



UNIVERSITÀ  
DEGLI STUDI  
FIRENZE

FLORE

## Repository istituzionale dell'Università degli Studi di Firenze

### **ADDRESSING THE SOCIO-SANITARY EMERGENCY IN AFRICA: THEORIES AND TECHNIQUES FOR DESIGNING A COMMUNITY**

Questa è la Versione finale referata (Post print/Accepted manuscript) della seguente pubblicazione:

*Original Citation:*

ADDRESSING THE SOCIO-SANITARY EMERGENCY IN AFRICA:  
THEORIES AND TECHNIQUES FOR DESIGNING A COMMUNITY  
HEALTH CENTRE IN MALI / Cecilia Iuschi, Adolfo Baratta, Laura Calcagnini, Fabrizio Finucci, Antonio  
Magarò, Massimo Mariani, Alessandra Venturoli, Alessandra Vezzi. - STAMPA. - (2018), pp. 50-57.  
(Intervento presentato al convegno Proceeding - PLACES AND TECHNOLOGIES 2018 THE 5TH

*Availability:*

This version is available at: 2158/1137652 since: 2018-10-20T22:10:58Z

*Publisher:*

University of Belgrade - Faculty of Architecture

*Terms of use:*

Open Access

La pubblicazione è resa disponibile sotto le norme e i termini della licenza di deposito, secondo quanto  
stabilito dalla Policy per l'accesso aperto dell'Università degli Studi di Firenze  
(<https://www.sba.unifi.it/upload/policy-oa-2016-1.pdf>)

*Publisher copyright claim:*

(Article begins on next page)

CONFERENCE  
PROCEEDINGS

**5th INTERNATIONAL  
ACADEMIC CONFERENCE ON  
PLACES AND TECHNOLOGIES**

EDITORS

ALEKSANDRA KRSTIĆ-FURUNDŽIĆ

MILENA VUKMIROVIĆ

EVA VANIŠTA LAZAREVIĆ

AND ALEKSANDRA ĐUKIĆ

# **PLACES AND TECHNOLOGIES 2018**

**THE 5<sup>TH</sup> INTERNATIONAL ACADEMIC CONFERENCE ON  
PLACES AND TECHNOLOGIES**

**EDITORS:**

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

**FOR PUBLISHER:** Vladan Đokić

**PUBLISHER:** University of Belgrade - Faculty of Architecture

**DESIGN:** Stanislav Mirković

**TECHNICAL SUPPORT:** Jana Milovanović

**PLACE AND YEAR:** Belgrade 2018

**ISBN:** 978-86-7924-199-3

**PRINTED BY:** University of Belgrade - Faculty of Architecture

## **TABLE OF CONTENTS**

# TABLE OF CONTENTS

## IMAGE, IDENTITY AND QUALITY OF PLACE: URBAN ASPECTS

THE EFFECT OF BEHAVIOURAL SETTINGS ON THE REGENERATION OF URBAN DYNAMIC ARTS, CASE STUDY: TEHRAN AZADI SQUARE Yasaman NEKOU Ali Entezarinajafabadi	3
DEVELOPMENT SCENARIOS OF THE ZAGREB'S SATELLITE TOWN DUGOSELO - "THE CITY OF THE FUTURE" Lea Petrović Krajnik Damir Krajnik Ivan Mlinar	11
SUSTAINABILITY OF MODERN-DAY UTOPIAS AS SEEN IN MASS MEDIA Aleksandra Til	18
URBAN DENSIFICATION OF THE POST-SOCIALIST CITY AND ITS IMPLICATIONS UPON URBAN STRUCTURE: A STUDY OF NIS, SERBIA Milena Dinić Branković Ivana Bogdanović Protić Mihailo Mitković Jelena Đekić	25
MUSEUM QUARTERS VS CREATIVE CLUSTERS: FORMATION OF THE IDENTITY AND QUALITY OF THE URBAN ENVIRONMENT Ekaterina Kochergina	35
URBAN NON-MECHANICAL CODE AND PUBLIC SPACE Aleksandra Đukić Valentina Milovanović Dubravko Aleksić	43
ADDRESSING THE SOCIO-SANITARY EMERGENCY IN AFRICA: THEORIES AND TECHNIQUES FOR DESIGNING A COMMUNITY HEALTH CENTRE IN MALI Adolfo F. L. Baratta Laura Calcagnini Fabrizio Finucci Cecilia M. L. Luschi Antonio Magarò Massimo Mariani Alessandra Venturoli Alessandra Vezzi	50
THE NETWORK OF LOCAL CENTERS AS A TOOL FOR STRENGTHENING THE SUPER-BLOCK COMMUNITIES: BELGRADE VS. ROME Predrag Jovanović Aleksandra Stupar	58
TRANSFORMATION OF IDENTITY OF SAVAMALA DISTRICT IN BELGRADE Aleksandra Đukić Jelena Marić Tamara Radić	66
THE CULTURE OF MEMORY AND OPEN PUBLIC SPACE - BANJA LUKA Jelena Stankovic Milenko Stankovic	73

## IMAGE, IDENTITY AND QUALITY OF PLACE: ARCHITECTURAL ASPECTS

IMPROVEMENT OF SOCIAL HOUSING THROUGH THE MIXING CONCEPT IMPLEMENTATION Nataša Petković Grozdanović Branislava Stoilković Vladana Petrović Aleksandar Keković Goran Jovanović	83
--	----

IMPROVING THE IDENTITY OF NON – SURROUNDED COMMUNAL SPACES WITH USING ARCHITECTURAL PROGRAMING. CASE STUDY: NAJAF ABAD (ESFAHAN), IMAM KHOMEINI SQUARE 91  
Ali Entezarinajafabadi YasamanNekoui

A CONTRIBUTION TO THE STUDY OF THE ARCHITECTURAL OPUS OF NATIONAL STYLE WITH MODELS IN FOLK ARCHITECTURE AND NEW INTERPOLATIONS 100  
Katarina Stojanović

SHOPPING CENTRE AS A LEISURE SPACE: CASE STUDY OF BELGRADE 108  
Marija Cvetković Jelena Živković Ksenija Lalović

ARCHITECTURAL CREATION AND ITS INFLUENCE ON HUMANS 119  
Nikola Z. Furundžić Dijana P. Furundžić Aleksandra Krstić-Furundžić

### **INNOVATIVE METHODS AND TECHNOLOGIES FOR SMART(ER) CITIES**

POTENTIAL OF ADAPTING SMART CULTURAL MODEL: THE CASE OF JEDDAH OPEN- SCULPTURE MUSEUM 131  
Sema Refae Aida Nayer

AN INNOVATIVE PROTOCOL TO ASSESS AND PROMOTE SUSTAINABILITY IN RESPONSIBLE COMMUNITIES 140  
Lucia Martincigh Marina Di Guida Giovanni Perrucci

GEOHERMAL DISTRICT HEATING SYSTEMS DESIGN: CASE STUDY OF ARMUTLU DISTRICT 148  
Ayşe Fidan ALTUN Muhsin KILIC

DATA COLLECTION METHODS FOR ASSESSMENT OF PUBLIC BUILDING STOCK REFURBISHMENT POTENTIAL 157  
Ljiljana Đukanović Nataša Čuković Ignjatović Milica Jovanović Popović

SMART HOSPITALS IN SMART CITIES 165  
Maria Grazia Giardinelli Luca Marzi Arch. PhD Valentina Santi

### **INNOVATIVE METHODS AND TOOLS**

PRIMARY AND SECONDARY USES IN CITIES – PRINCIPLES, PATTERNS AND INTERDEPENDENCE 175  
Marina Čarević Tomić Milica Kostreš Darko Reba

MODELLING AND ANALYSING LAND USE CHANGES WITH DATA-DRIVEN MODELS: A REVIEW OF APPLICATION ON THE BELGRADE STUDY AREA 183  
Mileva Samardžić-Petrović Branislav Bajat Miloš Kovačević Suzana Dragičević

INNOVATIVE DECISION SUPPORT SYSTEM 190  
Mariella Annese Silvana Milella Nicola La Macchia Letizia Chiapperino

URBAN FACILITY MANAGEMENT ROLE	196
Alenka Temeljotov Salaj Svein Bjørberg Carmel Margaret Lindkvist Jardar Lohne	
ANALYSES OF PUBLIC SPACES IN BELGRADE USING GEO-REFERENCED TWITTER DATA	205
Nikola Džaković Nikola Dinkić Jugoslav Joković Leonid Stoimenov Aleksandra Djukić	
SENTIMENT ANALYSIS OF TWITTER DATA FOR EXPLORATION OF PUBLIC SPACE SENTIMENTS	212
Miroslava Raspopovic Milic Milena Vukmirovic	
CITIES AND SCREENS: ARCHITECTURE AND INFORMATION IN THE AGE OF TRANSDUCTIVE REPRODUCTION	217
Catarina Patricio	
<b>CITIZEN EMPOWERMENT, PUBLIC PARTICIPATION AND DEMOCRATIC CITIES</b>	
CITIES AS PLATFORMS FOR SOCIAL INNOVATION: AN INVESTIGATION INTO HOW DIGITAL PLATFORMS AND TOOLS ARE USED TO SUPPORT ENTREPRENEURSHIP IN URBAN ENVIRONMENTS	227
Margarita Angelidou	
PROBLEM ISSUES OF PUBLIC PARTICIPATION IN HERITAGE CONSERVATION: GEO-MINING PARKIN SARDINIA	235
Nađa Beretić Arnaldo Cecchini Zoran Đukanović	
A METHODOLOGY FOR STAKEHOLDER EMPOWERMENT AND BENEFIT ASSESSMENT OF MUNICIPAL LONG-TERM DEEP RENOVATION STRATEGIES: A SURVEY WITHIN SOUTH-EASTERN EUROPEAN MUNICIPALITIES	242
Sebastian Botzler	
THE OPPORTUNITIES OF MEDIATED PUBLIC SPACES: CO-CREATION PROCESS FOR MORE INCLUSIVE URBAN PUBLIC SPACES	249
Inês Almeida Joana Solipa Batista Carlos Smaniotta Costa Marluci Menezes	
ARCHITECTURE AS SOCIAL INNOVATION: EDUCATION FOR NEW FORMS OF PROFESSIONAL PRACTICE	255
Danijela Milovanović Rodić, Božena Stojčić Aleksandra Milovanović	
CITY AS A PRODUCT, PLANNING AS A SERVICE	262
Viktorija Prilenska Katrin Paadam Roode Liias	
RAJKA: CHANGING SOCIAL, ETHNIC AND ARCHITECTURAL CHARACTER OF THE "HUNGARIAN SUBURB" OF BRATISLAVA	269
Dániel Balizs Péter Bajmócy	
POSSIBLE IMPACT OF MIGRANT CRISIS ON THE CONCEPT OF URBAN PLANNING	279
Nataša Danilović Hristić Žaklina Gligorijević Nebojša Stefanović	

TOWARDS DIMINUISHING DISADVANTAGES IN MIGRATION ISSUES IN SERBIA  
(FROM 2015) THROUGH PROPOSAL OF SOME MODELS 287

Eva Vaništa Lazarević Jelena Marić Dragan Komatina

## **ARCHITECTURAL DESIGN AND ENERGY PERFORMANCE OF BUILDINGS**

APPLICATION OF ENERGY SIMULATION OF AN ARCHITECTURAL HERITAGE  
BUILDING 303

Norbert Harmathy Zoltán Magyar

APPLICATION OF TRADITIONAL MATERIALS IN DESIGN OF ENERGY EFFI-  
CIENT INTERIORS 311

Vladana Petrović Nataša Petković Grozdanović Branislava Stoiljković Aleksandar Keković  
Goran Jovanović

DETERMINATION OF THE LIMIT VALUE OF PERMITTED ENERGY CLASS FOR  
THE KINDERGARTENS IN THE NORTH REGION OF BOSNIA AND HERZEGOVI-  
NA 318

Darija Gajić Biljana Antunović Aleksandar Janković

ARCHITECTURAL ASPECTS OF ENERGY AND ECOLOGICALLY RESPONSIBLE  
DESIGN OF STUDENT HOUSE BUILDINGS 326

Malina Čvoro Saša B. Čvoro Aleksandar Janković

ENERGY EFFICIENCY ANALYSES OF RESIDENTIAL BUILDINGS THROUGH  
TRANSIENT SIMULATION 332

Ayşe Fidan ALTUN Muhsin KILIC

INNOVATIVE TECHNOLOGIES FOR PLANNING AND DESIGN OF “ZERO-ENER-  
GY BUILDINGS” 340

Kosa Golić Vesna Kosorić Suzana Koprivica

ENERGY REFURBISHMENT OF A PUBLIC BUILDING IN BELGRADE 348

Mirjana Miletić Aleksandra Krstić-Furundžić

TPOLOGY OF SCHOOL BUILDINGS IN SERBIA: A TOOL FOR SUSTAINABLE  
ENERGY REFURBISHMENT 357

Nataša Čuković Ignjatović Dušan Ignjatović Ljiljana Đukanović

## **ARCHITECTURAL DESIGN AND NEW TECHNOLOGIES**

EVALUATION OF ADVANCED NATURAL VENTILATION POTENTIAL IN THE  
MEDITERRANEAN COASTAL REGION OF CATALONIA 367

Nikola Pestic Jaime Roset Calzada Adrian MurosAlcojor

TRENDS IN INTEGRATION OF PHOTOVOLTAIC FACILITIES INTO THE BUILT  
ENVIRONMENT 375

Aleksandra Krstić-Furundžić Alessandra Scognamiglio, Mirjana Devetaković, Francesco  
Frontini, Budimir Sudimac



INTEGRATION OF NEW TECHNOLOGIES INTO BUILDINGS MADE FROM CLT	389
Milica Petrović Isidora Ilić	
INTEGRATION OF SOLAR WATER HEATING SYSTEMS INTO GREEN BUILDINGS BY APPLYING GIS AND BIM TECHNOLOGIES	394
Kosa Golić Vesna Kosorić Dragana Mecanov	
IMPLEMENTING ADAPTIVE FAÇADES CONCEPT IN BUILDINGS DESIGN: A CASE STUDY OF A SPORTS HALL	402
Aleksandar Petrovski Lepa Petrovska-Hristovska	
SIMULATION AIDED ENERGY PERFORMANCE ASSESSMENT OF A COMPLEX OFFICE BUILDING PROJECT	409
Norbert Harmathy László Szerdahelyi	

### **ARCHITECTURAL DESIGN AND PROCESS**

THE HABITABLE BRIDGE: EXPLORING AN ARCHITECTURAL PARADIGM THAT COMBINES CONNECTIVITY WITH HABITATION	421
Ioanna Symeonidou	
REFURBISHMENT OF POST-WAR PREFABRICATED MULTIFAMILY BUILDINGS	428
Aleksandra Krstić-Furundžić, Tatjana Kosić, PhD	
THE FUTURE (OF) BUILDING	438
Morana Pap, Roberto Vdović, Bojan Baletić	
COMPARISON OF ARCHITECTS' AND USERS' ATTITUDES TOWARD SPATIAL CHARACTERISTICS OF APARTMENTS	445
Ivana Brkanić	
DIGITAL VS. TRADITIONAL DESIGN PROCESS	453
Igor Svetel Tatjana Kosić Milica Pejanović	
CREATING THE EASTERN CAMPUS CONCEPT AT THE UNIVERSITY OF PÉCS - CONNECTED THE FACULTY OF BUSINESS AND ECONOMICS	461
Péter Paári Gabriella Medvegy Bálint Bachmann	

### **BUILDING STRUCTURES AND MATERIALS**

SUSTAINABILITY BENEFITS OF FERROCEMENT APPLICATION IN COMPOSITE BUILDING STRUCTURES	471
Aleksandra Nenadović Žikica Tekić	
POSSIBILITIES OF ENERGY EFFICIENT REFURBISHMENT OF A FAMILY VILLA IN BELGRADE: A CASE STUDY	479
Nenad Šekularac Jasna Čikić Tovarović Jelena Ivanović-Šekularac	

ENHANCING THE BUILDING ENVELOPE PERFORMANCE OF EXISTING BUILDINGS USING HYBRID VENTILATED FAÇADE SYSTEMS	485
Katerina Tsikaloudaki Theodore Theodosiou Stella Tsoka Dimitrios Bikas	
STRUCTURAL ASPECTS OF ADAPTIVE FACADES	493
Marcin Kozłowski Chiara Bedon Klára Machalická Thomas Wüest Dániel Honfi	
STRATEGIZING FOR INFORMAL SETTLEMENTS: THE CASE OF BEIRUT	500
Hassan Zaiter Francesca Giofrè	
THE IMPACT OF USERS' BEHAVIOUR ON SOLAR GAINS IN RESIDENTIAL BUILDINGS	509
Rajčić Aleksandar Radivojević Ana Đukanović Ljiljana	
PRESERVATION OF ORIGINAL APPEARANCE OF EXPOSED CONCRETE FACADES, CASE STUDY: RESIDENTIAL BLOCK 23, NEW BELGRADE	517
Nikola Macut Ana Radivojević	

## **ADAPTIVE REUSE**

CONVERSION AS MODEL OF SUSTAINABLE SOLUTION FOR DEVASTATED INDUSTRIAL COMPLEXES	529
Branko AJ Turnšek Aleksandra Kostić Milun Rancić	
SILO CONVERSION - POTENTIALS, FLEXIBILITY AND CONSTRAINTS	537
Branko AJ Turnšek Ljiljana Jevremović Ana Stanojević	
ARCHITECTURE OF MULTIPLE BEGINNINGS AS A TOOL OF SUSTAINABLE URBAN DEVELOPMENT	545
Milan Brzaković Petar Mitković Aleksandar Milojković Marko Nikolić	
INHABITING THE TOWER. THE PARADIGM OF THE FORTIFIED TOWERS OF MANI AND THE REUSE PROJECT	556
Rachele Lomurno	
ADAPTIVE REUSE THROUGH CREATIVE INDUSTRY TOOLS: CASE OF URAL-MASH, YEKATERINBURG, RUSSIA	564
Eva Vaništa Lazarević Timur Abdullaev, Larisa Bannikova	

## **URBAN MOBILITY, TRANSPORT AND TRAFFIC SOLUTIONS**

POLICY FOR REDUCING EMISSIONS IN AIRCRAFT OPERATIONS IN URBAN AEREAS BASED ON REGULATORY AND FISCAL MEASURES	579
Marija Glogovac Olja Čokorilo	
SIMULATING PEDESTRIAN BEHAVIOUR IN SCHOOL ZONES – POSSIBILITIES AND CHALLENGES	586
Ljupko Šimunović Mario Ćosić Dino Šojat Božo Radulović Domagoj Dijanić	

MODEL OF SMART PEDESTRIAN NETWORK DEVELOPMENT USING AN EDGE-NODE SPACE SYNTAX ABSTRACTION FOR URBAN CENTRES 593

Bálint Kádár

THE ROLE OF SMART PASSENGER INTERCHANGES IN THE URBAN TRANSPORT NETWORK 604

Bia Mandžuka, Marinko Jurčević, Davor Brčić

## **CLIMATE CHANGE, RESILIENCE OF PLACES AND HAZARD RISK MANAGEMENT**

THE IMPACT OF CLIMATE CHANGES ON THE DESIGN ELEMENTS OF CONTEMPORARY WINERIES - CASE STUDIES 617

Branko AJ Turnšek Ana Stanojević LjiljanaJevremović

DETERMINATION OF COMMUNITY DEVELOPMENT POLICIES USING URBAN RESILIENCE AND SYSTEM DYNAMICS SIMULATION APPROACH 626

Zoran Keković Ozren Džigurski Vladimir Ninković

QUALITIES OF RESILIENT CITY IN SYSTEMS OF PLANNING SUSTAINABLE URBAN DEVELOPMENT. AN INTRODUCTORY REVIEW. 634

Brankica Milojević Isidora Karan

PLACE-BASED URBAN DESIGN EDUCATION FOR ADAPTING CITIES TO CLIMATE CHANGE 641

Jelena Živković Ksenija Lalović

IMPROVING URBAN RESILIENCE, INCREASING ENVIRONMENTAL AWARENESS: NEW CHALLENGE OF ARCHITECTURAL AND PLANNING EDUCATION 652

Aleksandra Stupar Vladimir Mihajlov Ivan Simic

URBAN RESILIENCE AND INDUSTRIAL DESIGN: TECHNOLOGIES, MATERIALS AND FORMS OF THE NEW PUBLIC SPACE 659

Vincenzo Paolo Bagnato

THERMAL COMFORT OF NIŠFORTRESS PARK IN THE SUMMER PERIOD 666

Ivana Bogdanović Protić Milena Dinić Branković Petar Mitković Milica Ljubenović

## **LANDSCAPE ARCHITECTURE AND NATURAL BASED SOLUTIONS**

SMALL ISLANDS IN THE FRAMEWORK OF THE U.E. MARINE STRATEGY – CHERADI'S ARCHIPELAGO IN TARANTO 679

Giuseppe d'Agostino Federica Montalto

LANDSCAPE AWARENESS AND RENEWABLE ENERGY PRODUCTION IN BOSNIA AND HERZEGOVINA 686

Isidora Karan Igor Kuvac Radovan Vukomanovic

SAVAPARK – A RESILIENT AND SUSTAINABLE NEW DEVELOPMENT FOR ŠABAC 692

Milena Zindović Ksenija Lukić Marović

ADRIATIC LIGHTHOUSES. STRATEGIC VISIONS AND DESIGN FEATURES 702  
Michele Montemurro

LANDSCAPE ARCHITECTURE AND INFRASTRUCTURES: TYPOLOGICAL INVENTORY OF GREEK WATER RESERVOIRS' LANDSCAPE 710

Marianna Nana Maria Ananiadou-Tzimopoulou

THE BASIN OF THE MAR PICCOLO OF TARANTO AS URBAN AND LANDSCAPE "THEATRE" 717

Francesco Paolo Protomastro

INTERWEAVING AND COMPLEXITIES OF THE MAN-MADE ENVIRONMENT AND NATURE 725

Dženana Bijedić Senaida Halilović Rada Čahtarević

### **BUILT HERITAGE, NEW TECHNOLOGIES AND DANUBE CORRIDOR**

DIGITAL TOOLS IN RESEARCHING HISTORICAL DEVELOPMENT OF CITIES 737

Milena Vukmirović Nikola Samardžić

APPLICATION OF BIM TECHNOLOGY IN THE PROCESSES OF DOCUMENTING HERITAGE BUILDINGS 751

Mirjana Devetaković Milan Radojević

GIS-BASED MAPPING OF DEVELOPMENT POTENTIALS OF UNDERVALUED REGIONS – A CASE STUDY OF BAČKA PALANKA MUNICIPALITY IN SERBIA 758

Ranka Medenica Milica Kostreš Darko Reba Marina Carević Tomić

MAPPING THE ATTRACTIVITY OF TOURIST SITES ALL ALONG THE DANUBE USING GEOTAGGED IMAGES FROM FLICKR.COM 766

Bálint Kádár Mátyás Gede

INVENTARISATION AND SYSTEMATIZATION OF INDUSTRIAL HERITAGE DOCUMENTATION: A CROATIAN MATCH FACTORY CASE STUDY 777

Lucija Lončar Zlatko Karač

CULTURAL LANDSCAPE OF ANCIENT VIMINACIUM AND MODERN KOSTOLAC – CREATION OF A NEW APPROACH TO THE PRESERVATION AND PRESENTATION OF ITS ARCHAEOLOGICAL AND INDUSTRIAL HERITAGE 785

Emilija Nikolić Mirjana Roter-Blagojević

ALTERNATIVE TERRITORIAL CHANGES OF HOUSING ESTATES TOWARDS A SUSTAINABLE CONCEPTION 793

Regina Balla

## **HERITAGE, TOURISM AND DANUBE CORRIDOR**

- CULTURAL TOURISM IN THE BALKANS: TRENDS AND PERSPECTIVES. 807  
Kleoniki Gkioufi
- CULTURAL TOURISM AS A NEW DRIVING FORCE FOR A SETTLEMENT REVIT-  
ALISATION: THE CASE OF GOLUBAC MUNICIPALITY IN IRON GATES REGION,  
SERBIA 814  
Branislav Antonić Aleksandra Djukić
- CULTURAL AND HISTORICAL IDENTITY OF TWIN CITIES KOMÁR-  
NO-KOMÁROM 823  
Kristína Kalašová
- PLACE NETWORKS. EXPERIENCE THE CITY ON FOOT 830  
Milena Vukmirovic Aleksandra Djukić Branislav Antonić
- STORIES WITH SOUP - CULTURAL HERITAGE MOMENTS ALONG THE DAN-  
UBE RIVER 837  
Heidi Dumreicher Bettina Kolb Michael Anranter
- ETHNIC AND TOPONYMIC BACKGROUND OF THE SERBIAN CULTURAL HERI-  
TAGE ALONG THE DANUBE 844  
Dániel Balizs Béla Zsolt Gergely

## **SPATIAL AND RURAL DEVELOPMENT**

- BEAUTIFUL VILLAGE PROJECT: AN ARCHITECTURAL AND LANDSCAPE DESIGN  
STRATEGY FOR NON-HERITAGE VILLAGES IN HEBEI PROVINCE 859  
Dapeng Zhao Bálint Bachmann Tie Wang
- CHANGES IN DEVELOPMENT OF NORTHERN CROATIA CITIES AND MUNICI-  
PALITIES FROM 1991 TO 2011: MULTIVARIABLE ANALYTICAL APPROACH 869  
Valentina Valjak
- SPECIFICS OF DYNAMICS OF SHRINKING SMALL TOWNS IN SERBIA 879  
Milica Ljubenović Milica Igić Jelena Đekić Ivana Bogdanović-Protić Ana Momčilović-Petroni-  
jević
- BALANCED REGIONAL DEVELOPMENT OF RURAL AREAS IN THE LIGHT OF  
CLIMATE CHANGE IN SERBIA– OPPORTUNITIES AND CHALLENGES 888  
Milicalgić MilicaLjubenović Jelena Đekić Mihailo Mitković
- COLLABORATIVE RESEARCH FOR SUSTAINABLE REGIONALDEVELOPMENT:  
EXPERIENCES FROM “LEARNING ECONOMIES” ITALY-SERBIA BILATERAL  
PROJECT 899  
Jelena Živković Ksenija Lalović Elena Battaglini Zoran Đukanović Vladan Đokić

ASSESSMENT OF VALUE OF BIOMASS ENERGY POTENTIAL FROM AGRICULTURAL WASTE IN LESKOVAC FIELD AND ITS IMPORTANCE IN THE SETTLEMENT DEVELOPMENT PLANNING 908

Mihailo Mitković Dragoljub Živković Petar Mitković Milena Dinić Branković Milica Igić

MULTIFUNCTIONAL FACILITIES – FROM PRIMARY FUNCTIONS TO SPATIAL LANDMARKS (STUDY OF TWO CASES IN SERBIA AND BOSNIA AND HERZEGOVINA) 918

Aleksandar Videnovic Milos Arandjelovic

**IMAGE, IDENTITY AND QUALITY OF PLACE:  
URBAN ASPECTS**

## ADDRESSING THE SOCIO-SANITARY EMERGENCY IN AFRICA: THEORIES AND TECHNIQUES FOR DESIGNING A COMMUNITY HEALTH CENTRE IN MALI

### **Adolfo F. L. Baratta<sup>1</sup>**

Department of Architecture, Roma Tre University, Via Madonna dei Monti 40, 00184 Rome, Italy, [adolfo.baratta@uniroma3.it](mailto:adolfo.baratta@uniroma3.it)

### **Laura Calcagnini**

Department of Architecture, Roma Tre University, Via Madonna dei Monti 40, 00184 Rome, Italy, [laura.calcagnini@uniroma3.it](mailto:laura.calcagnini@uniroma3.it)

### **Fabrizio Finucci**

Department of Architecture, Roma Tre University, Via Madonna dei Monti 40, 00184 Rome, Italy, [fabrizio.finucci@uniroma3.it](mailto:fabrizio.finucci@uniroma3.it)

### **Cecilia M. L. Luschi**

Department of Architecture DIDA, University of Florence, Via della Mattonaia 8, 50121 Florence, Italy, [cecilia.luschi@unifi.it](mailto:cecilia.luschi@unifi.it)

### **Antonio Magarò**

Department of Architecture, Roma Tre University, Via Madonna dei Monti 40, 00184 Rome, Italy, [antonio.magaro@uniroma3.it](mailto:antonio.magaro@uniroma3.it)

### **Massimo Mariani**

Department of Architecture DIDA, University of Florence, Via della Mattonaia 8, 50121 Florence, Italy, [massimo.mariani@unifi.it](mailto:massimo.mariani@unifi.it)

### **Alessandra Venturoli**

Department of Architecture DIDA, University of Florence, Via della Mattonaia 8, 50121 Florence, Italy, [alessandra.venturoli@unifi.it](mailto:alessandra.venturoli@unifi.it)

### **Alessandra Vezzi**

Department of Architecture DIDA, University of Florence, Via della Mattonaia 8, 50121 Florence, Italy, [alessandra.vezzi@unifi.it](mailto:alessandra.vezzi@unifi.it)

## ABSTRACT

The contribution communicates the results of a research that has as its background the critical study of typological and technological aspects for socio-sanitary emergencies in highly critical contexts such as sub-Saharan Africa. The research, supported by *Gente d'Africa Onlus* and carried out in the Departments of Architecture of the Universities of Florence and Roma Tre University, had the general objective of determining the guidelines for the design of a Community Health Centre (CSCoM).

For this purpose, during the research it was possible to:

- define the quality and utility thresholds of the spatial and distributive-functional relationships of a minimal typological plant for a CSCoM, related with the use of local communities;
- explicate the transmittable constructive technologies taking into consideration the local constructive possibilities in terms of both material and human resources;
- check the local climatic conditions, in terms of thermal comfort and the lighting conditions of the interior spaces, also in relation to the local attitudes;
- identify the operating methods for the resolution of traditional technological systems in a

1 Corresponding author.



context without networks and the design of special elements to guarantee hygienic conditions by defining new (but vernacular) technological systems.

The theoretical assumptions of the research have been characterized by an approach based on a continuous comparison between local knowledge and the reference sciences in technical-constructive matters (materials and construction techniques), socio-economic (economic evaluations) and climatic-environmental (thermal wellness, natural lighting).

The theoretical framework has determined technical and technological criteria for the definition of the guidelines that have been applied in a design program for the construction of a CCom (of more than 1,700 m<sup>2</sup>) that will be built in Mali, near Kita, between the villages of Dyalaya, Koronji and Tounbouba.

**Keywords:** Socio-sanitary Emergency, Community Health Centre, Traditional Techniques, Guided Self-Containment, Local Communities.

## Introduction

The contribution expounds the results of the research project implemented by the Department of Architecture of Florence University and Roma Tre University for the *non-profit organization* (NPO) Gente d'Africa, which for over a decade has been engaged in building public works in Africa. The aim of the research is to draw up guidelines for planning a Community Healthcare Centre (CCom) in Mali. By means of the adoption of appropriate investigation methods, the activities, which involved teachers and students<sup>2</sup> of the two departments, were split up into:

phase 1: analysis of the state of the art of the peculiar and difficult territorial context, with attention to environmental criticality, to the application limits of operating tools and to the results achieved by previous research both in terms of methodology and application results. The analysis, in addition to the study of existing literature, was supported by surveys on the territory (survey in February 2017);

phase 2: synthesis of the analyses for the correct definition of the guidelines, through the evaluation of the application results existing on the territory, the definition of the potential quality of the built environment and the definition of parameters and design and process tools broken down according to the nature of the resources: material, technological, energy-environmental and economic-financial;

phase 3: definition of the guidelines on the basis of the parameters identified in the synthesis through the adoption of technical solutions and locally sustainable technologies based on availability, durability and low maintenance requirements, as well as the technical and construction culture to be implemented;

phase 4: application of the guidelines to the CCom case study serving 12 villages around Tounbouba, near Kita, 150 km from Bamako.

The peculiarity of the environmental and area context and the type of building were the two factors that conditioned the definition of the specific project guidelines.

## CONTEXT

Mali is the largest West African state in the sub-Saharan region: 1.25 million km<sup>2</sup> of desert, in which live 18 million people. A land poor in natural resources, mainly desert and uncultivated, with very irregular rainfall (nearly absent rainfall in winter and alluvial in summer) and lack of

<sup>2</sup> Novella Lecci, Valentina Luperto, Francesca Maioli, Sofia Pistolesi, Lucrezia Pucci, Francesco Rappelli, Domenico Rivetti, Alessandra Venturoli, Alessandra Vezzi, Benedetta Zamboni, Marta Zerbini of University of Florence; Emma Allegretti, Francesca Carfagna, Luigia Capristo, Ottavio Minella of Roma Tre University.

suitable land areas, which means that only 2% of the territory is ploughed or under arborescent crops. Extension complicates land management, producing food scarcity, poverty and instability and triggering problems of social equity and cohesion. The political situation is unstable: after the 2012 *coup d'état*, despite United Nations intervention and the peace agreement signed by armed militias in 2017, many smaller groups did not accept the government's development plan, making the situation fragile (De Georgio, 2017). The instability of the country aggravates health conditions. Health policies, directed by the *Ministère de la Santé* and implemented by the *Direction Nationale de la Santé* of Bamako, are applied by the Regional Health Directorates. The country has three national hospitals (Point G, Gabriel Touré and Kati) and seven regional hospitals. In the *Cercles* (Districts) there are 56 *Centres de Santé de Référence* which link the hospitals with the 930 *Centres de Santé Communautaire* (CSCCom), managed by the *Associations de Santé Communautaire*. This pyramidal system (fig. 1) counts on twenty thousand volunteers (Community Health Volunteers) who together with qualified operators (Community Health Workers) make up the sector's major resource (USAID, 2013), but are not enough. Mali suffers from emergency social-healthcare conditions with unsolved problems of child mortality<sup>3</sup>: 78% of the population lives in conditions of poverty (13 million people) and 55.9% are in conditions of extreme poverty (Jahan et al., 2016). The social-healthcare emergency is therefore among the country's major problems.

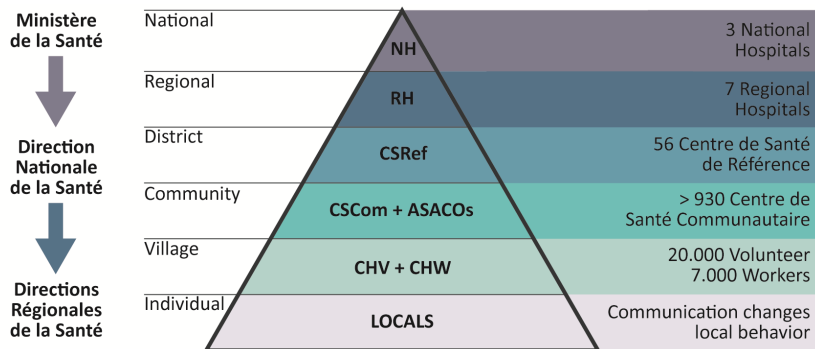


Figure 1: Mali Health Pyramid.

## Project

The subject of the research work is a Community Health Centre that performs a public function but is managed by a private association linked to the community. For this reason, in the planning stage, the choice of location for the Centre was a particularly delicate one. Thanks to the *NPO* experience, the decision was taken to locate the Centre in an area near the village of Tounbouba, in the Kayes region.

The village is centrally located with respect to 11 other villages<sup>4</sup>, close to the main road that leads to the Capital and the area is crossed by the Bamako-Dakar railway line. The research work began with the analysis of the typological characteristics of the traditional Malian dwelling with the aim of becoming acquainted with the building and social conditions of the local inhabitants. The traditional houses provide, above all, minimum conditions of well-being, given the climatic-environmental context and usability and in view of gradual family-growth conditions.

The buildings are developed, first of all, defining the boundary around the family property and

3 In Mali, 11.5% of deaths are children under 1 year of age [Unicef, 2016].

4 Balambougou, Baléyani, Bandigoula are all within a distance of 20 km.

then erecting a first rectangular building raised off the ground to protect it from flooding. Mainly intended for night shelter, the house does not contemplate specialisations or hierarchies. In accordance with changes extending over time, a series of cells are placed on top of each other as needed. Despite the insertion of space hierarchy, made recognizable by loggia filters, the primitive functional living pattern is well present in the CSCom, as is demonstrated by:

a composition made up of modular cells contained in an introverted enclosure and with the presence of courtyards that make it easy to use the rooms;

the location of the various environmental units in separate single-functional modules for health-care activities (emergency, childbirth, outpatient), service (canteen, storage of medicines and equipment, toilets) and residential (housing for medical and paramedical personnel);

the dislocation of service spaces in cells separated from the main cells, such as areas intended for the management of water resources (*château d'eau*) and for the incineration of organic and hospital waste.



Figure 2: Functional and distribution scheme of the CSCom.

## Cognitive insights

Among the cognitive insights of stages 2 (available resources and critical parameters) and 3 (technical and technological solutions) of the research work, the following are those related to material, environmental, plant engineering and waste aspects.

## Material issues

Raw earth is widely used<sup>5</sup> to build houses using adobe stabilized with straw. Humidity conditions, particularly in the violent rainy seasons, are severe. As a result, the adobe is waterproofed, before drying, with Karité butter, which is produced in abundance throughout the entire Malian Niger Basin. However, the hygiene and health standards of a healthcare facility are hardly guaranteed by the use of adobe, without forgetting the difficulty of maintenance. For this reason, a more tenacious and durable brickwork solution was adopted, in part plastered with lime. In particular, foundation and elevation structures are made of UNI bricks, a model also widespread in former French-speaking colonies, internally covered with ceramic elements or plaster.

Clay tables were used for the wall slab, which allows ventilation and sufficient detachment from the ground in case of flooding, while the roof slab is in brick vaults and steel profiles. The

5 In the north of the Country are the splendid Great Mosque of Djenné and the ancient city of Timbuktu.

modularity of the minute brick element allows this property to be transferred to the cells that go to form the building, making it possible to spread a correct and economic building culture.

## Environmental issues

Excepting rainfall periods<sup>6</sup>, climatic conditions are constant throughout the year. Solar radiation persists, approximately, during all the seasons with high average radiation values<sup>7</sup> and prevalent horizontal radiation<sup>8</sup>. Average temperatures are always high<sup>9</sup>, with little difference between night and day. There is therefore no preferable orientation: the presence of shading and natural ventilation systems is preferable to horizontal closures, while the façade can be designed with a uniform layer of masonry.

The use of natural ventilation layers on the roof avoids direct heat gain; the optimal dimensioning of the wall thickness should vary between 30.5 and 40.6 cm (Olygay, 1990), without the need for thermal insulation. In the study case, the wall thickness was hypothesized as 38 cm and a second floor of spaced roof determines a strong overhang on the courtyard triggering convective motions that guarantee cooling by ventilation, fed by vents of air on the front. The roof overhang also makes it possible to widen the openings, guaranteeing indirect lighting of the interior spaces. Window frames with insect and fine dust netting maintain internal hygienic conditions. Verification of performance relating to the natural lighting of the section where the outpatient surgeries and delivery rooms are located shows an average daylight factor of 8% with minimum illuminance on a horizontal plane<sup>10</sup> of 560 lux.

## Plant issues

Water scarcity, especially in the phases of use and operation of an activity, is one of the most critical aspects: at present, water is generally supplied by means of wells. Since the flow capacity of a well is insufficient to ensure the normal operation of a CSCom, storing rainwater is of crucial importance, given that there are months in which 300 mm of rainfall is reached. In the case study, the solution was suggested of a château d'eau (fig. 3) with a lower floor for the use of the water resource and raised with the tank. The recovery of rainwater was conceived through a system of underground tanks connected in series, filled by gravity, able to store up to 60 thousand litres of rainwater recovered from the roof surface for non-drinking purposes. The sun remains the only sure and exploitable resource through active systems for the production of energy. In case of using photovoltaic solar systems must take into account that power requirements, due to the power input of CSCom medical equipment, are easily covered by RES. It should be noted that in 2016 the per capita electricity consumption in Mali was 80 kWh/year, compared to 4.790 kWh/year in Italy (Indexmundi, 2018). In order to exploit the sun's resources on the roof, the installation has been suggested of photovoltaic solar panels with estimated electricity production of 3,9MWh (JRC, 2018).

---

6 Heavy rains from June to September, then 6 mm of rain from November to April.

7 2,200 kWh/m<sup>2</sup>.

8 The sun remains rather high during all the hours of daylight and during all the seasons.

9 Between March and June, the temperature exceeds 40°C nearly every day.

10 Checked at 180 cm from the natural ground level, 110 cm from floor by means of Ecotect software.

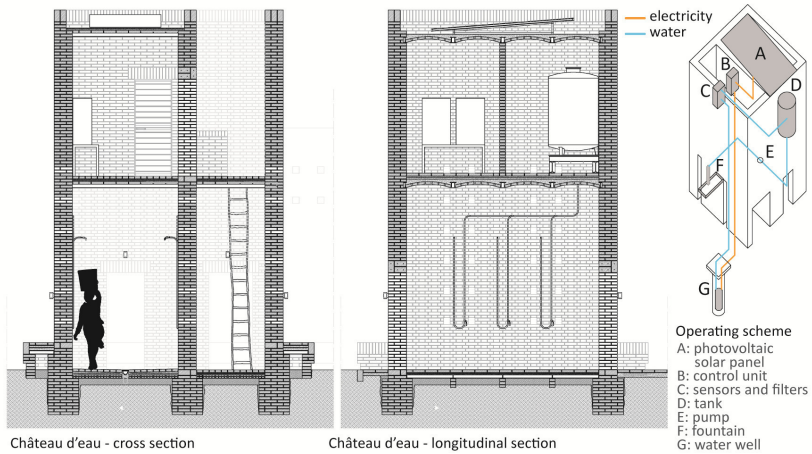


Figure 3: Château d'eau: sections and functional schemes.

### Waste management

Currently, the use of toilets is not widespread, and in fact physiological activities occur in conditions of poor hygiene and low safety, putting at risk the health conditions of people who, through contact with soil contaminated by excrements and insects, can contract very serious diseases (Moroni et al., 2014). In addition to organic waste, in the case of CSCom other organic waste is generated by important activities. The scarcity of water makes it impossible to transfer comontechnical solutions to the African context, but requires the adoption of dry solutions that can be managed, especially in the emptying phases, while maintaining the best possible hygienic conditions. Hospital organic waste must be managed with the same care and using solutions that guarantee a minimum risk of infection. In existing literature, it is considered possible to apply the principle of compost toilette or clivus multrum (fig. 4) which operates on the basis of the separation of human excrements into dry and leachate, responsible for the proliferation of pathogenic germs. Besides the composting of such waste, solutions must be provided for final-stage waste management. In the case study, this integrated principle has been applied to the design of an incinerator; the emptying of the containment chamber is carried out by means of a waste transport system on a trolley with a moving bottom as far as the incinerator. The latter operates according to the double chamber principle (Rogers, Brent, 2006).

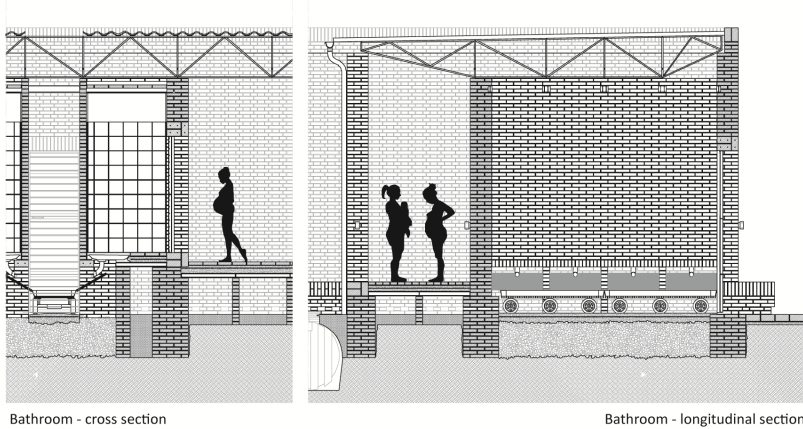


Figure 4: Waterless bathroom's system.

## Conclusions

The Tounboubou case study illustrates the potential and possible application of the guidelines. The research work, which is continuously tested through discussion with specialists and operators in the sector, is now facing the development of economic models for its implementation. It is therefore a question of verifying its financial and economic viability, favouring economies of scale and overall greater social sustainability. The scarcity of resources, the environmental context and the critical issues have been taken into account in defining the economic-financial instruments that can be used. Since it was not possible to refer to technologies, techniques or labour costs for works or similar solutions because not described and non-existing, it was decided to carry out a quantitative and economic analysis of the materials, checking things out on local markets and with European producers operating in the territory in order to elaborate a parametric cost to compare with the costs of similar jobs. The main reference was a database of multi-parameter prices (CYPE, 2018) which generates realistic prices for the most common jobs, breaking down each item into the cost of individual materials, equipment and labour to determine the cost of each material to be produced on site and evaluating the cost of other materials "to measure". For the completion of CSCCom, a crowdfunding charity is currently being set up, which will go to join the sponsorships of economic operators who can give a boost to fund raising.

## References

- Biolcati Rinaldi Maurizio, and Venturi Luca. 2011. *Architettura sanitaria di emergenza. Strutture permanenti realizzate con tecnologie appropriate*. Bologna: CLUEB.
- Baratta, Adolfo, and Gabriele Stefano. 2014. "La terra cruda come eredità culturale." In *Centro PV. Esperienze e conoscenze. Progetti internazionali nei paesi emergenti*, edited by Giofrè Francesca, and Trusiani Elio, 293-300. Roma: Orienta Edizioni.
- CYPE. 2018. "Générateur de Prix, Mali." CYPE Ingenieros, S.A. Accessed January 30, 2018. [www.republique-du-mali.prix-construction.info](http://www.republique-du-mali.prix-construction.info).
- De Georgio, Andrea. 2017. "Il Mali degli occidentali, bersaglio preferito dei jiahadisti." *Limes Rivista Internazionale di Geopolitica*. Accessed January 30, 2018. [www.limesonline.com/il-mali-degli-occidentali-ber-saglio-preferito-dei-jihadisti/99736?prv=true](http://www.limesonline.com/il-mali-degli-occidentali-ber-saglio-preferito-dei-jihadisti/99736?prv=true).
- Gotaas, Harold B. 1956. *Composting: Sanitary Disposal and Reclamation of Organic Wastes*. Ginevra: World Health Organization.
- Jahan, Selim et al. 2016. "Human Development Report." United Nations Development Programme. Accessed January 30, 2018. [hdr.undp.org/en/2016-report](http://hdr.undp.org/en/2016-report).
- JRC. 2018. "Photovoltaic geographical information system". Joint Research Centre. Accessed January 30, 2018. [re.jrc.ec.europa.eu/pvgis/apps4/pvest.php?map=africa](http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php?map=africa).
- Moroni, Mauro, Esposito Roberto and Antinori Spinello. 2014. *Malattie infettive*. Milano: Edra Masson.
- Olgay, Victor. 1963. *Design with Climate. Bioclimatic Approach to Architectural Regionalism*, Princeton: Princeton University Press.
- Rogers, David E. C., and Brent Alan. 2006. "Small-scale medical waste incinerators. Experiences and trials in South Africa." *Waste Management*26, no. 11 (February): 1229-1236
- Unicef. 2016. "La giusta opportunità per ogni bambino". Accessed January 30, 2018. [www.unicef.it/Allegati/Condizione\\_infanzia\\_nel\\_mondo\\_2016.pdf](http://www.unicef.it/Allegati/Condizione_infanzia_nel_mondo_2016.pdf)
- Indexmundi. "Countries. Mali". Accessed January 30, 2018. [www.indexmundi.com](http://www.indexmundi.com).