term indicates the buildings with higher performances than standard buildings built according to national codes and regulations. In many countries German, non-governmental definition is in use (Table 1).

When nearly zero energy buildings are considered, according to EPBD recast, it is also suggested to make national definition, intermediate targets and action plans (Table 2).

Table 1 National definitions of energy performance of buildings in European countries

GE	Low energy buildings (KfW40). 40% of minimum requirements (EnEv 2009) NGO: Passive house, heating demand 15kWh/m ² y, total primary energy requirement 120 kWh/m ² a, including electrical appliances
AT	Klima: aktiv house, 70% of minimum requirements correspond to 25-45kWh/m ² per year for heating Klima: aktiv passive house, 20% of minimum requirements correspond to 15 kWh/m ² per year for heating and 65 kWh/m ² per year for primary energy Low energy social buildings: Max 60 kWh/m ² per year for heating (final energy consumption) NGO: Passive house (German definition)

¹⁵³ Ministry of energy, development and environmental protection of Republic of Serbia, Strategy of energy development of Serbia by 2015 with projection by 2030, Draft version

DK	The minimum requirement for low energy buildings class 2015 residential buildings is given by $30+1000/A$ kWh/m ² a (A is a heated gross floor area). For other buildings the minimum requirements are given by $41+1000/A$ kWh/m ² a The minimum requirement for non-residential buildings includes electricity for building integrated lighting. A new low energy class for 2020 is on its way and is given by 20 kWh/m ² a for residential and for other buildings the minimum requirements are given by 25 kWh/m ² a NGO: Passive house (German definition)
IT	NGO: Casa Clima gold10 kWh/m ² a
UK	1*-6*, corresponding to an energy reduction of 10%, 18%, 25%, 44% 100% and zero carbon of the minimum requirement for total heat demand (69 kWh/m ² a) (4* corresponds approximately to a passive house in accordance to German definition).

Table 2 Planned initiative towards “nearly zero energy buildings”

AT	Existing requirements for housing	Proposed strategy 2010: 15% reduction compared
	2010-2011	
	2012-2013	
	2014-2015	Proposed strategy 2015:Passive
	2016	
DK	Existing requirements for housing	2010: 52,5-60kWh/m ² a primary energy
	2010-2011	2010: 25% reduction compared to 2008.
	2012-2013	
	2014-2015	2015: 50% reduction compared to 2008.
	2016	
DE	Existing requirements for housing	2009: 70kWh/m ² a primary energy
	2010-2011	
	2012-2013	30% reduction compared to 2009.
	2014-2015	
	2016	
UK	Existing requirements for housing	Regulated through CO ₂ demands 2010 100kWh/m ² a primary energy
	2010-2011	2010: 25% reduction compared to 2006.
	2012-2013	2013: 44% reduction compared to 2006.
	2014-2015	
	2016	All buildings zero carbon proposal: 10-14kg CO ₂ /m ² a dependent on the type of dwelling apartments: 39 kWh/m ² a row house: 46 kWh/m ² a single family houses: 46 kWh/m ² a
	2020	

DEFINITIONS OF LOW ENERGY BUILDINGS AND NEARLY ZERO ENERGY BUILDINGS INS IN SERBIA

In order to make the national definition of nZEB and prepare sustainable road map for Serbia, it is necessary to identify several parameters that can be classified in following groups: location, calculation methodology, building stock characteristics, technical possibilities and economy.

Parameters deriving from the location itself are climate and renewable energy sources. Introducing the Regulations on energy efficient buildings, the old standard JUS.U.J5.600 which defined climatic zones, is not any more in effect. According to new Regulations, all calculations are taking into account the exact values for the location of the building for: HDD, insolation, external temperatures. For nZEB definition only one set of climatic data should be calculated representing the whole country. For RES, based on the present investigations, the estimation or mean values for whole country should be prepared taking into account solar, wind, geothermal and biomass energy.

Calculation methodology in Regulations on energy efficient buildings is already based on EU standards and EPBD Directive (2002). As our present regulations give the method for calculating final and primary energy and CO₂ emission, it is necessary to upgrade those standards to EPBD recast (2010) and include calculations for other types of energy spent in the buildings as obligatory. Further tightening of benchmarks and allowed levels of needed energy as well as allowed levels of CO₂ emissions are necessary in a very short period of time.

The quantity and quality of building stock has been evaluated to some extent through the National Census, but more information are available in National building typology¹⁵⁵ elaborated in accordance with principles of TABULA project¹⁵⁶ appointed as one of two official European methodologies for energy building performance calculations¹⁵⁷. According to Serbian national typology, the most of the building stock of single family houses was built in the period from 1946-1960, and of multy-family houses the period from 1960-1970, before the first regulations on thermal protections appeared. It means that approximately 50% of Serbian building stock is uninsulated, with high values of thermal losses through all the elements of envelope (walls, windows, ceilings, floors...). Same investigation indicated that building stock, as whole, is in poor condition, renovation measures were applied to a negligible percentage of houses.

¹⁵⁵ Jovanović Popović Milica, Dušan Ignjatović et all 2013. National building typology, Belgrade, Faculty of Architecture

¹⁵⁶ www.building-typology.eu

¹⁵⁷ European Commission, "Notices from European Union institutions, bodies, offices and agencies. Guidelines accompanying Commission delegated regulation (EU) No 244/2012 of 16 January 2012 supplementing Directive 2013/10/EU", Official Journal of the European Union, C115 (2012), 1-28

Technical possibilities depend on existing state of knowledge and systems applied in everyday practice. While the first is absolutely up to date and is possible to develop and implement all the new products available on the world market, the second is mostly developed in the past century and rehabilitated to a small extent.

According to the EBBD (recast) every EU member state has to make its own definition of nZEB, according to the local economy status and to make calculations that prove that initiatives are sustainable, and that industry is possible to produce new materials and elements that could lead to energy efficiency and nearly zero CO2 emission in buildings. For Serbia, the moment for introducing those standards is very difficult because of the economy crises, and it can influence the position of the benchmarks to lower standards.

If Serbia is planning to join EU in 2020, it means that all the regulations must be harmonized till that date, including present and future Directives concerning energy efficiency of buildings and GHG emission reduction to almost zero level. One of possible scenarios is presented in Table 3. It is suggested that, as basis, present Regulations could be used, tightening the permitted levels of needed energy for heating for 25% every year. More rigorous solutions would include, as in other countries, all energy spent in buildings

Table 3 Possible initiative towards “nearly zero energy buildings” for Serbia for new buildings (residential buildings)

2011-2012	2015-16	2017	2018	2019	2020
Regulations on EE of buildings Regulations on EPC	25% reduction compared to 2011. 48kWh/m ² a	25% reduction compared to 2015. 36kWh/m ² a	25% reduction compared to 2017. 27kWh/m ² a	25% reduction compared to 2018. 20kWh/m ² a	25% reduction compared to 2019. 15kWh/m ² a

CONCLUSION

In the process of joining EU, Serbia must harmonize all the laws and regulations with corresponding EU regulations, including Directives on energy efficiency of buildings and CO₂ emission reduction. Since it is possible for each country to make its own road map, it is necessary that Serbia prepares its own strategy that is sustainable and feasible. This strategy for nZEB definition must include: location, calculation methodology, building stock characteristics, technical possibilities, which can be estimated as given and known factors and especially economy as the only limiting factor.

REFERENCES

- Andreas Hermelink et al 2013. Towards nearly zero energy buildings, Ecofys, Politecnico di Milano
- Bogdan Atanasiu et al 2011. Principles for nearly zero energy buildings, Building performance institute Europe
- Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings, Official Journal of the European Communities 4.1.2003, L1/65-71
- Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast), Official Journal of the European Communities 18.06.2010, L 153/13-35
- Directive 2009/28/EU of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directive 2001/77/EC and 2003/77/EC
- European Commission, "Notices from European Union institutions, bodies, offices and agencies. Guidelines accompanying Commission delegated regulation (EU) No 244/2012 of 16 January 2012 supplementing Directive 2013/10/EU", Official Journal of the European Union, C115 (2012), 1-28
- Google. Marszal A.J. et al. Zero Energy and Buildings, a review of definitions and calculation methodologies, Energy and Buildings, 2011 ENB 383
http://www.enob.info/fileadmin/media/Projektbilder/EnOB/Thema_Nullenergie/Energy_and_Buildings_Zero_Energy_Building
- Google. Ministry of energy, development and environmental protection of Republic of Serbia, Strategy of energy development of Serbia by 2015 with projection by 2030, Draft version
<http://www.merz.gov.rs/sites/default/files>
- Jovanović Popović Milica, Dušan Ignjatović et al, 2012. Atlas of family housing in Serbia, Belgrade, Faculty of Architecture
- Jovanović Popović Milica, Dušan Ignjatović et al, 2012. Atlas of multifamily housing in Serbia, Belgrade, Faculty of Architecture
- Jovanović Popović Milica, Dušan Ignjatović et al 2013. National building typology, Belgrade, Faculty of Architecture
- Regulations on energy efficiency of buildings (Pravilnik o energetskej efikasnosti zgrada) Official gazette of Republic of Serbia 61/2011
- Regulations on conditions, content and method of issuing EPC (Pravilnik o uslovima, sadržini i načinu izdavanja sertifikata o energetskej svojstvima zgrada), Official gazette of Republic of Serbia 61/2011, 3/2011