

EDITORS:
MLADEN BURAZOR
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SENKA IBRIŠIMBEGOVIĆ

METAMORPHOSIS
OF
ARCHITECTURAL
EDUCATION
IN
(POST)
TRANSITIONAL
CONTEXT

FACULTY OF ARCHITECTURE
UNIVERSITY OF SARAJEVO (AFS)

FACULTY OF ARCHITECTURE AND FINE ART
NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY (NTNU)

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SARAJEVO, 2016.

Faculty of Architecture
University of Sarajevo (AFS)

Faculty of Architecture and Fine Art
Norwegian University of Science and Technology (NTNU)

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GRAPHIC DESIGN:

Mirna Česović

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PREFACE



For more than 65 years, the Faculty of Architecture, University of Sarajevo, has been thriving to provide a wide spectrum of knowledge to the students. This is achieved through various teaching/learning modes that always focus on realities aiming to develop young professionals' innovation capabilities. The overall objective in this process is to produce well-informed, competent architects, capable of meeting increasing demands coming from the ever-changing social and spatial environment. We recognise the importance of the exchange of knowledge and experience among different schools of architecture. For this purpose, we are engaging our students and staff in substantial cooperation with colleagues from universities from all over the world, for the purpose of improving their knowledge.

Cooperation with NTNU through a joint programme entitled "Rethinking architecture and energy efficiency in buildings and urban development" was a great challenge for all of us. Namely, this programme, in addition to exploring new methods applied in knowledge and skills transfer, also had a goal to develop institutional capacities within the field of energy efficiency and sustainability and to incorporate those subjects in curricula at the schools of architecture.

The aim of this publication is to present the achievements of the programme, lessons learned and conclusions made in relation to the possible improvement of teaching methods and raising awareness of the role of architects in sustaining the global environment.

We hope that all parties involved in the HERD programme benefited from the cooperation process, as well as from the findings concerning innovation opportunities within the learning/teaching course.

Mevludin Zečević

*Dean, Faculty of Architecture,
University of Sarajevo*



At NTNU – Faculty of Architecture and Fine Art, we appreciate our collaboration with the University of Sarajevo (UNSA), initiated many years ago by our professors Hans Skotte and Finn Hakonsen. The HERD project presented in this publication represents bilateral capacity building on core issues of today. We all know that our cities and buildings have to contribute to a reduction of global warming and pollution. This applies to all countries. We also know that we cannot just add new technology to outdated structures.

This publication is a call for rethinking architecture and urban development, in terms of concepts, technology, user behaviour and even aesthetics. It is also a call for rethinking education to empower the young architects and urban planners with relevant knowledge, skills and attitude. We are pleased to have contributed to this collaboration with our competent staff in educational methods, urban planning and sustainable architecture.

It has also been a pleasure for staff and students on both sides to get acquainted with each other through a in a series of workshops, both on professional and personal levels. One should not underestimate the positive power of cultural exchange and understanding when one aspires to work towards a sustainable future.

The publication is, if I may say so, a summary of our experiences, and is a source for learning and further collaboration. I also hope that the documentation in this publication will inspire others to initiate similar collaborative projects.

Fredrik Shetelig

*Dean, Faculty of Architecture and Fine Art,
Norwegian University of
Science and Technology (NTNU)*

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INTRODUCTION

Challenged by the dynamics of change at all levels of our contemporariness, architectural education is continuously being influenced by rapid technological, economic and socio-cultural shifts. Within a wide spectrum of contemporary issues, the sustainability paradigm has unquestionably emerged as the most relevant catalyst in the process of the transformation of modes in teaching and learning about architecture. The task of tracking and steering the process of change becomes even more complex in a setting which has undergone radical social and political shifts.

Striving to address the identified challenges, the academic research project entitled “Rethinking architecture and energy efficiency in buildings and urban development” was launched in 2014, funded by the HERD/Energy 2010-2016 programme. The project has generated several joint activities, ranging from the introduction of new design studios and courses within the existing academic curricula, to the organisation of conferences, collaborative research activities, workshops, student and academic staff exchange programmes, all implemented at the Faculty of Architecture University of Sarajevo and the Faculty of Architecture and Fine Art in Trondheim together with the Faculty of Architecture in Banja Luka.

This monograph represents a collection of theoretical outlooks and research texts, written by the academic staff from Norway and Bosnia and Herzegovina, who participated in the aforementioned project activities. For most part, the theme of the monograph was instigated by the necessity to provide an updated analytical and projective discourse on the changing role of architectural education guided by the imperative of sustainability. Moreover, it revisits the perpetual debate on the capacity of architectural education to address the problems of the real-world.

Owing to their active engagement in the academic process, contributors of the texts in this monograph present their insights on the status of metamorphosis of architectural education at their home institutions. Aiming to identify the internal “weak points” of the existing programmes, eight theoretical texts contained in this volume are built upon a detailed analysis of the current state of academic practices, specifically referring to the impacts of the process of social and economic transition on education. In addition to their analytical basis, they present the effects of the design studios introduced through the HERD

programme. They are specifically reflecting on the change that was generated by underpinning the topic of sustainability throughout the courses, and by reinforcing both internal and external networking throughout the educational process.

The monograph begins with a systematic exploration of the HERD programme implementation outcomes presented by **Mladen Burazor**, who highlighted the benefits which may be valuable for the process of the curriculum transformation at the Faculty of Architecture, University of Sarajevo. An insightful qualitative and quantitative analysis of origins and historical trajectories of the faculty’s academic programmes are followed by a meticulous assessment of the current academic programmes and modes of teaching, underscoring the significance of the impact generated by the HERD project.

Contributors **Erdin Salihović**, **Nermina Zagora** and **Amra Salihbegović** further examine and critically observe the current educational practices, indicating that the lack of correspondence between theory and practice may still represent the weakest link in the architectural education. The readers will be introduced to case studies in which challenges of the theory-practice dichotomy in architectural education are tackled at the “micro level”, and are performed at the level of the existing or new courses. The process of metamorphosis of the existing academic programmes, reinforced by the sustainability perspective, was described in the case of the “Contemporary Spatial Concepts, Design and Prototype” design studio, by establishing internal networks within the faculty, as well as by developing external links with professionals and industry. Correspondingly, authors **Nina Ugljen-Ademović**, **Senka Ibrišimbegović** and **Elša Turkušić Jurić** emphasised the significance of integration of theory and practice, as well as of an interactive work methodology as key strategies in addressing the challenges of the current architectural education system. The elaboration of the concept of the three-level interactive approach in the design education arises from a theoretical discussion about phenomenological approach to “modernity” in residential space, and is further exemplified by the study of the results achieved in the studio “Problems of modernity of the single/family house”.

Authors **Amira Sallihbegović**, **Vedad Islambegović** and **Dženis Avdić** further explore the

sustainability aspect, as one of the essential layers comprising the aforementioned term “modernity” in the case of single/family houses. Analogously to the previously mentioned principles of interactivity and integration, both in design and educational processes, the authors of this text additionally underline the holistic approach, referring to the interdependence between the materialisation of the envelope and the articulation of the form, as well as in the expression of the local identity in design.

The discourse on the topic of integrated design approach continues in the text written by **Adnan Pašić, Nihad H. Čengić** and **Slađana Miljanović**, who emphasised that the sustainability paradigm may actually represent the key integration factor, bringing together the disciplines of urban, architectural and structural design. Moreover, the relevance of integrated approach may be understood as a balance between the dynamics of the contemporary society and the traditional values, which may be discovered in the sources of what the authors name as the “hidden or lost knowledge”.

Notions “contemporary” and “traditional” are juxtaposed in the title of **Lemja Chabbouh Akšamija** and **Lejla Šabić**’s text which sheds light to the delicate relationship between authentic, traditional values and contemporary challenges of sustainability. Their research was based on the empirical findings of the energy efficiency study in the case of Svrzo’s House in the historic residential settlement in Sarajevo, which was conducted in the design studio as part of the HERD programme. The authors strive to create a theoretical framework and a set of guidelines for the design of sustainable contemporary housing in areas of the protected architectural heritage, as well as for upgrading of traditional buildings according to EE standards.

Aida Idrizbegović Zgonić and **Amir Pašić** also acknowledge values of the “hidden knowledge” in the text about the research and pedagogic methodology in the design studio that was conducted within the HERD programme. The concept of the studio was dedicated to the rereading of the spatial logic and vernacular wisdom in the cases of the historical settlements of Vranduk and Počitelj in Bosnia and Herzegovina. An assertive evaluation of the pedagogic outcomes of the aforementioned design studio gives rise to the core imperative of creating the architectural tools that would adequately respond to the complexity

of architectural discourse in dealing with historical context, especially in the countries in transition, both at the level of education and practice.

As a summary of the effects of all HERD programme activities, performed at the Faculty of Architecture of the University of Sarajevo and the Norwegian University of Science and Technology, Trondheim, this monograph ends with a survey-based discussion by **Venkatesh Govindarajan** and **Markus Schwai**. The authors provided a detailed analysis based on a survey conducted among academic staff at the two partner universities, as well as among a number of invited international academicians. The results of the study have revealed the key issues and challenges in the process of incorporating the paradigms of sustainability and energy efficiency in architectural education.

A common idea that bonds all contributions in the monograph is that the architectural education should play a more active role, by not only by responding to, but also by steering the dynamic processes in the contemporary society. Even though addressing the real life problems certainly represents a significant challenge for academia, especially in (post) transition societies, the HERD programme implementation has demonstrated the potentials of the so called “micro interventions” in the academic process, as well as the benefits of internal and external networking. Moreover, the common conclusion of all participants in the project is that the sustainability paradigm should not be regarded as an isolated area of research, and that instead it needs to be integrated in the very core of thinking, education and practice in all design disciplines.

This publication tries to provide an insight into the metamorphosis of architectural education, and highlights some key issues to be considered in the future work. The publication, which also represents a summary of the HERD project activities, can be seen as the ground for future fruitful cooperation in this field.

Nermina Zagora

On behalf of the editorial team

METAMORPHOSIS OF
ARCHITECTURAL
EDUCATION
IN
(POST)
TRANSITIONAL
CONTEXT

I.
ARCHITECTURAL
EDUCATION:
EMBRACING
THE
PROCESS
OF
CHANGE



Mladen Burazor, PhD

Assistant Professor,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
mladenb@af.unsa.ba

HAS THE HERD PROGRAMME MADE A SIGNIFICANT CHANGE TOWARDS DEVELOPMENT OF A NEW CURRICULUM AT THE FACULTY OF ARCHITECTURE IN SARAJEVO?

ABSTRACT

In its history of 67 years, the Faculty of Architecture in Sarajevo has changed the curriculum only a few times. This can be viewed as a good or a bad thing depending on the viewpoint one holds. Essentially, many students are affected by changes in the curriculum, which cannot be taken lightly. The last change was introduced at the Faculty of Architecture in Sarajevo in 2003.

With the introduction of the Bologna process at the University of Sarajevo, the Faculty of Architecture was the first to adopt the European Credit Transfer and Accumulation System (ECTS) and changed its structure from the former five-year graduate course to a Bachelor and Master course (3+2 years respectively). This transition, however, has left many scars, and, for many teachers at the Faculty, it came somewhat too soon and was not well-thought-out. Although, many will point out several repercussions and few positives, even after 13 years – at the time of writing – the system does not seem to have changed. This paper will explore the reasons behind this reluctance to change and how, as a significant change, the HERD programme has contributed to the development of a new curriculum at the Faculty of Architecture. Identifying challenges that are ahead of the teaching staff in due process is the first step towards facing them. The teaching staff involved with HERD courses, had already taken that step.

Keywords: *curriculum change, syllabus improvement, studio work*

INTRODUCTION

The purpose of this paper is to examine the role of the Programme for Higher Education, Research and Development in the Western Balkans 2010-2016 (the HERD programme) in the process of improving the curriculum at the Faculty of Architecture in Sarajevo.

The overarching goal of the HERD/Energy 2010-2016 programme was to contribute to economic growth and social development in the Western Balkans, through cooperation between higher education institutions, while focusing on energy issues. Within it, there were four sub-programmes: Maritime, Agriculture, Energy Sector and Development Studies (Norwegian University of Science and Technology, 2016). In October 2013, the Norwegian University of Science and Technology (NTNU, Trondheim, Norway), together with the Faculty of Architecture of the University of Sarajevo, Bosnia and Herzegovina (AFS) and the Faculty of Architecture and Civil Engineering in Banja Luka of the University of Banja Luka (AGFBL), as an additional partner, applied for and received funds from the HERD board for the project titled “Rethinking architecture and energy efficiency in buildings and urban development.”

Questioning whether the HERD project has fulfilled its goals and why is it important to change the curriculum are the main discussion themes in this paper. Based on the comparative analysis of previous and the current curriculum at AFS, certain shortcomings were identified, and the idea was to use the HERD programme to address

them. In order to evaluate the efforts and results achieved by those involved in the HERD project, it is important to recognise challenges that they had to surmount. In that sense, it is necessary to examine reasons for previous changes to the curriculum in the history of AFS.

CHANGES TO THE CURRICULUM AT AFS

The Technical Faculty in Sarajevo was founded in 1949. After World War II, the country had to be rebuilt and engaging workers in establishing the necessary infrastructure and industries, was a priority. An important part of this process was to establish higher education institutions in Bosnia and Herzegovina (BiH) as a places for educating the population that would assist in the further development of the country. With the assistance of the previously-established universities in Belgrade, Zagreb and Ljubljana, the Faculty of Architecture in Sarajevo was founded. Architects from BiH, which later became the core of the teaching staff at AFS, with the help from professors from technical faculties of the previously-established universities, created the first curriculum (Arhitektonski fakultet Sarajevo, 2016, p. 2).

EVOLUTION OF THE CURRICULUM AT AFS

Over the course of time, several evolutionary phases in the development of the curriculum at AFS can be distinguished. The first phase lasted from 1949 until 1961, when the Technical Faculty was divided into four new faculties: Architecture and Urbanism, Civil Engineering, Mechanical Engineering and Electrical Engineering. The second phase lasted until 1977/78, when specialised programmes of study were introduced (architectural design, engineering and urbanism). Up to that point, architects had been educated according to the general curriculum (Arhitektonski fakultet Sarajevo, 2016, p. 5). In 1993/94, during the war in BiH, the curriculum was changed back to the general curriculum, which can be attributed to a shortage of teaching personnel (a reduction from 64 to 42 (Arhitektonski fakultet Sarajevo, 2016, p. 7)), and also to the fact that a more general profile was sought after, for architects would have to help rebuilding the country after the war. This curriculum, with some modifications, was implemented until 2003/2004, when the Bologna process was introduced at the faculty. For the next 5 years the old and the new curricula were implemented simultaneously, in order to enable students who enrolled the faculty prior to the Bologna process introduction to finish their studies in time.

The structure of the faculty (organisation in terms of departments) has not changed much through its history – it has always consisted of six departments. In addition to these departments, several general subjects are taught by teachers

from other faculties (such as Mathematics, History of Art, English language, etc.). However there are observable changes in the share in the curriculum for these departments (Figure 1). These percentages are responsible for the nature of the architectural study programme, and it is in the focus of any discussion on curriculum change.

As far as the description of the faculty's curriculum is concerned, there has always been an issue of **content** and **form**. Content is what brings true value to education, provided that the learning outcome is defined well and clearly. The established form, however, can emphasize those objectives and make them more appealing to students, but it can also prove to be a significant disadvantage/obstacle. The form has changed over time and there were study programmes (from 1974, for instance) that lasted for four years, but then one semester lasted for 19 weeks instead of 15. When compared to the five-year study programme of 1998, there was a 28% reduction in the total number of hours spent at the faculty. *Vis-à-vis* the Bologna curriculum, that reduction is even greater (43%). The total number of subjects has changed and now students have 10-12 subjects per semester. Previously, students had four weeks at the end of the semester to prepare for exams and now they have more exams to take at the same time. There has been a 54% increase in the number of subjects in the present curriculum, compared to that of 1998, and, at the same time, a 21% reduction of total time spent interacting with the teaching staff (Figure 2). The fact that the number of subjects has more than doubled, and, thereby, the time at hand to prepare for the examinations has halved,

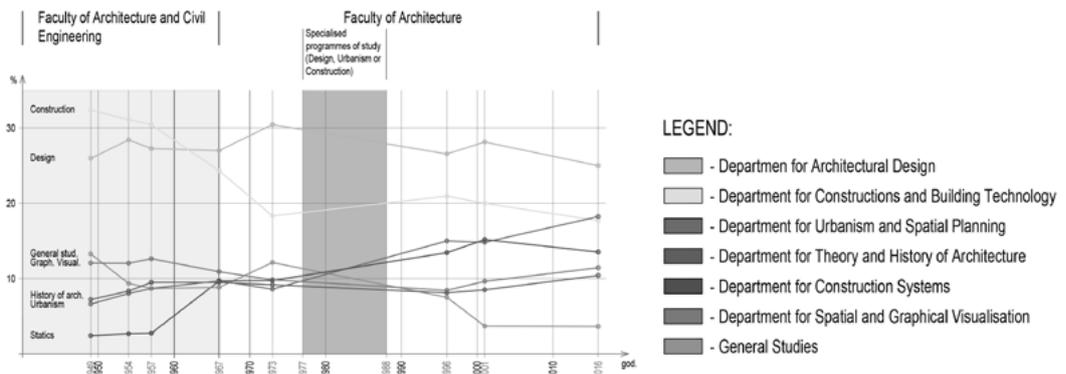


Figure 1. Departments' share in the curriculum (Source: Emir Fejzić, PhD, 2016)

poses difficulties to many students. It is true that students should spend more time at home to prepare for tests during the semester, but at the end of the semester, there is simply not enough time to prepare all subjects. It is argued here that **the established form of the Bologna study programme is troublesome and is proving to be a disadvantage.**

THE BOLOGNA PROCESS IN BIH

It would be apt to write a bit about the Bologna process, which has been and will be referred to many times in this text. It was in 1999 that 29 ministers in charge of higher education in European countries, signed a declaration in Bologna (Italy), which marked the beginning of a process that created what would later be termed the European Higher Education Area (EHEA) (About the Bologna Process, n.d.). Today, the number of member countries has risen to 48 (How does the Bologna Process work?, n.d.) and BiH joined the process in 2003, with the ratification of the Convention on the Recognition of Qualifications concerning Higher Education in the European Region (Lisbon Recognition Convention) (Stephen, 2011). At the University of Sarajevo, the Faculty of Architecture was the first one to join this process.

The principle objective of the Bologna process is to facilitate the mobility of students and staff and to offer access to high-quality education, based on democratic principles and academic freedoms (About the Bologna Process, n.d.). In order to accomplish that goal efficiently, academic institutions had to (re)organise their study programmes in accordance with the common

structure of bachelor, master and doctorate studies. Another task was to establish a quality assurance framework in order to easily compare degrees and guarantee a fair recognition of foreign higher education qualifications. Changes in higher education influence research and innovations, but also affect society and employment.

So far, among teachers at AFS, there have been mixed feelings about the Bologna process. Some see it as an inevitable and correct choice, while others disagree and question its benefits and feel it was prematurely introduced at the institution. Integration of faculties and academies at the University of Sarajevo is still an on-going process and many procedures and regulations are missing. In that sense, AFS pioneered a lot of changes at the University using a bottom-up approach. However, some of the disadvantages that can be seen are a result of the missing top-down national strategy. Mobility of students has increased but it is not working in favour of institutions in BiH. Students are leaving the country, many of them permanently. This means that investments made in their education from public funds, are 'lost' to the country. The main reason why they do not return is because they find it difficult to find employment. In BiH, in February 2016, there were 718,281 employed and 536,684 unemployed persons (Agency for Statistics of the Bosnia and Herzegovina, 2016). With a very high unemployment rate, it is extremely difficult for students to find a job. Furthermore, the labour market does not recognise the need for BA qualifications and students often decide to continue their master studies in other European countries.

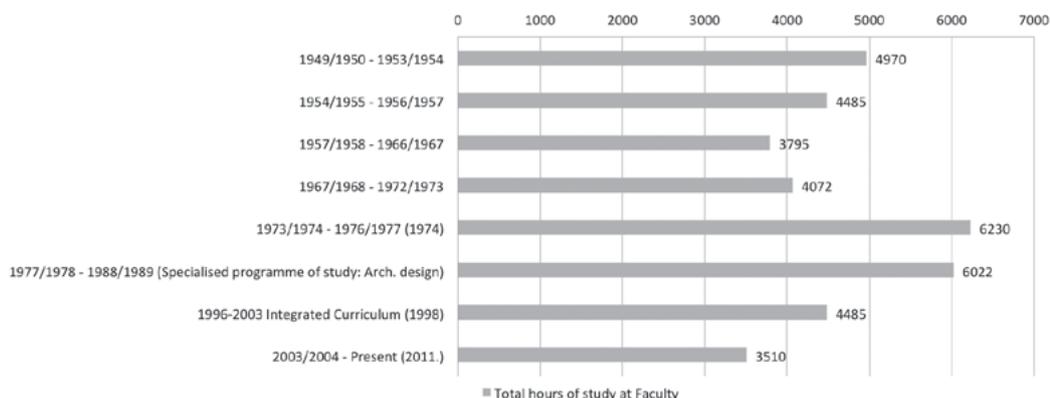


Figure 2. Total number of study hours per curriculums (Source: Emir Fejzić, PhD and Mladen Burazor, PhD, 2016)

CREATING THE HERD PROJECT

How to create an effective, purposeful and well-structured programme in higher education and connect all people is a challenge for every individual, regardless of his/her prior experience. Choosing the right theme that confronts current issues, which have a big impact on the way we behave and perform, is therefore the most important decision.

ENERGY AND ARCHITECTURE

For many years, energy issues have been at the forefront, when lists of priorities in engineering and technology are outlined. There are innovations in technology that help us in everyday tasks and change the way we live and use our time. Technology has always been a driving force for progress, and architects need to react to changes and adequately respond to new needs of users in buildings. So, it seemed more than appropriate to pose a question: Why is the energy issue so important today and how does it relate to the society and architecture?

There is an increase of interest for optimisation in technology, economy, architecture and generally in life. Also, doing more with less until eventually you can do everything with nothing seems like some self-imposed obligatory task, en route to entrenching itself as a mindset. Sir Norman Foster identified in an interview the themes that dominate architecture today while referring to Richard Buckminster Fuller's way of thinking. *Never has the exhortation to "do more with less" – to make an enclosure lighter, to use materials more economically, to consume less energy – been more relevant. The principles of sustainable design, which Bucky really pioneered, are completely central to architecture today.* (Foster, 2014)

Words such as "efficiency" and "sustainability", over the last few decades, have entrenched themselves very firmly – metamorphosing from jargon to 'household words' – when it comes to dealing with energy and energy sources. Architects advocate "sustainable architecture" and "zero emissions" and look for ways to utilise less energy and gain more comfort. In theory, this sounds very good when we think about future projects, but what happens when we come down from the "global" to the "local" and observe the status quo?

Concept models, regardless of scale, will behave exceptionally, but in real and quotidian conditions there are always unforeseen influences.

Architects are devoted to creating something new, which, due to their creativity, contains added value that can be perceived by users. They take pride in their work, as long as things are working out well. However, mistakes in the built environment caused by architects and urban planners linger on for decades, affecting many people, and are often very difficult (or even impossible) to correct. This is the very reason why architects have to be self-critical and scrutinise their own ideas and attitudes, continuously.

Some may argue that too much focus was placed on technology and that basic human needs were often forgotten during the design process. Enclosed spaces have an artificial environment controlled by computers programmed to conserve energy and perform efficiently without human interference. But in the process, sometimes one forgets about the basic human needs and reactions and why it is important to be able to simply open the window in an office space in order to naturally ventilate the room.

In BiH, 97.4% of the total housing building stock is represented by individual housing (i.e. single family houses - 93.9% - and terraced houses - 3.5%), and the remaining 2.6% is multifamily housing according to a survey conducted by the Agency for Statistics (GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit); Energy Efficiency Consultancy in Bosnia and Herzegovina, 2015). As for the number of individual living units (flats/apartments), 66.4% is within individual housing and 33.6% within multifamily housing (GIZ - Energy Efficiency Consultancy in Bosnia and Herzegovina, 2015). The significance of these numbers is that the majority of people in BiH live in single family houses which necessitates a focus on this category of buildings when it comes to further discussion about energy saving plans on a national level. Furthermore, an interesting indicator is that only 49.9% of the entire surface area is heated in single-family houses (GIZ - Energy Efficiency Consultancy in Bosnia and Herzegovina, 2015); Energy Efficiency Consultancy in Bosnia and Herzegovina, 2015). There are more questions to which answers could be sought - "Why is only half of the building heated?" "Is it because the house is not completely used, or is it because heating the entire building would be expensive?". This is just



Figure 3. Left image - opening meeting at NTNU (from left: Sonja Jurošević, Torbjørn Tryti, Tore Brandstveit Haugen, Neran Rustempašić, Lemja Akšamija-Chabbouh, Dženana Bijedić, Mladen Burazor); Right image - Work in progress at NTNU (from left: Sonja Jurošević, Mladen Burazor, Dženana Bijedić, Steffen Wellinger, Lemja Akšamija-Chabbouh; (Photo credit: Neran Rustempašić, PhD, 2012).

an example of why scientific research has to be conducted for the benefit of the entire population.

Observing new tendencies in technology, evaluating and making them applicable to architecture from urban level to individual buildings and interiors, is the only way forward. The first step in the implementation phase is knowledge, which is essential to the recognition of the need to implement innovations. Thereafter, one devises strategies and approaches to influence and bring about the much-needed changes. Students of architecture gain knowledge at their faculties and that is the place for fostering “the right” attitudes towards energy efficiency. Faculties are also places which can and have to influence national policies by offering expert opinions and suggestions to lawmakers.

Words such as *knowledge*, *innovation*, *perception*, *attitude*, are, by default, embedded into the curricula of faculties. Using these words in the context of sustainability and energy efficiency in architecture is a subject of discussion. Therefore, it seems appropriate and even essential to rethink architecture and energy efficiency in buildings and urban development.

ESTABLISHING STRUCTURE

Theme selection is just the beginning. The most challenging part comes next. It is the structuring of the project. Defining specific objectives, performing risk analysis, identifying indicators of success, setting milestones, setting up a budget, involving people and ensuring continuity and sustainability, are from an organisational point of view, very challenging.

In order to prepare the project application, two meetings were held, first in Trondheim and then in Sarajevo. At these meetings, the representatives of AFS (Dženana Bijedić, Neran Rustempašić, Lemja Akšamija-Chabbouh and Mladen Burazor) and NTNU (Hans Narve Skotte, Markus Schwai and Steffen Wellinger) worked together on the framing of the project (Figure 3).

As a result of these meetings, specific objectives were established with the sole purpose of supporting **students** in their quest for knowledge, **teachers** in strengthening their expertise as well as perfection of teaching skills, and enhancements in the **curriculum** – the last one being the link between the desirables for both students and teachers.

Students who were enrolled at the Faculty of Architecture in Sarajevo, after the most recent

curriculum change (2003/2004), in general, criticise the number of exams that they have to take. From around 45 exams in five years that students had to take in the pre-Bologna study programme, that number has risen to around 69 in the Bachelor course and around 30 in the Master course - an increase of more than 100% compared to the previous curriculum. While analysing the total number of hours students had to spend at the faculty working on projects at the Department of Design, a reduction in the number of hours spent on practicals can be seen while the number of lectures has increased (Figure 4). For students, this means that they spend more time on lectures and less working on actual architectural design compared to the previous generations. Given the nature of architecture, the reduction of actual time spent dealing with that form of design was seen as a problem that needed to be addressed.

At the time of the HERD project application, energy efficiency issues in buildings were studied at AFS as part of architectural physics subjects. However, in other subjects, students were not required to examine the effects their design had on energy needs and consumption.

From the point of view of the representatives of AFS, creating an environment where students would have fewer exams to take, spend more time on architectural design and learn about energy efficiency in buildings and urban planning, as an integral part of the design process, was the main line of interest. Finding the right modes to enhance the innovative capacity of teachers and providing students with answers to shortcomings in the curriculum had become the primary goal.

Teachers are those who create content and define learning outcomes in such a manner that students gradually gain skills and prepare themselves for real-life architectural work. For this reason, it is important to assist teachers in enhancing their educational capacities. Capacity building at an institution can be achieved through exchange of teaching experience, collaboration in research, study visits and courses. Therefore, the intention was to engage faculty staff in those versatile activities and form collaborative groups which would generate a positive feedback. At the same time, it was important to create a platform for transferring research results through seminars, conference presentations and publications and to draw benefits from other projects.

The curriculum has a principal role in the transfer of knowledge between teachers and students. Given the overall importance of energy efficiency and sustainability in architecture, it is important to incorporate those themes into existing courses and even create new ones with the intention of raising awareness about causes and effects within that relationship. Development of new courses with appropriate content and structure which are inclusive in terms of the energy component and acknowledgement of the challenges of efficiency and sustainability in architecture, is an approach worth examining. Establishing links between educational institutions and industries in relation to student projects, and also including practising architects in the academic/pedagogical process, is certainly a way to improve the curriculum.

Students who are enrolled in architectural courses at the academic institutions in BiH

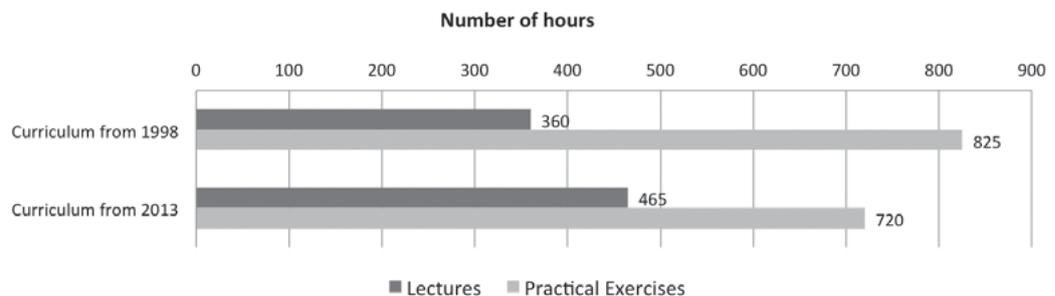


Figure 4. Total number of hours for lectures and practical exercises at the Department of Design (Source: Mladen Burazor, PhD, 2013).

will seek employment in building companies, architectural offices or institutions that are dealing with the built environment. Therefore, the role of education in shaping the built environment in BiH is crucial. It is important to bring energy issues to the attention of future architects as early as possible. This is where the faculty's curriculum plays a key role.

IMPLEMENTATION OF THE HERD PROJECT AT AFS

From the point of view of AFS personnel, who were dealing with the structuring of the HERD programme, the main lines of interest were to positively affect the curriculum form and, at the same time, improve the content of the study programme. Fewer exams, more time spent on architectural design and a wider knowledge of energy efficiency in buildings and urban planning, as an integral part of the design process, were the principal goals. **Introduction of design studios** was recognized as a way to affect both form and content of our curriculum. However, there were several challenges ahead, the first one being the need to engage the staff in the creation of new content.

Lack of interest of the personnel to engage in new projects is understandable if one takes into account their professional obligations. Some may be interested in pursuing an academic career, while others may wish to practise architecture and the timing of a new project might be bad for some. So, those who agreed to participate were obviously keen on widening their knowledge and venturing into an unfamiliar territory where they could, through collaboration, learn something new and at the same time, improve their modes of teaching.

INTRODUCING STUDIOS (CHALLENGES OF CREATING STUDIOS)

Although there were some attempts in the late 1990s by teachers at the Department of Architectural Design and the Department of Urban Planning and Design to work on faculty projects with students in the "studio manner", this concept never gained momentum before the introduction of the HERD programme. There could be many reasons why studio work did not come to life and

here are three possible reasons why this did not happen: reluctance to make an **additional effort** required to create them, **fear of losing autonomy** and **clash of views**. Adjustment of the curriculum and the introduction of new study material require additional effort in comparison to the established form and content and for many it is an unnecessary nuisance (Fejzić, 2016). Teachers have autonomy in creating and shaping their subjects. This is why it always becomes difficult to design a curriculum together with others. There is, as mentioned earlier, an insecurity regarding the loss of autonomy once the studio is established. Also, it might be even harder to make additional changes (because it would require another set of discussions/negotiations) in comparison to making changes to individual subjects, which are in that sense more agile (presuming that in this case additional efforts are not an issue). Merger of several subjects into one studio where each subject has retained its individuality and was not modified, as opposed to amalgamation can easily be perceived. As one student observed, there is: *"no strict connection between two subjects"*; (Burazor, Student evaluation of HERD course, 2015)

However, this approach should not be perceived negatively since it affects the form and that in itself is an advantage to students who have fewer exams to take. But, when the issue of content is also addressed, more advantages come to the fore, since students are working on a single project instead on several unrelated ones.

Although teachers always encourage their students to make their own conclusions based on facts and analyses, when it comes to the designing part, students are often influenced by their mentors, who are unwittingly imposing their views (Zagora, 2016). So, being exposed to a clash of views where each architect/teacher express his/her opinion on a single design, may prove challenging for students. As one has noticed: *"The main weakness of this course could be the number of teaching staff. There were eight members of teaching staff and twelve students. At first sight, it may look like an ideal situation, but almost every single member of the teaching staff had different views and opinions on the same thing, and was giving different suggestions. From time to time, this was frustrating and disorientating and on the other hand challenging."* (Burazor, Student evaluation of HERD course, 2015)

Students may perceive opposing views or a clash of arguments as a difficulty in their work but, that in itself is the essence of the guidance process. Exploring solutions to a given problem from various angles is a mind exercise where students learn to find arguments to defend their own views. As long as teachers are not imposing their views but rather guide students, there is no fear of personal confrontation between teachers.

STUDIO STRUCTURE AND DISTRIBUTION

In 2014, after a series of teaching staff meetings, six elective studios were structured and in October, at the beginning of the new academic year, students were able to choose their first studio. Those elective studios were positioned in the first or second year of the Master course. They were distributed throughout semesters and study years in such a way to allow for their gradual introduction and there were two reasons for such an approach. The first reason was the number of strictly assigned ECTS credits (7, 9 or 10) for elective subjects per designated semester and the second was to provide students an opportunity to continually increase knowledge from one semester to the other regarding energy issues. Otherwise they would have to choose between one and another studio in one semester (Table 1). However, due to a total number of offered studios, some overlapping was inevitable.

Themes for the four envisioned studios originated from the teaching staff from the Department of Architectural Design and the other two originated from the Department of Theory and History of

Architecture. Eventually, five out of six studios were formed, and, most importantly they were formed and conducted by teaching staff from all six departments of the faculty. Overall, 10 different teachers participated in the five studios (some of them in several studios) working with 11 teaching assistants and introducing guest lecturers from architectural practices, government institutions and other faculties.

RESULTS OF THE HERD PROGRAMME

Results of the HERD programme can best be examined by observing the impact it had on students, teachers, and the curriculum – an analysis, in other words, of whether specific objectives set in the programme were met.

THE STUDENTS

From 2014 to 2016, students had an opportunity to work on projects in studios where they met and discussed their ideas with people from architectural practice, who work in government institutions or industries. At the Contemporary Spatial Concepts, Design and Prototype studio, guest lecturers from architectural practices shared their experience with students and contact with manufacturers was directly established so that students had an opportunity to witness the manufacturing processes first-hand. In the studio that was dealing with problems of modernity of single/family houses, students worked on real-life projects establishing contacts with administrative personnel from municipalities and incorporated

COURSE LEADERS	TIMELINE							
	Oct-14	Jan-15	Feb-15	Jun-15	Oct-15	Jan-16	Feb-16	Jun-16
STUDIO 1 Ugljen-Ademović/Salihbegović								
STUDIO 2 Akšamija-Chabbouh								
STUDIO 3 Pašić/Cengić								
STUDIO 4 Salihović								
STUDIO 5 Idrizbegović-Zgonić/Pašić								

LEGEND:

	- first time introduction
	- repeated course

Table 1. Elective studios timeline
(Source: Mladen Burazor, PhD, 2016)



Figure 5. Student presentations at NTNU
(Photo credit: Emina Alić, 2014).

suggestions into their designs in order to make them realistic. In studios that were dealing with historical aspects of buildings (preservation, revitalisation), students worked with experts in mechanical engineering and learned how to use appropriate software for the calculations of energy needs. Working in the studio that links urban planning and design of public buildings, students had an opportunity to learn about the surveying methodology in establishing parameters for the most appropriate sites for cultural buildings. From the students' perspective, the work in a studio has provided them with a better understanding of what architecture is and prepared them better for situations in future practice.

While participating at workshops in Norway, 25 students from BiH, had an opportunity to see the conditions in which Norwegian students learn, as well as advantages and disadvantages perceived in the two institutions (Figure 5). Through the exchange, and while working with host students, they were able to evaluate their own work and compare themselves to foreign students, thereby identifying points for self-improvement. Equally important, those selected students then disseminated information among other students in respective studios.

As intended, having fewer subjects and therefore fewer exams to take made a difference for the students. They saw it as an advantage and when asked about the strengths of the course they

replied: "...One subject with more ECTS points...; The fact that we had only one final project instead of two;" (Burazor, Student evaluation of HERD course, 2015)

THE TEACHERS

Teachers, who are not primarily dealing with energy efficiency and sustainability themes, participated in related activities that increased their knowledge. Owing to the prior HERD energy programme at the Faculty of Mechanical Engineering in Sarajevo, a training programme for energy audits and energy certification of facilities was organised with participation of teachers and assistants from the AFS. Upon completion of this course in 2014, three teachers from the Department of Design were awarded certificates. Two of them were further engaged in energy themes in housing together with a senior teaching assistant from the same department, as part of a team working on a project entitled National building typology in BiH. This project, backed by the German Organisation for International Cooperation (Deutsche Gesellschaft für Internationale Zusammenarbeit - GIZ GmbH), relies on academic staff from both faculties of architecture in Sarajevo and Banja Luka as well as the mechanical engineering faculties in those two cities.

Along the lines of continuous improvement, one representative from each studio had an opportunity to travel to Trondheim and experience



Figure 6. Left image – Lecture given by professor Hans Skotte, PhD, Right image – a seminar at Jahorina (staff from NTNU, AFS and AGFBL: from left: Markus Schwai, Lejla Šabić Steffen Wellinger, Hans Narve Skotte, Luca Finocchiaro, Aida Idrizbegović-Zgonić, Senka Ibrišimbegović, Sladana Miljanović, Malina Čvoro, Nevena Novaković); (Photo credit: Mladen Burazor, PhD, 2015).

teaching and work methods of colleagues at NTNU. Public lectures and a seminar held in BiH also served as a platform for exchanging teaching experiences and disseminating research results (Figure 6).

At the level of the elective studio itself, collaboration between staff from different departments was perceived by some as a strength with far reaching impact. Strengths perceived by the teaching staff in a studio were: *Teamwork and collaboration between different departments and cooperation with local institutions on improving the quality of life for the whole community (EE highlighted as an important topic in housing quality) holistic approach to problem solving* (Burazor, Teacher's evaluation of HERD course, 2015). Also, when asked to grade collaboration with colleagues from other departments in that studio, all members of the teaching staff gave it the highest grade i on the given scale. This may not be the case with every studio, however, the learning outcome from collaboration, which cannot be dismissed, is most important. Content-wise, perhaps the best illustration of the importance of the new content is provided by a member of the teaching staff, who commented: *The course can be described as a serious effort to combine philosophical/theoretical and technical knowledge in an attempt to create a successful design* (Burazor, Teacher's evaluation of HERD course, 2015).

CURRICULUM IMPROVEMENT

Based on the analysis of the shortcomings of the existing curriculum at AFS (form and content), the HERD programme was structured in such a manner as to address those issues. Perhaps an appropriate question would be: *Did we really need some external influence in order to make an attempt at introducing changes to our curriculum?* After taking into consideration the reasons behind earlier curriculum changes in the history of AFS (industry demands, war, political decisions) the simplest answer would be “yes”. In history of the AFS curricula, external factors (that could not be ignored) have always been the reason behind a change. This is logical since higher education serves as the country's development platform to educate population, produce innovations and assist in creating development strategies. The answer to the previous question is affirmative since the HERD programme is by all means an external influence. It is funded by a foreign country with the purpose of addressing energy issues in higher education in a way to affect the curriculum. In practice, the HERD programme offered a platform to try out possible models of overcoming the shortcomings at AFS. At most, 48% of students in a semester were influenced by the changes in the curriculum. HERD elective studios offered an alternative to the existing subjects and in terms of content that change amounts to 69%. The overall

change of the curriculum in the master course is 20%, which is a significant change if we consider that a 25% change in a curriculum amounts to a new curriculum (Table 2).

In general, a change in the curriculum can be approached from two angles: restructuring of an existing programme or creating a completely new one (Gehmlich, et al., 2008, p. 3). Both approaches can involve collaboration with the existing or new international partners. Historically speaking, the curriculum at the Faculty of Architecture has gone through several phases of evolution in terms of form and content. However, the latest change (year – 2003) brought about by the Bologna process, has affected the curriculum unfavourably and a revision is long overdue. HERD programme served as a platform for both evolutionary and revolutionary concepts. It was leaning onto the existing structure of the Master course and, at the same time, offered an alternative in terms of form and content.

In February 2016, a Committee for Curriculum Change and Amendment was appointed at the Faculty of Architecture in Sarajevo. It consists of one representative from each department, one representative of senior teaching assistants and assistants, one student representative and vice dean for student affairs. Six out of eleven members of this commission were, at some point, involved with the HERD activities, whether through participation in studios or their organisation. This information is significant in terms of discussions related to the introduction of studios as obligatory in Bachelor and Master Courses. For the personnel involved in the HERD elective studios, their insights into the advantages of work in studios, as well as identified difficulties in work processes, will prove valuable in suggesting solutions. Reducing the number of subjects and integrating related study material into studios is certainly a way forward.

Semester	ECTS per semester	Max. number of ECTS for elective subjects	Academic year 2014/15	Number of ECTS for studio	Number of students in studio	Total number of students in semester	Percentage of students who attended HERD studios	Academic year 2015/16	Number of ECTS for studio	Number of students in studio	Total number of students in semester	Percentage of students who attended HERD studios
I	30	7	Studio 1	7	12	56	21%	Studio 1 Studio 4	7 7	14 17	64	48%
II	30	9	Studio 2 Studio 3	9 9	7 8	61	25%	Studio 2	9	8	63	13%
III	30	9				57		Studio 5	8	15	53	28%
IV	30	10				56					53	
Total ECTS for Master:												120
Maximum number of ECTS for elective subjects:												35
Maximum possible ECTS a student can accumulate by attending HERD studios in Master course												24
HERD studios vs. other elective subjects												69%
HERD studios' share in Master course												20%

Table 2. HERD studios' influence on students and the curriculum, (Source: Mladen Burazor, PhD, 2015).

CONCLUSIONS

This paper represents an overview of the most recent efforts towards curriculum improvement at AFS. From the historical point of view, introduction of the Bologna system represents a crucial milestone for the higher education in BiH. Introduction of a new system implies a transition process which can last for years and in turn it means making the necessary adjustments and revisions. Now, after more than a decade since the introduction of the Bologna system at AFS, there is an urgent need for improvements in order to address all identified shortcomings. It is imperative to reduce the number of subjects and exams, and it is equally important to improve the content of the curriculum. Striking the right balance between theory and practice is yet another priority.

At AFS, the HERD programme was used as a platform to deal with the transition process and test possible solutions. In this paper, several scientific methods were used in order to examine the role and evaluate results of the HERD programme. Interviews with teachers and students, as well as surveys, helped as an assessment tool. A comparative analysis of the pre-Bologna and the Bologna curriculum was used in order to emphasise the shortcomings (i.e. reasons for the change) and to show to what extent has the Bologna curriculum changed under the HERD programme. It is evident from the empirical set of data documenting these changes that the change has been significant.

Based on facts and figures presented in this paper, it can be concluded that the HERD programme is indeed responsible for the systematic integration of different subjects into studios under the umbrella of energy efficiency. Studio work was (re)introduced and the HERD programme is responsible for the motivation of teaching staff in making additional efforts to create new content. Teachers and teaching assistants from different departments collaborated in those studios in such numbers previously unseen in the history of AFS. Challenges that teachers had to surmount and achieved results now serve as a base on how to treat the entire curriculum for both the Bachelor and the Master course.

The HERD programme has influenced both students and the teaching staff. It supported activities related to an exchange of teaching experience, collaboration in research, study visits and dissemination of research results. It is responsible for addressing the shortcomings of the current curriculum in terms of form and content and based on the fact that there is a 20% change of the curriculum in the master course, it can be concluded that the **HERD programme has made a significant change towards the development of a new curriculum at the Faculty of Architecture in Sarajevo.**

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Erdin Salihović, PhD

Associate Professor,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
erdins@af.unsa.ba



Nermina Zagora, PhD

Senior Teaching Assistant,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
nerminaz@af.unsa.ba



Amra Salihbegović,
M. Arch.

Teaching Assistant,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
amras@af.unsa.ba

CHALLENGES OF THE THEORY-PRACTICE DICHOTOMY IN ARCHITECTURAL EDUCATION

A CASE STUDY – ARCHITECTURAL STUDIO “CONTEMPORARY SPATIAL CONCEPTS, DESIGN AND PROTOTYPE”

ABSTRACT

Curricula of most architectural schools globally have been grounded on one of the two polarised concepts, favouring either theory- or practice-based learning models. Since there is no particular concept or formula that would correspond to the context of continuous diversification in architectural practice, the schools have generated individual curricular reforms and embraced more flexible approaches, which would easily bridge the gap between theory and practice. In that sense, evaluation of the traditional curriculum at the Faculty of Architecture of the University of Sarajevo has shown that its weakest link can be identified as the goal-oriented abstract educational model, in which the students are pragmatically expected to focus on completing their tasks instead of concentrating on the thinking and creative process, analysing and experimenting. One of the examples of changes in this static approach to learning was the introduction of the prototype production within the Interior Design course, owing to a series of collaborations with furniture production companies in Bosnia and Herzegovina over the last seven years. Another significant transformation in the curriculum was generated by the introduction of the HERD programme, especially in promoting the concept of collaborative teaching methodology in studios. This paper will elaborate the process of curricular transformation in the case of “Contemporary spatial concepts, design and prototype” studio.

Keywords: *architectural education, curriculum, theory, practice, networking*

ARCHITECTURAL EDUCATION: THEORY VS. PRACTICE

One of the most important challenges in contemporary architectural education is finding the right balance between two polarised concepts – favouring either theory-, or practice-based learning models. The main arguments of those in favour of the theoretical model are that architecture faculties “... *should not be technical schools but should teach students to analyse, design and think*”. (Temkin, 2002) Reinforcing the theoretical aspect in architectural education is essential for developing a neutral and independent academic stance, with a capacity and responsibility to critically evaluate the limits and challenges of architectural practice.

On the other hand, educational strategies focusing on the purely theoretical curricula can be criticised for endorsing a school concept as “*a place of fantasy removed from the needs of the real world in which the students will work when they graduate.*” (Lawson, 2005)

In other words, instead of remaining isolated and indifferent to practice, architectural education should focus on the development of skills and applicable knowledge for the real world.

On one end of the curricular spectrum are the theoretically oriented passive modes of learning; while, on the other end, we have the practice-oriented models, which prioritise the “know-how” over theory. (Hickman, 2005). In support of the latter perspective, some of the innovative

educational strategies and methodologies were developed at the beginning of the new millennium including the *PBL/Project Based Learning, Live-simulated Hybrids* and *Live Projects*. These educational models focus on creating skills and competences, which will enable the students to critically analyse and evaluate specific problems as well as to perceive and understand their projects in relation to their context. Simultaneously, the theoretical aspect in education possesses an interdisciplinary character and a variety of methodological approaches, capable of “*introducing criteria, enriching the knowledge and creating order, at the same time representing a creative construct*”. (Folić, 2010)

Architectural theory and history, combined with all relevant experience and knowledge from the earlier historical epochs, represent an essential platform necessary for understanding the contemporary architectural discourse. In this sense, the architectural profession requires a lifetime education, comprising of both theoretical and practical aspects, while architecture schools can be regarded as “*a starting point on the path to architecture, where students are guided towards their individual directions*”. (Gharaati, 2006)

Due to the processes of diversification and emergence of a variety of specialisations in architecture worldwide, there is no need to develop the universal educational or pedagogic

principle, applicable in all scientific and professional settings. The path to improving the efficiency of educational process and the quality of academic programmes will require a continuous evaluation of the existing status of individual programmes as well as the introduction of flexible approaches and methodologies aiming to bridge the gap between architectural education and practice. In this sense, the current status of the model of the academic programmes at the Faculty of Architecture of the University of Sarajevo requires critical evaluation, as a first step towards a new and reformed curriculum.

DEVELOPMENT OF THE ACADEMIC PROGRAMME AT THE FACULTY OF ARCHITECTURE UNIVERSITY OF SARAJEVO

The academic programme of the Faculty of Architecture of the University of Sarajevo originates from the legacy of technical traditions of the central European capitals, and it was established by architects who graduated from the technical universities of Vienna, Budapest and Prague, as well as from the former Yugoslav centres of Zagreb and Belgrade. The academic staff who founded the first tenures at the Technical University of Sarajevo was comprised of renowned architects who practised in the period between the two world wars. They directed a gradual and linear evolution of the programme, which was rarely modified or broadened outside the initially-defined academic limits. The process of evolution of the initial educational model was rather inert and the teaching techniques were rarely criticised. This gradually led towards an academic model with an inadequate relationship between academic and professional practice.

Nevertheless, among the initial academic staff of the Sarajevo school of architecture who demanded thorough reforms of the initial static concept of education was Professor Juraj Neidhardt. Neidhardt's international educational background of studying in Vienna and actively practising in the architectural studios of Peter Behrens and Le Corbusier, helped him learn about the essence of architectural education and the actual role of a teacher: *"Teachers should avoid stereotypes in teaching and also refrain from making assumptions. Their role is to guide the students. The pedagogic capacity of a teacher*

depends on how successful s/he was in encouraging the students in their own autonomous decision-making..." (Karlić-Kapetanović, 1990)

Moreover, Neidhardt criticised the structure of the academic programme which prevailed at that time for being too fragmented and proposed that the smaller courses be integrated into larger units of the architectural field of study.

The initial stages of development of the educational system in the 1950s and 1960s were directly influenced by the post-war social context, and the resulting academic disorientation can be associated with inadequate working conditions, limited institutional autonomy and the reduced information flow in architectural education and the profession.

Nevertheless, even after the recent attempts to improve the academic programme by the introduction of two study cycles in 2006, the Faculty of Architecture has not obtained the mode to adequately relate with professional practice and the labour market. The current academic programme has proven to be inert in terms of relating to the changing needs and impulses of the architectural profession. This is why architectural studios, industries and contractors often require graduate architects to undergo further specialisations and training. All these reasons reveal the necessity to deal with the state of educational atrophy and search for the balance between theory and practice, making the transition between school and the workplace easier. Of course, this does not mean that the two worlds should be integrated or merged together, bearing in mind that the education process should preserve its academic stance, while professional practice must be receptive to the demands of clients and market dynamics. However, it is still possible to syncretise the two realms and reap mutual benefits.

Although there have been individual improvements on the level of organising international workshops and design studios in several courses over the last decade, the most dominant teaching method at the Faculty of Architecture in Sarajevo still remains constrained by the ex-cathedra cognitive format. Another problem is the fragmentation of study areas and the lack of interdisciplinary collaboration, leaving the individual academic tenures and courses isolated and unrelated to a broader academic and research context. The

weakest link of the inherited educational system is the “goal-oriented learning” in which the students pragmatically concentrate on completing the predefined tasks, without engaging in the process of thinking, studying, testing or analysing the full complexity of design problems. Design courses are often based on abstract assignments, which are then followed by design development under exclusive supervision by the academic staff. These conjured scenarios are not related to reality, to the needs of stakeholders and other external factors - economic, technical and organisational challenges, time limits and compromises which are part and parcel of the real design process.

The Faculty of Architecture in Sarajevo stands at the crossroads of educational reforms, facing contemporary challenges and the necessity to adapt to real-life scenarios. One innovative teaching model is the PBL (Project Based Learning) which deals with real projects and stimulating issues and assignments, in order “... to teach students academic content of working cooperatively to solve the problems”. (Bender, 2012) Instead of potentiating final results in the education process, PBL develops typological approaches, which gradually engage the students to understand the project comprehensively in order to complete genuine realisations. PBL also endorses interactive techniques such as *brainstorming* and *student voice and choice*, giving the priority to students to express their own opinions and ideas. Unlike in imagined assignments and their hypothetical locations, PBL involves visits to, and explorations of the real locations related to the project. Moreover, the software tool “Web 2.0” enables team work and collaboration in a modern technological environment in which the students “...are actually creating knowledge rather than merely using technology to passively gain knowledge”. (Bender, 2012)

The intended curriculum reform at the Faculty of Architecture in Sarajevo will consist of establishing obligatory multicourse design studios, followed by real architectural and urban design assignments and an interdisciplinary approach. The new methodological platform will also involve a mind-set change for all the stakeholders in the educational process, as well as an elimination of prejudices, and overhauling of traditional attitudes.

The moot question is whether the existing structure of the Faculty of Architecture can respond to the challenges of rapid transformations in professional practice and a constantly evolving technological environment.

STUDY PROGRAMME EVOLUTION IN THE DEPARTMENT FOR INTERIOR DESIGN

Academic courses within the Department for Interior Design at the Faculty of Architecture in Sarajevo have transformed over the last two decades, in response to the most important developments in academia and professional practice, trying to address the issues and challenges of correlation between theory and practice. The original curriculum mainly corresponded with the programme of the Department for Housing, in which the students were developing interior design projects based on their own housing design projects from the previous semester. Within such a hypothetical framework, the students mainly focused on graphics and visual representation rather than on analytical or conceptual phase. Even though the methodology of aligning common study areas and collaboration between the Department for Housing and the Department for Interior Design had a positive connotation, the final result was a hermetically enclosed project, lacking the connections with the real design challenges.

One of the major steps in the evolution of the curriculum was the introduction of the assignments which involved an interior re-modelling of the existing dwelling. Design briefs were equivalent to the real professional commissions, and consisted of several stages, including the architectural measuring and recording of the existing space, evaluation of the structural and infrastructural constraints and potentials. These assignments enabled the students to acquire a more conscious and responsible approach while approximating their learning process to the real life experience, at the same time.

In order to promote a more active and dynamic educational programme, the Department for Interior Design initiated a collaboration with the industrial realm in 2009, taking the students out of their conventional educational setting and

giving them the opportunity to discover their own creative potentials within a practical and realistic framework. The introduction of a practical component in the academic curriculum has shifted the role of the students from their static positions to a new perspective of holistic and critical thinking, which leads to more innovative design solutions.

Advantages of *live projects* and *proto-practice* lie in establishing an open dialogue between the academic institution and social needs within the interdisciplinary educational process, thus creating a purposeful liaison among the academic staff and students on the one hand, and the professional experts and industry-representatives on the other.

Students got to know about the technical and technological constraints that are encountered in the reality, owing to their interaction with the industry. This further enabled them to understand the advantages and disadvantages of employing different materials, directly influencing the formal, functional and structural aspects of the finalisation of their design concepts.

Seven years of collaboration with the industrial sector have resulted in a variety of experiments in the transformation of the conceptual sketches, detailed design drawings and models into prototypes. The production of the prototypes is often accompanied by unpredictability and uncertainty until the final product is released,

which also adds a specific creative quality to the educative process. The students benefit from the adventure of encountering the unknown and getting familiar with the process of experimentation. Most importantly, the students are given the opportunity to establish direct communication with the industrial realm, thus acquiring invaluable experience in the process of converting their own ideas into real designer products.

On the other hand, furniture production companies gain from collaborating directly with the academia, especially in the process of selection and acquisition of the best student designs, which are on occasion further developed and launched in serial productions, enriching their own design lines and collections. As the wood processing industry expands and becomes increasingly prominent in Bosnia and Herzegovina, collaborations between academia and industries will gain more significance for fostering the development of authentic local design and products.

The methodological approach of *proto practice* in the case of the Master level course in Interior Design has shown that networking between academia and domestic furniture companies has broadened earlier perspectives of the public and generated further initiatives, with new companies approaching the Faculty of Architecture and joining in the collaboration in the following semesters.



Figure 1. (Left and centre) Student Haris Bulić participating in the prototype development phase at the furniture factory in Sarajevo (Photo credit: Narcisa Gaković, 2014); (Right) Image of the final stage of the prototype (Photo Credit: Armin Kešo, 2014)



Figure 2. Exhibition of the realised prototype of best student furniture design project in 2014 and 2015 at the Faculty of Architecture University of Sarajevo (Photo credit: Nermina Zagora, 2016)

Educational strategies of this kind imply “... *reinventing the school not as an established hierarchy, but as an orchestrated network*” (Hunter, 2012) and bring about inventive outcomes, which directly correspond with actual social needs. Interaction between the theoretical and practical models of teaching not only enables the students to gain practical experience, but it also helps them develop social and communication skills, therefore preparing them for the concrete professional challenges.

CASE STUDY: LAUNCH OF THE ARCHITECTURAL DESIGN STUDIO “CONTEMPORARY SPATIAL CONCEPTS, DESIGN AND PROTOTYPES”

The introduction of the HERD study programme at the Faculty of Architecture, University of Sarajevo has uncovered opportunities for an integrated approach in design and empowered networking at different levels of architectural engineering. The architectural design studio

entitled “Contemporary spatial concepts, design and prototypes” was launched within the framework of the HERD programme and dedicated to the conceptual design approach of modular pre-fabricated buildings, specifically focusing on energy efficiency in architecture, interior and furniture design. The implementation of principles of energy efficiency in education has been motivated by the ecological and climatic challenges the world is facing. The emergence of this paradigmatic shift in contemporary architectural education aspires to raise consciousness and teach about the postulates of energy efficiency based on vernacular principles, which should ultimately lead to the development of energy-efficient and environmentally responsible design solutions.

The potential of advancing energy efficiency in education lies in a systematic and holistic approach in architectural design encompassing design considerations, the built environment, social, cultural and political contexts, environmental concerns, economic and technological considerations and the occupants. (Gucyeter, 2016)

There are several methods of adapting academic curricula according to the postulates of energy efficiency – from a broader context, via establishment of interdisciplinary studios, to creating modifications of existing minor courses in a narrower context, or, otherwise the adjustments can be made in the process of revising the curriculum completely. (Rusinko, 2010)

Even though there are diverse approaches when it comes to conceiving the new framework in architectural education, all of the aforementioned methods, along with their potentials and weaknesses, are applicable at different levels of the higher education curricula.

The topic of energy efficiency was explored as part of the new architectural design studio “Contemporary spatial concepts, design and prototypes” from a novel perspective, differently from the way it is studied in existing sustainability courses at the Faculty of Architecture. Another distinctiveness of the new studio was that the modular, prefab architecture design was explored for the first time in a holistic and interdisciplinary manner. Additionally, the subject selection was rather controversial, considering many opposing perspectives, arguments for and against the design and construction of prefabricated buildings in the context of contemporary architecture.

The key learning objectives of the studio included promoting the importance of a holistic approach in design, by simultaneously bringing together architectural, interior and product design, as

well as exploring the innovative potentials in the design of modular, prefabricated buildings and its correlation with smart technology and energy efficiency.

The structure of the studio followed the model of the *Live-Simulated Hybrid*, representing a pragmatic methodological compromise, which focuses studying based on creative assessment and research constructed on a real design brief. Even though the projects would not be actually realised, the structure of the assignments stemmed from real-life scenarios.

The organisation of the studio “Contemporary spatial concepts, design and prototypes” comprised of two levels of networking: firstly, it was realised as a result of an internal collaboration among the academic staff of the three departments at the Faculty of Architecture and secondly, it included an external collaboration among the faculty and professional experts from the realms of design and construction (Figure 4). The main goal for establishing the internal network and to join academic staff from the departments of architectural design, structural design, building technology and architectural physics, was to demonstrate the correlation between all aspects of, as well as the complexity of the design and construction processes of a specific building typology. On the other hand, the academic programme was additionally upgraded by lectures by professional experts who were invited to talk about their successful projects. These invitees explained their own perspectives

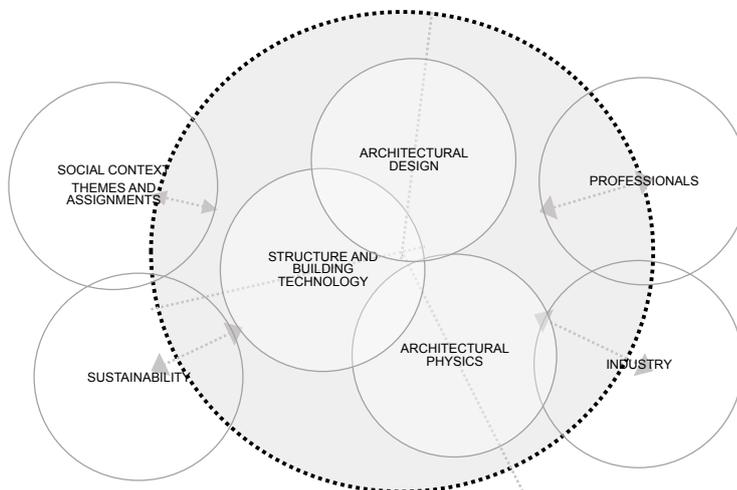


Figure 3. Architectural studio “Contemporary spatial concepts, design and prototypes” structure (Source: Salihović, Zagora, Salihbegović, 2016)



Figure 4. Assignment overview: design parameters and functional typologies (Source: Salihović, Zagora, Salihbegović, 2016)

on the most important issues, challenges as well as possibilities in the domain of prefabrication in architecture.

The studio was initiated by a series of ex-cathedra lectures on the theoretical overview about historical and typological aspects and the methodology of design, as well as the structural and physical characteristics of prefabricated modular buildings. Additionally, the students visited the company “Promo” in the Bosnian town Donji Vakuf, in order to get to know the entire technological process: from design/production, to transport and assembly of the prefabricated buildings on site. The second half of the semester consisted of a student project development in a studio, which was supervised by academic staff as well as external collaborators, who also participated in the mid-term and final evaluations.

In order to allow a certain level of customisation of assignments, the students were given the opportunity to select the specific functional typology out of the three given options: eco-

tourism, urban interventions and urgent/post crisis housing, as well as to select the location for their projects. (Figure 4) In other words, the task was to design modular prefabricated buildings in real locations, guided by the principals of holistic design, from the urban and architectural, to the level of interior and furniture design, at the same time maintaining a balance between the postulates of sustainability and the economic parameters of prefabrication in architecture.

According to the predefined time schedule, the project consisted of three stages: analysis, concept and final design (Figure 5). The design process was initiated by a series of analyses of the selected functional typology, site studies, case studies, programme development, and was later followed by the development of a concept and final design for the individual modular buildings as well as their urban layout on the selected site.

Architectural design studio “Contemporary Spatial Concepts, Design and Prototypes” was successfully completed by 12 out of 15 enrolled students in

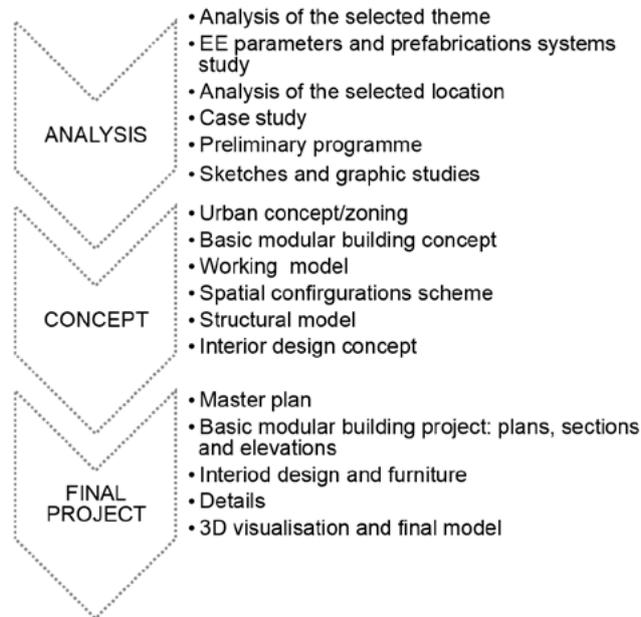


Figure 5. Studio assignment schedule (Source: Salihović, Zagora, Salihbegović, 2016)

the academic year 2015/2016. Evaluation of the final projects was carried out by the academic staff along with the invited professional experts, using creativity and innovativeness, adequacy of technical knowledge and methodicalness as criteria.

The presented illustrations (Figure 6) depict two student projects that were created in the architectural design studio “Contemporary spatial concepts, design and prototypes”. The first project represents the concept of the prefabricated weekend houses, as a part of the designed eco-resort located at the mountainous part of central Bosnia, resembling the form of the mineral pyrite, as a formal association to genius loci, as the site is known for the findings of various minerals. The second project represents the concept of a multifunctional pavilion, which would serve as a workshop and exhibition venue, as an urban addition to the campus of the Faculty of Architecture, University of Sarajevo. The trapezoidal form of the pavilion enables multiple options of horizontal and vertical combinations,

making it almost a universal and versatile ephemeral design, potentially serving various purposes at different locations.

Furthermore, during the process of interior and furniture design, the students have analysed the possibilities of applying ecological and recycled materials and components. They have taken into consideration the possibilities of implementation of principles of low-carbon and low-energy design, accompanied by smart (energy) metering systems.

Bringing extra-academic professionals into the academic environment, as well as expanding the learning setting from the classroom to the factories and real sites, transformed the pilot studio “*into a place of integration of values and knowledge from society into the production of scientific knowledge*”. (Scholz, Mieg, & Oswald, 2000)

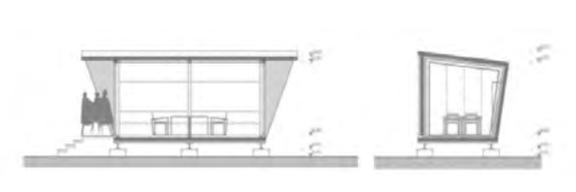
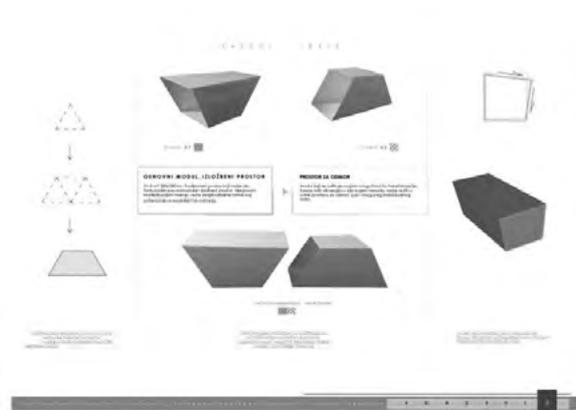
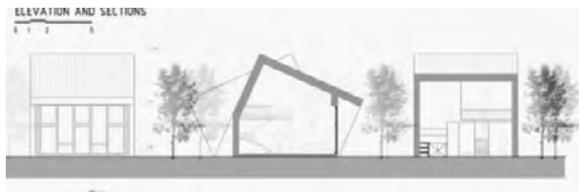
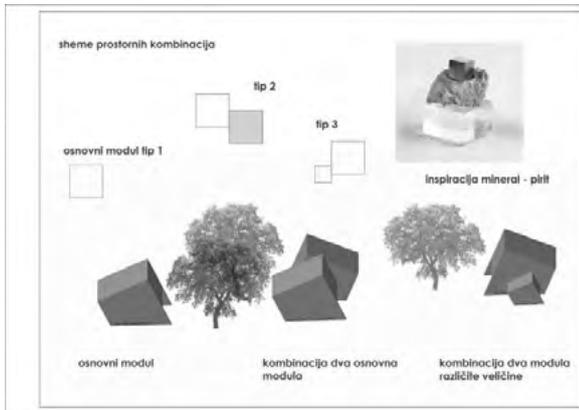


Figure 6. Student project 1: Weekend house for eco resort in Central Bosnia (design by graduate student Šejla Hasanbegović, 2016 (left column); Student project 2: Multifunctional pavilion designed for the campus of Faculty of Architecture University of Sarajevo, designed by graduate student Zerina Alić, 2016 (right column).

CONCLUSIONS

Following the valorisation of the potentials and weaknesses of the educational curriculum at the Faculty of Architecture University of Sarajevo, and continuing the path of transformations of the academic programme at the Department of Interior Design, the architectural design studio “Contemporary spatial concepts, design and prototypes” was conceived and realised outside a strictly-academic scope. The academic structure of the studio was reinforced by two levels of networking; an internal network was established between the three departments at the Faculty of Architecture, while the external network was represented by an interaction between the Faculty on the one hand, and experts from professional engineering practice and industry, highly experienced in the design and fabrication of modular buildings. In this manner, the resulting academic curriculum became flexible and the methodological approach of “learning through making” has blurred the strict academic barriers and constraints. The pedagogical approach applied in this studio primarily required a more active role for its academic staff, whose static “ex cathedra” position was replaced by the role of active participants in the research and experimental processes along with students throughout the design development. The dynamic interaction of teachers, architects, representatives from industrial sector and the students, has yielded an innovative methodological framework and inventive design solutions which responded to the real project demands.

In order to convert higher education into the basis of social progress and true support for the economy of Bosnia and Herzegovina, universities ought to adapt to the rapid and changing requirements of the labour market by means of developing the new and innovative curricula.

The true benefit of emphasising the practical component in the academic curriculum is in the improvement of the labour market and employment conditions, enabling the employers to recognise the true potential, skills and devotion of the young professionals. The link between the academia and the industrial sector can facilitate and accelerate the socioeconomic development in Bosnia and Herzegovina and at the same time raise awareness about the significance of education in that process. The inauguration of the design studios within the HERD programme and the establishment of networks among several study courses, professionals and experts from the industrial realm, have relocated the focus of the architectural education into the real and socially responsible framework.

The introduction of the HERD program at the Faculty of Architecture University of Sarajevo has generated a platform for comprehensive studies on the values of sustainable and energy-efficient models in design and underlined the importance of the design of accessible and adaptable spaces; it has transformed the perception of energy efficiency principles in relation to the design studio, turning it into one of the crucial elements in architectural education.

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Nina

Ugljen-Ademović, PhD

Associate Professor,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
ninau@af.unsa.ba



Senka

Ibrišimbegović, PhD

Senior Teaching Assistant,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
senkai@af.unsa.ba



Elša Turkušić Jurić, PhD

Senior Teaching Assistant,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
elsat@af.unsa.ba

CHALLENGES OF INTEGRATING ARCHITECTURAL THEORY IN EDUCATION THROUGH SITE-SPECIFIC APPLIED PRACTICE

CASE STUDY – STUDIO “PROBLEMS OF MODERNITY OF SINGLE/FAMILY HOUSES”

ABSTRACT

The fundamental problem of this type of studio begins with a question - how to link the current educational process and architectural practice in order to improve the discipline itself?

The actual role of architecture in the new social conditions, brought about by the processes of transition in Bosnia and Herzegovina, considerably deviates from the deep-rooted aspirations of architecture as the human paradigm of society and culture.

This is seen as the turning point where the educational system needs to find appropriate answers to a whole range of problems, from the local to the global level. Therefore, it appears necessary to adopt interdisciplinary thinking so that concrete solutions to the demands of places, users, and local communities can be offered, as well as to the needs of architecture as a cultural product.

A family house is both the most represented typology of residential space and the most germane domain of dealing with (this) new social reality. Therefore, the studio's methodology was developed from the basic tendency towards integration of theory and practice through work on specific locations in the city and in cooperation with relevant planning institutions. By linking the issues of modernity with sustainable design and materialisation, students are encouraged to create thoughtful and creative solutions and promote understanding of architectural design as an open process.

Keywords: *educational process, architectural practice, residential space, modernity, sustainable design*

INTRODUCTION

The traditionally-oriented system of education chose to observe architecture as a dichotomous phenomenon. On the one hand, it emphasised its technical component, and on the other – the artistic. In such an approach, one of the essential expressive features of architecture – the contextual value – was often either overlooked or left exclusively to individual creativity and inventiveness. To a certain extent, this was understandable, because the education system fitted into a firm socio-economic framework, and for the most part, supported strictly-determined design guidelines and parameters provided in regulating and urban development plans. The situation evolved and became more complex over the previous two decades, when Bosnia and Herzegovina was exposed to both transition processes, but also to internal turmoil caused by neo-liberal market forces. In such a context, architectural education found itself facing a conflict between the emerging needs and realistic possibilities. Almost simultaneously with the development of new regulating plans, which is in itself quite a contradiction, a boom of illegal construction occurred, leading to the current situation which could be described as nothing short of alarming, both in terms of social transformation and with regard to the remoulding of community values and to their impact on every individual. Taking into account that educational processes must function in a realistic framework and generate optimal solutions, the design process is organised in two divergent, but inseparable parts.

The first part may be termed ‘deductive’, focusing on the issue of modernity viewed in phenomenological terms, as well as on the issue of housing considered in terms of the transformation of needs of the community and of individuals, moulded as a particular and dynamically-evolving cultural identity. Consequently, the first part of the paper will present an analytical and scholarly description of the design process (in the form of a project programme), with an emphasis on theoretical discourse as the basis for this part of the research work.

The second part of the paper concentrates on the active incorporation of generated findings and on their exemplification in a current, realistic framework on a path to crafting a specific design.

Recognising space as the most important resource which human beings influence and in which they function, and bearing in mind the complex realities in which it develops, the entire work process is framed as a dialectic search for creative contradictions in order to engender new quality, both for individual residential units and for space in a broader sense. Learning to work in this fashion will help students to transcend the issues that are addressed solely within the academic community and train them for working in teams, with participation of other experts in urban planning.

PHENOMENOLOGICAL APPROACH TO MODERNITY IN SHAPING RESIDENTIAL SPACE

The idea for the examination of the issue under consideration is found in the fact that most construction is related to family residences, which ensued from the primal need of human beings through the entire history of building to create their own personal, sheltered spaces where they live, work and where they rule. This is also the reason why the traditional approach to this type of buildings remains prevalent and significant, while attempts to introduce modernity remain rare, almost 'disruptions' of space. This is why, even in the first stage of the research, it is important to determine the proper significance of modernity as a phenomenon in the development of individual consciousness of residential space through theoretical discourse, which is frequently neglected due to the complexity of demands in practical architectural work. In this context, there are three different concepts (modernisation, modern, and modernity), which in common parlance are often not differentiated, or are, for that matter, used incorrectly, resulting in inappropriate architectural works. This complicates the evaluation of the previously-constructed space and the development of reference parameters.

Modernisation is a social development process in the sense of technological development, industrialisation and urbanisation. It is impacted and magnified by rising urban populations, strengthening of nation states, burgeoning bureaucracies, development of all types of communication, expansion of capital in world markets and, ultimately, by democratisation in all of its aspects. Urbanisation and industrialisation are the most important aspects of modernisation for our specific topic of research, i.e. those aspects that change it from the past and offer vistas and perspectives of the future. As a universal civilisation model, modernisation interacts with various social contexts and generates different particular forms. The term 'modern' is associated with the present, and with the specific features that separate the moment we live in from previous periods, by introducing something new. It is characterised by innovation, experiment and intentional distancing from the past. To these various descriptions of the aspect of 'novelty' we should add the attribute 'short-lived', since, although 'modern' is accepted as a universal concept, in practice it often yields ephemeral features. Last, but most important, the

term 'modernity' refers to imperatives imposed by modernisation's socio-economic processes and implemented by individuals. Modernity can be described as a system of thought, transmitted through five hundred years of modern development of the society. The various ways it seeks to challenge the imposed restrictions and introduce new ways of thinking make it both integral and unique. Modernity refers to typical phenomena of modern times and to ways those phenomena affected individuals: modernity relates to life through acceptance of continuous evolutionary and transformative processes, and through orientation towards the future, which differs from both the past and the present.

This allows us to arrive at the crucial definition of modernity, i.e. to the manner we see it today – modernity as the mediator between the process of socio-economic development (modernisation) and the subjective reaction to it. Recognising that modernity includes two concepts – programmatic and transitory/short-lived, particularity of character of residential spaces reflects their creative synthesis. The examination of these phenomena and their implications in the history of building clearly reveals that the evolution in social behaviour leads to modifications of the very notion of habitation. As a consequence, the very consciousness of space changes, as well as the perspectives on spatial and cultural identities, and these shifts require changes to their accompanying architectural strategies.

METHODOLOGY OF CONTEMPLATION AND DESIGN AS A RESPONSE TO SOCIAL DYNAMICS

REFLECTING ON THE CURRENT EDUCATIONAL SYSTEM/APPROACH

The existing system of education, essentially traditional, tended to study architecture in a one-sided manner, choosing, to a considerable extent, to overlook contextual features that enfold it and affect it with inevitability. When it was recognised that the reality affects even the educational discourses, the work methodology was based on the idea that new experiences needed to be incorporated into the existing, adopted curriculum. This process began even before the Faculty of Architecture joined the HERD Project. After joining the project, the faculty received vital guidelines.

DESIGN PROCESS AS INTERACTIVE WORK METHODOLOGY

Taking into account the fact that the issue at hand concerns an extremely sensitive matter of activation of a concrete space, whose proper use is in the interest of the society at large on the one hand, and private investors on the other, the focus has been placed on the study of the relations of programmes and concepts with user participation in the sense of examination of concrete needs and desires of a local community. This engendered a peculiarly interactive approach, i.e. interactive education that proceeded on three new levels:

FIRST PART OF THE DESIGN PROCESS: SOCIAL SUSTAINABILITY

Providing guidance to students within rather 'confusing and chaotic' interventions of inhabitants, in which students were accorded considerable freedom and were encouraged to take initiative in communication with the inhabitants, sometimes crossed the boundaries of the customary working methods. The social component of the settlement's sustainability was just as important to us, in order to ensure their long-term functionality. A settlement is more

than just a physical environment inhabited by residents; it is a place where they actualise equally the private and public dimensions of their lives, a place where they fulfil themselves. For a settlement to sustain existence and development of culturally and socially heterogeneous communities, a good quality of life is needed.

Students examined its private and semi-private aspects through elaboration of a first-rate and modern spatial residential structure. This was an attempt to redefine social sustainability of an urban area, which is generally based on strengthening and improvement of public spaces. However, without suitably private aspects, the public aspect of human life cannot be of a high quality either.

SECOND PART OF THE DESIGN PROCESS: COOPERATION WITH THE TOWN PLANNING INSTITUTIONS

Research and analysis of the proposed regulating and urban development plans, which were sometimes found to include shortcomings and inconsistencies, allowed the students to propose more optimal solutions and participate equally in discussions with authorised town planners and plan designers. Such discussions ranged from the analysis of the community level to the



Figure 1. Site visit with students and researching of the urban and social housing space at the Alifakovac, 2014.

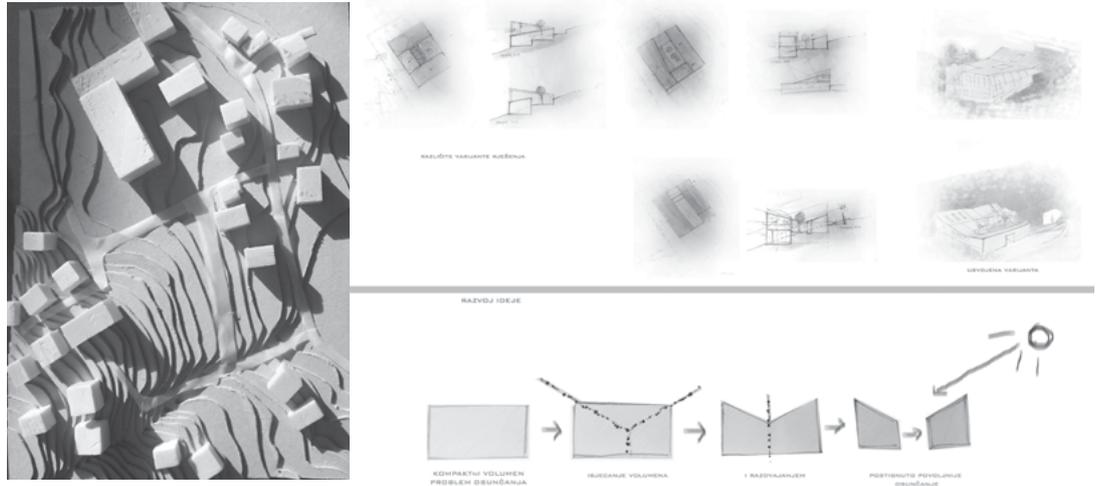


Figure 2. Collaboration with the Sarajevo Canton Institute for Urban Planning; maps and visit to the site; Students research of typology and given propositions of the individual housing at the Cicin Han Hill, 2016.

actual internal organisation of the structure in question. Students were permitted to challenge and test their visions of space and constructed spatial structures against realistic possibilities – economic, social and legal. But they also offered the planners a different way of thinking and treatment of the existing space, which could be incorporated into the existing town plans.

THIRD PART OF THE DESIGN PROCESS: DESIGNING WITH ARCHITECTURAL MODELS

The emphasis was placed on the exchange between the teacher and the student, but not *ex cathedra*, but through simulation of work in a design studio, with the teacher acting also as a critic and where the role of the architect is

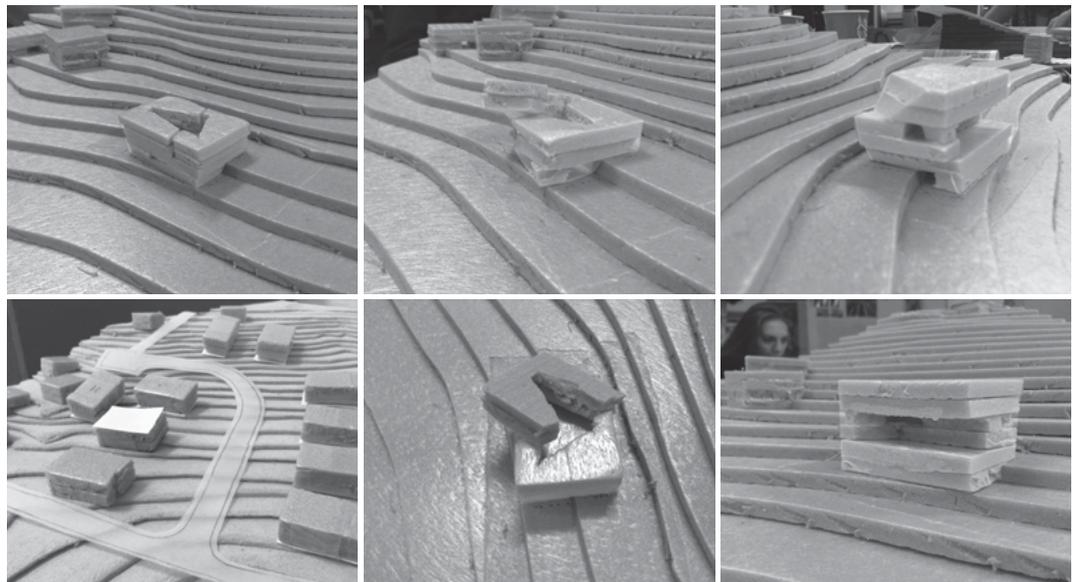


Figure 3. Designing process with architectural models through construction of several model variants by student Tea Gaštan, the Individual housing at the Cicin Han Hill, 2016

contemplated between the two poles: the creator vs. the critic. This manner of teaching was possible through the application of structural models in all stages of work. It is well-known that a structural model clarifies architectural concepts for the general public, thereby serving as a presentation and representation of the entire project. Still, the main goal was not to use the structural models exclusively as the final result of the design process, but as a means/tool to allow evaluation and development of the designing process through an open discussion between the student and the group, between the student, the group and the teacher, and the student, the group and the planner.

The digital age we live in is dominated by the visual culture but in such a way that the digital image often provides wrong information and impression of an architectural design, often mystifying it. In such a context, designing with working structural models offers a more realistic perception of the features of designed spatial structures and makes it easier to suggest potential alterations.

Through the construction of several model variants, each student and the group were confronted with the spatial, substantive and formal repercussions of their ideas/concepts. This permitted them, as future designers, to comprehend the design process as a source of inspiration and ideas that are necessarily challenged with the purpose of deepening and improving their own practice. Therefore, we completely agree that 'making models and learning to master their possibilities, goes hand in hand with the development of a personal design signature'.

DIRECTIONS/LESSONS FROM THE STUDIO

Due to pervasive and intense transformational social dynamics in our country and the region, the work methodology implied an examination of local features of the existing space, as well as of their contemporary implications within the current social context encumbered with countless problems – chaotic changes to cities and their environment, non-selective introduction of capital investment, impact of the dominant infrastructural systems and insecurity. Through this process, architecture comes to life and transcends purely academic boundaries. Everything becomes real – forms, materials, details – and they all have their developmental path, their genesis from their scientific and technical foundations to amateur attempts to improve, modernise and adapt living space to the requirements of the new times. In this context, the dialogue about sustainability has an important place in architecture and has no alternative.

The nature and the character of the studio assignment required an examination of the ambiguity of sustainable architecture, so the students were guided to understand this concept in its integrity. Prevailing views of sustainability through environmental parameters, and their technological options were studied and adopted equally with non-material social and cultural needs of local communities. It was believed that all these elements could provide a complete answer to the contemporary need for sustainable architecture, synergistically.

So, at the very beginning, we identified a need to develop a methodology that would allow for an architecture that is sustainable from the standpoint of its users, the community and the environment.

A careful evaluation of these requirements led to the development of a model that meets the needs of the contemporary habitation, but also provides for the role of architecture as a phenomenon whose physical structure engenders sensitive exchanges with other planes of the society's existence.

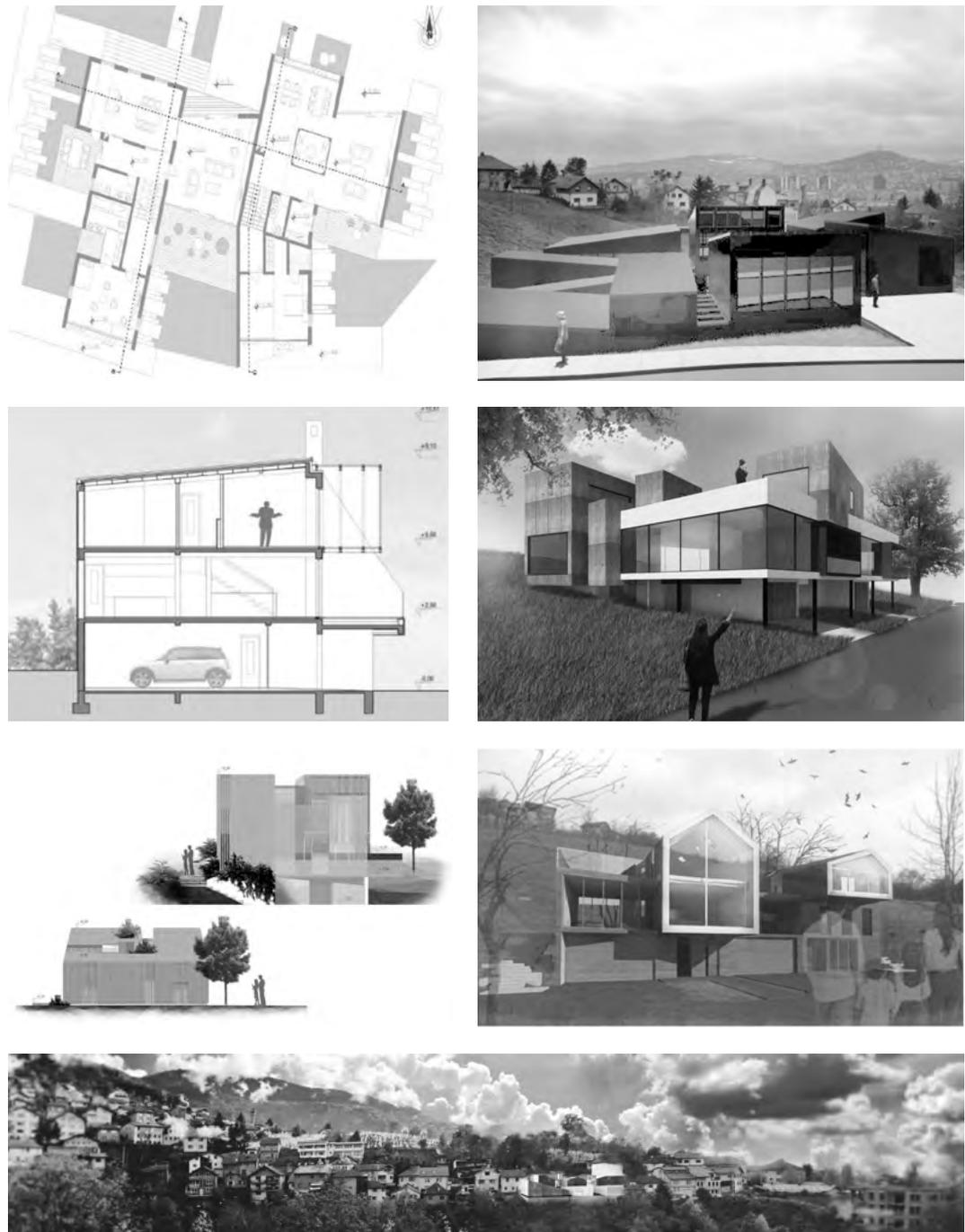


Figure 4. Student project 1: Individual housing proposal on the Vraca Hill, designed by students Merima Terović and Amina Mihmić, 2015.; Student project 2,3,4: Individual housing proposal on Cicin Han Hill, designed by student Tea Gaštan, Nejra Basara, Amar Zuka and Emina Alić, 2016; Student project 5: Individual housing proposal on Vrace Hill, designed by students Mirza Topalović and Toni Cindrić, 2015; Student project 6: Individual housing proposal on Alifakovac, designed by students Belma Zvizdić and Amina Kovačević, 2014.

CONCLUSIONS

The academic structure of the studio is improved by two levels of networking: an internal network was established between two departments at the Faculty of Architecture, while the external network was represented by an interaction between the faculty and experts from the Sarajevo Canton Institute for Urban Planning.

In this manner, the resulting academic curriculum became flexible and the methodological approach of “learning through working on-site” has changed the strict academic approach to practice. This is considered to be the turning point where the educational system needs to find adequate answers to a range of problems at the local level. Therefore, it appears necessary to introduce interdisciplinary thinking, to offer concrete solutions to the demands of places, users, local communities as well as the needs of architecture as a holistic cultural product.

The aforementioned has led to an interactive educational approach that took place on three new levels:

1. First level of design process: social sustainability
2. Second level of the design process: cooperation with the town planning institutions
3. Third level of design process: designing with architectural models

Interaction in education is also applied with more active roles of academic staff, who became more active participants in the research and design process in order to reach more innovative methodological frameworks which can respond more to the real project demand on-site. By including the Department for Sustainable Design and Materials, we achieved a transformation in the process of working outside a strictly academic scope, and added value to the student’s individual design. The studio work has transformed the perception of energy-efficient principles in designing individual housing by turning it into one of the important elements in architectural education.

Due to the ever-present intense social dynamics and transformation in Bosnia and Herzegovina, working methodologies developed through the HERD program at the Faculty of Architecture of the University of Sarajevo could help develop new and more innovative curricula. In addition, this strengthens valorisation as both the potentials and weaknesses of the educational curriculum are exposed in this way, with a purpose to revive and raise architecture beyond purely academic frameworks.

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METAMORPHOSIS OF
ARCHITECTURAL
EDUCATION
IN
(POST)
TRANSITIONAL
CONTEXT

II.
FOCUS
ON
SUSTAINABILITY



Amira Salihbegović, PhD

Assistant Professor,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
amiras@af.unsa.ba



Vedad Islambegović, PhD

Senior Teaching Assistant,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
vedadislambegovic@gmail.com



Dženis Avdić, M. Arch.

Teaching Assistant,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
dzenis.avdic@gmail.com

ENVELOPE MATERIALISATION OF SINGLE FAMILY HOUSES AS AN EXPRESSION OF MODERNITY THROUGH PASSIVE HOUSING STRATEGIES

ABSTRACT

Energy efficiency of contemporary architectural structures is no longer an expression of modernity, but a necessity which should be immanent to all newly-built objects. What is it, then, that makes structures “modern” in the time when architectural form is not sufficient enough to pronounce a particular structure unique?

The single family house modernity can be observed through a series of interlaced characteristics, which can be interpreted correctly only by adopting a holistic approach. Thus, discourse and articulation of architectural form are taking place in parallel to materialisation. Materialisation makes the form possible by giving it an opportunity to improve to the level when it becomes a symbolic representation of local architectural expression– a part of spatial identity. By using passive housing strategies and traditional construction principles through materialisation of form and spatial articulation, the single family house is provided with a new expression which gives it a unique, state of the art “modernity”. Materialisation of form in contemporary construction is possible through a wide range of applicable materials and equally satisfying final results. Through case studies and a comparative analysis of architectural envelope layers, it is possible to show advantages of locally available materials in contemporary construction details with regard to the usual contemporary construction, comparing them in terms of sustainability in energy performance and guaranteed lifetime. Modernity issues of single family housing in the contemporary architectural expression are based on the identity discourse in the local context through sustainability adjustments to global trends.

Keywords: *energy efficiency; materialisation of form; passive housing strategies; traditional materials*

INTRODUCTION

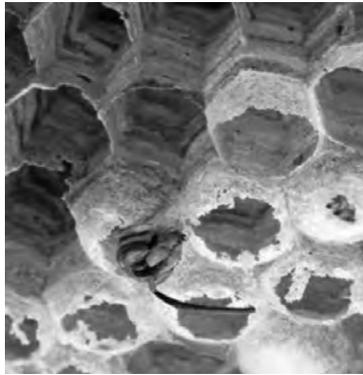
Rapid social change, technological development and the influence of globalisation not only affect economy, social and cultural trends, and politics, but also, through those activities, influence the formation of our environment, architecture, everyday lives. Climatic change, natural disasters, resource depletion, energy and environmental crises, migrations, globalisation processes, and social crises, are all phenomena associated with the postmodern era. The matter at hand requires an immediate response, urgent activities and a holistic approach, seeking to improve all areas of social activity, especially with regards to the construction of buildings, which represents the single largest energy-consuming sector in Bosnia and Herzegovina (Avdić, 2012).

A holistic approach to building construction would mean meeting the needs of the present and future generations while also optimising energy consumption without decreasing the level of comfort within the architectural space. Lately, the three Es - Efficiency, Energy and Ecology - defined a new approach to solving existential and social development problems (Pucar, 2006). According to Professor Ljubomir Mišćević (2011), the '3Es' can be expanded to '5Es' - Energy, Ecology, Education, Economy and Ethnicity. A prerequisite in surmounting the challenges brought about by globalisation is the re-establishment of balance and interaction between architecture (which is anthropogenic) and the natural environment. Furthermore, flora and fauna studies, receptiveness of laws of nature in design processes in forming and materialising architectural spaces

with optimal microclimatic conditions are well-justified starting points for high-quality, modern architectural expression, which meets the lifestyle needs of the contemporary society (Figure 1).

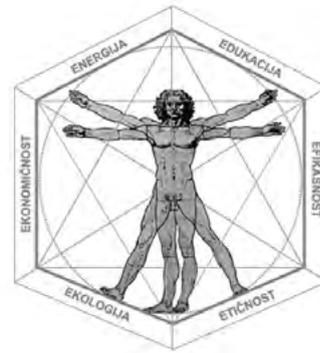
Therefore, permanent education and sustainable development¹ and encouragement for sustainable buildings are necessary. The task for an architect, above all, is to find the right construction patterns - architecture in harmony with its natural environment, natural resources and the benefits of utilising solar energy. That leads to looking upon the architectural object as an active energy system, which exchanges energy and matter with its natural environment. In that way, negative environmental impacts are suppressed and positive environmental impacts are utilised in achieving overall improvements in the energy balance of the buildings. By using "free" energy from nature (the sun, wind, geothermal energy, hydropower, etc.) and technologically advanced heating, ventilating and cooling systems, we are making "conscious" architecture. This is a model for achieving sustainability goals - energy efficiency, a gradual shift to renewable energy, rational exploitation of natural resources and materials, elimination or reduction of toxic/harmful gases, and, in the process, improving the natural environment and the quality of living for the members of the society.

1 "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs", <http://www.un-documents.net/ocf-02.htm>



Beehive microclimate conditions:
with exterior temperature: $t_e = -10^\circ\text{C}$
interior temperature of the beehive: $t_i = +30^\circ\text{C}$

Figure 1. (Left) Beehive microclimate conditions (Source: Forum Energie Zurich, 2007); (Right) 7E principle (Source: Salihbegović, 2012).



Optimal conditions of architectural space are achieved through: education, ethics, energy-efficiency, ecological and economic feasibility, and acceptable construction, with special aesthetic characteristics and values in accordance with the technological development of the society

The search for a construction pattern and principles in the context of sustainability, in terms of family housing, as well as for the entire settlement, is encouraging us to find answers in traditional architecture. Choice of the site, orientation, insolation, wind rose, topography adjustments, spatial organisation, structure and materialisation are all bioclimatic parameters, but also a paradigm of the traditional architecture (Vuksanović, 2005). Architectural heritage, built intuitively with adjustments to the local site, is a model for sustainable optimisation of building proportions and functions along with a rational utilisation of locally-sourced materials. Those are the values that have formation roots and carry testimony, identity of the specific area, traces of existential, social and cultural needs and expectations of a certain group, which can be transposed into contemporary architecture (Paunović – Žarić et al., 2016).

In education, there is a focus on the materialisation of transparent and non-transparent structures, as well as on building envelope treatment (multi-layered, multifunctional and adaptable), geometry of form and atrium concept as passive strategy and energy-efficient design. Introduction to concepts and principles of materialisation in EE (energy efficiency) and a sustainable building

context, including European and BiH regulations and legislation, should encourage responsibility and raise awareness, but also help creative thinking and designing processes.

LEGISLATION AND THE CURRENT STATE OF EE IN BOSNIA AND HERZEGOVINA

The current state of legislation and architectural practice when it comes to energy efficiency in private housing architecture in Bosnia and Herzegovina (BiH) (especially the Sarajevo region, in which students have worked on their practical assignments) is not satisfactory. Even though some progress has been made through education and training of the professional staff, illegal construction trends, especially in individual housing, are continuing unabated, with a callous attitude towards the minimal requirements regarding energy characteristics of a building. However, through tightening regulations conditioned by the European norms, this trend is about to change, so “modernity” in architecture is not only expressed through energy characteristics of a building, but through the quality of building materials and their low carbon

footprints. Materials sourced locally (even better if they are natural/organic materials), with less energy contained in them during the production processes and assembly/installation stages accord a greater degree of sustainability to the life-cycle of the building.

Because we are talking about the specific area, rich in resources for building, architectural practice could find a new route in achieving energy efficiency and sustainability in individual family housing. A significant potential for possible savings through the utilisation and application of locally-available materials and energy efficiency improvements, especially in upgrading the existing structures, is currently the main reason for the adaptation of the energy efficiency legislation. Statistical data in BiH, from 2009 show that 55% of all energy is consumed in households (in the Sarajevo Canton, it is 44%), representing the biggest potential for energy consumption reduction, of all the sectors studied, according to Avdić (2012).

By 2009, Bosnia and Herzegovina was using the inherited JUS (ex-Yugoslav) standard² in the field of energy efficiency of buildings, while the applicable set of regulations, enacted in 2009³, is currently under revision and in the process of being harmonised with European regulations. Current regulations are mostly based on the European Directive 2010/31/EU (EPBD) on energy performance of buildings, but they are not adapting the increasingly strict criteria regarding energy efficiency of buildings and efficiency of built-in systems.

However, through history and the development of architecture, it took us a lot of time to start understanding the exchange of heat between a building and its environment, i.e. climatic conditions and the context. As a result, we have unfinished buildings in terms of final façade, thermal insulation, roof structure and roofing elements. Roof structures are most commonly built without any additional thermal insulation, or any layers other than structural elements used to close the building and define an architectural space.

The transition (from being a part of Yugoslavia to an independent country) crisis and the post-war period in Bosnia and Herzegovina was characterised by the availability of cheap labour and low-quality building construction, which was in most cases favoured by an absence of sanctions, i.e. impossibility to enforce sanctions in the current bureaucracy, but also through an absence of adequate subsidies and incentives for energy efficient construction. Energy efficiency is being neglected today, due to consistent trend of cheap building construction. Getting larger net-floor-area is the primary goal regardless of functionality and living comfort.

The absence of climatic and insolation data in national statistics emerged as a key challenge when BiH had to start complying with European regulations. The site of the building and the insolation are crucial parameters when it comes to the materialisation of a building (Hadrović, 2010). It is also essential in energy efficiency, where spatial and climatic contexts themselves define the input data required for the 'energy design' process. Approximation of climatic data taken from similar sites in a wider region has shown disadvantages in creating design documentation. Even through utilisation of a building, problems can be noticed in overheating or vapour diffusion through enclosing panes. Previous practice that involved the treatment of architectural details according to permitted values defined by approximation of climatic data proved insufficient. The main reason for that is the fact that a building site has multiple input data, practically unpredictable through calculation, but noticeable through many years of building utilisation. Therefore, legislation should include parameters which show passive solar energy gains based on the annual use of the building. That is possible only through the implementation of adequate climatic data.

CLIMATE FRAMEWORK AND INPUT PARAMETERS

A comparative analysis includes walls and roof structures, as elements that make up most of the area of enclosing panes exposed to environmental influences, while openings are presented as weak spots of the building envelope, and not necessarily a thermal bridge that could drastically downgrade the energy rating of the building. Analysis of the current state included envelope layers, with measured data for existing walls

² JUS U.J5.600 Toplinska tehnika u građevinarstvu, tehnički uvjeti za projektovanje i građenje zgrada enacted in 1980 than improved in 1987

³ Službene novine FBiH br. 49/09, Pravilnik o tehničkim zahtjevima zatoplotnu zaštitu objekata i racionalnu upotrebu energije, 2009.

and openings. Results showed that individual housing buildings in BiH have walls, as the largest bounded surface of a building, with average heat transfer coefficient of $U=1.4 \text{ W/m}^2\text{K}$, and openings with average $U=2.9 \text{ W/m}^2\text{K}$. Collective residential buildings are somewhat better with an average heat transfer coefficient in wall details ranging from 1.5 (in structures built before 1970) to $0.7 \text{ W/m}^2\text{K}$ in structures built in the post-war period (from 1996 to the date). With the adoption of EN guidelines, building energy efficient collective housing structures increased slightly, but the focus on single-family housing remains dominant.

The upper bounding plane (flat or sloped roof, or unheated attic floor construction), which is the most sensitive detail in the envelope structure of a building, has not been included in the analysis of the current state. Considering the permitted values of heat transfer coefficients, thermal insulations should be the most significant layer in the structure of this bounding plane.

Table 1:
Heat transfer coefficients and materialisation – current state (Source: Authors⁴).

Architectural element	Materialisation	Heat transfer coefficient - U (W/m ² K)
Walls	Bricks or concrete blocks approx. 25 cm thick	1.4
Openings	Windows with wooden frame and conventional double glazing (air layer in between) or windows with wooden frame and double casement with single glazing	2.9
	Reinforced concrete slab 15 cm thick	3.5
Unheated attic floor construction	Reinforced concrete slab 15 cm thick with wooden decking floor	2.2
	Reinforced concrete slab 15 cm thick with minimal thermal EPS* insulation 2 cm thick	1.3

* EPS – expanded polystyrene

Most of the individual housing structures that have been built, do not have a residential attic space, and when they do, the roofing detail generally

contains a non-ventilated insulating material only between the rafters of the roof structure. A very small percentage of those details have proper heat transfer coefficients calculated according to the currently permitted values, without taking weak spots or vapour diffusion into account.

Considering site and context where students designed their single family individual housing structures, permitted values according to the regulations, which are currently enforced, correspond to the materialisation given in Table 2:

Table 2:
Heat transfer coefficients and materialisation – the required minimum (Source: Authors⁵).

Architectural element	Materialisation	Heat transfer coefficient - U (W/m ² K)
Wall	Bricks or concrete blocks approx. 25 cm thick with minimum of 8 cm polystyrene or glass wool insulation layer	0.45
Openings	Windows with wooden frame and insulated double glazing (24 mm argon layer in between)	1.8
Roof structure or Unheated attic floor construction	Reinforced concrete slab 15 cm thick with minimum of 10 cm thermal insulation layer or sloped roof structure with minimum of 12+2* cm thermal insulation layer	0.3

* 12cm thermal insulation between wooden rafters + 2cm EPS for thermal bridge elimination

According to EN standards, the U value for a window (including both frame and glazing elements, as well as the installation method) should be at least $1.3 \text{ W/m}^2\text{K}$, which means that glazing should be insulated with at least double glazing with an inert gas in between, and that is still rarely seen in individual housing building practice.

If we consider the status quo and the most-common materialisation of the bounding

structure (roof structure, walls and openings), the estimated cost of an upgrade to a satisfactory level, would be approximately 10% to 20% of the minimum estimated investment for a two-storey building with a total of 100 square metre net-floor-area, and standard storey height.

Satisfying materialisation according to the current regulations has a limited lifetime since regulations are about to get more stringent, as adjustments to the European norms get underway. Therefore, the estimated investment for meeting minimal requirements is soon going to become insufficient, even without taking the efficiency of the built-in systems (ventilation, air conditioning, heating, water heating) into consideration.

APPLICATION OF LOCAL MATERIALS AND TRADITIONAL BUILDING PRINCIPLES

Bosnia and Herzegovina is tremendously rich in building material resources, which can be seen through the history of BiH architecture, with an emphasis on individual housing, and vernacular architecture as well. Traditional materials are used to a great extent even today, most commonly as aesthetic architectural elements. With new and cheap materials available in the global marketplace, building with locally-available materials has been curtailed. However, these 'cheap' materials are associated with a lot of contained energy (contained in the upstream of the lifecycle) and the associated negative environmental impacts.



Figure 2. (Left) Traditional materials and principles in contemporary architecture; NHRV House, Sarajevo, Bosnia and Herzegovina (Source: Vedad Islambegović, Filter Architecture, 2014); (Right) Pressed straw in contemporary application; Zagorje Cottage, Kumrovec, Croatia (Source: Damir Fabijanić, Proarh Studio, 2012)

Stone and wood, throughout the history of individual housing architecture, have been used for the bearing structure. Organic thermal insulation materials like straw bale, sawdust and sheep wool are almost completely neglected today, even though they have proven to be superb insulators and interior humidity regulators. These two parameters - interior temperature and humidity- are the main indicators of comfort within a home.

Building with wood and locally-sourced thermal insulation materials has a great potential in the development of individual housing architecture. If organic materials are adopted, in addition to a reduction of energy use, there is also an estimated 20% reduction of CO₂ emissions compared vis-à-vis the status quo. For instance, the eco-production (cradle to gate) of sheep wool insulation requires two to three times less energy than glass wool, two times less than rock wool, six times less than EPS (expanded polystyrene), and eight times less compared to XPS (extruded polystyrene). If we consider emissions during the transportation phase, the savings are even greater, as these are locally-sourced.

However, for a given thickness, sheep wool costs three to four times more than EPS. This economic fact may explain why the former is rarely used in individual housing architecture. But, if we also take the life-cycle of a material into account – functionality throughout the utilisation period and the embodied energy ratio –sheep wool has a shorter payback period and less negative environmental impacts vis-à-vis EPS. Built within traditional building principles, in structures with wood and stone, this material gives much better results in comparison with the current state. Some examples of traditional materials and structures and their thermal features in contemporary architecture are given below in Table 3:

Table 3:
Heat transfer coefficients and materialisation –
traditional materials (Source: Authors⁶).

Architectural element	Materialisation	Heat transfer coefficient - U (W/m ² K)
Wall	Wooden rafters 16 cm thick with sheep wool infill and additional 4 cm thick thermal insulation layer with wooden boarding	0.22
Unheated attic floor construction	Wooden floor structure 16 cm thick with straw bale infill, wooden boarding and additional 10 cm thick sheep wool thermal insulation layer	0.22
Sloped roof	Wooden rafters with 12 cm sheep wool infill, and additional sheep wool 8 cm thick insulation layer packed with wooden boarding	0.21

Potential lies in the availability of resources for the production of building materials in BiH. Therefore, there is a chance, if coupled with the establishment of raw material processing plants, for prices to become locally acceptable and affordable in comparison with common EPS insulations. One of the goals of the educational programme is to raise awareness about the potential of local materials– stone, wood, leftovers of woodwork as thermal insulation material, as well as straw bale, sheep wool, and other materials whose eco-friendly features give them a clear advantage when it comes to architectural practices prevalent today. Contemporary architecture should use tried-tested-and-trusted materials, to become truly ‘modern’ through sustainability and passive strategies in utilisation of contextual, in-situ energy potential.

Through application of traditional materials and techniques, the goal was to expand architectural vocabulary of a future architect, enabling him/her to perceive opportunities beyond examples of the current state. Critical perception of practical

examples is possible only through broadening one's horizons, i.e. through understanding the possibilities of materials application and keeping pace with contemporary architecture, which are increasingly inspired by traditional materials and techniques as features of the local identity. Family housing architecture, as one of the most demanding architectural tasks, gets a new dimension of modernity through encouragement of traditionally-inspired materialisation and passive strategies, and students showed exceptional creativity through their designs. The acquired knowledge is about to be shown through architectural practice, once they become graduated architects.

SINGLE FAMILY HOUSE MODERNITY

In the education process, beside lectures considering different aspects of building physics and energy efficiency in general, the question largely discussed at the study courses was: What does being modern mean today? A general conclusion was that, modernity is treated as an acceptance of continuous evolutionary processes, future-oriented and committed to the state of progress, while clearly differentiating the past from the future. On the other hand, considering the fact that different societies around the world are going through different stages of development, and that we can look at development from different starting points, the conclusion was that modernity should be considered within a contextual perspective. In other words, the meaning of the word 'progress' in Bosnia and Herzegovina, seen from the perspective of more developed countries, can be misinterpreted as something that has already been achieved or exceeded, especially in terms of energy efficiency and building physics.

In order to engage acquired knowledge with regard to topics of energy efficiency and modernity in today's Bosnia and Herzegovina, students were asked to do an assignment the main purpose of which was to mimic a real-life situation in contemporary, local practice. They were asked to design an energy efficient, single family house, according to the parameters prescribed by an official regulatory site plan.

In terms of the aforesaid, the decision was made to conduct a building site critical analysis, in a way which could reveal more information considering

current social and morphological givens. The final goal was to formulate criteria according to which improvements of the contextual reality could be made. The main idea was to develop student designs as logical outcomes of the conclusions generated by the critical analysis.

The analysis consisted of two essential segments: interviews with the people living in the neighbourhood, and a critical research of the regulatory site plan given by the Sarajevo Canton Planning Institute.

The first segment of the analysis sought to reveal current social relations and unwritten rules regarding the neighbourhood building occurrence, and prevailing spatial organization features. In this sense, through interviews with people at nearby neighbourhoods, students found out that acute lack of physical privacy inside the houses, as well as at the parcels, emerged as the most influential factor in spatial organisation, building positioning, building openness, and even landscaping. The people living in the neighbourhood stated that their houses have very little privacy, due to the fact that the building density is very high in the area, as well as the proximity of the houses. By using the term "lack of privacy", they wanted to express the lack of spaces inside or outside the house that are not exposed to the views of their surrounding neighbours.

This criterion appeared to be so important that it had influenced all other aspects of the building construction process, such as the correct positioning within the parcel, relation to the slope, or correct orientation towards the sun movement, which, in general terms, are being considered as more important factors at the faculty teaching. For example, interior spatial layout is almost always organised in a way that living rooms are connected to the most private sections of the exterior, regardless of the fact that other criteria of comfortable living are not being met. The conclusion of this part of research was fairly simple – students decided to design and create living spaces where privacy, and other factors, such as correct orientation and sight openness, coexist without conflict.

The second part of the research dealt with the analysis of the currently applicable regulatory plan, which defined the urban matrix of the new building sites, within which students were assigned to develop their designs. The plan was

analysed on the basis of three main criteria: public space/pedestrian space, vehicular space/site accessibility, spatial orientation towards the open view and the sun movement.

Considering the first criterion, it was observed that public/pedestrian space has not been provided in accordance to the proposed plan, and that the planned settlement is not any different than the illegally built settlements in the surrounding area. In terms of the second criterion, proposed roads are steeper than allowed, since they are perpendicular to isohypses of a very steep terrain. With this in mind, it was concluded that vehicular communications in informally built (unplanned) parts of the settlement are showing better quality (parallel to isohypses) than those proposed in the regulatory plan. Analysis of the third criterion showed that the proposed urban matrix does not offer adequate conditions regarding many energy efficiency preconditions or preconditions of comfortable living in general, such as correct positioning towards the movement of the sun, or proper orientation towards the open view. Without having some of the essential preconditions for sustainable living given by the regulatory site plan, students concluded that it would be very hard to create a convincing design of an energy-efficient, single family house at the proposed site.

Based on the research results, students also tried to create a potential proposal for the modification of the regulatory plan. Although conclusions reached based on student analysis of the plan could have been validated, in cooperation with representatives from the cantonal institute it was decided to continue working on the assignments based on the original plan. The main reason for this decision was the insufficient amount of time reserved for the course, since a new plan would require additional activities.

Design proposals that students made based on the conducted analysis are more or less successfully endeavouring to meet the established parameters. Since it was hard to achieve proper orientation and positioning within urban matrix, necessary amount of energy efficiency in their designs has mainly been achieved by the technical and technological interventions, or by the use of adequate materials. Several conclusions could be made from the research at the building site:

Energy efficiency, as one of the most important factors of future development, is directly affected by the social context, mentality and habits of people occupying or will be occupying individual buildings. Regarding the specific subject, the factor of physical privacy was proven to be in conflict with many parameters of comfortable and sustainable living, such as the correct orientation towards the movement of the sun.

To deal with energy efficiency of individual buildings is fairly difficult, if main preconditions of energy efficiency, such as correct orientation, are not made available through the urban/regulatory site plan. In a situation such as this, energy-efficiency is mainly based upon technical/technological solutions and upon the choice of the materials.

CONCLUSIONS

Implementation of EE principles and materialisation of the ‘envelope’ through the education process is necessary to be initiated from an early phase of urban planning and design, i.e. through a comprehensive analysis of the socio-cultural, geographical and climatic factors. The analysis of the specific urban or rural fabric and context, identification of the microclimatic conditions (climate, geology, morphology, vegetation, natural water springs etc.), grouping of interdependent natural factors and local particularities should result in the appropriate architectural materialisation, expression and ‘responsible’ architecture.

Even though energy efficiency in Bosnia and Herzegovina, including legislation regarding energy use and thermal characteristics of buildings, is still trying to catch up with EU trends, gradual progress and positive transitions can be seen. However, the collective consciousness of a society in transition has to change through positive examples and grants to build quality solutions, and also with the aid of education and training of young professionals. Our job as educators in the process of forming positive shifts and raising awareness is training and education of personnel who would be able to recognise and implement high-quality examples in energy efficiency along with meeting other criteria in improvement of housing quality through building individual single family houses.

By generating awareness about locally-sourced materials, a new dimension of ‘modernity’ is presented to students, along with the idea of using available, in-situ resources. Throughout the course, we have presented advantages of locally available, traditional materials in contemporary housing, and have defined a new concept of modernity which takes building physics into consideration as one of main comfort criteria. Through understanding the context, in terms of energy potentials regarding climatic features and passive strategies, and the possibilities of implementing local materials and traditional building techniques and principles, we enabled students to see the ‘bigger picture’ of energy efficiency, showing them environmental impacts of built-in materials. That included explaining materials from raw material exploitation, production and transportation, to building final product in architectural structure on site, along with life cycle of materials and recycling limitations.

Materials that are a part of the spatial identity, in contemporary application and passive strategies could become a new expression of family house ‘modernity’. Taking into consideration the measurable features of built-in ‘traditional’ materials, economic viability and sustainability are proved through the persistent U values without any additional maintenance costs during the guaranteed lifetime.

An integrated approach to education should help define modern building expressions, architecture adjusted to contemporary age, using economically-viable, energy-efficient and environmentally-acceptable technologies, materials and solutions. Traditional materials and techniques should be considered in designing process of single family housing structures, as one of the main modernity features, and also as comfort-defining factors through building physics.

Energy efficiency is on the agenda of many planners, entrepreneurs and decision-makers today. A holistic approach to urban planning and architecture is necessary in order to bring about meaningful changes.

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Adnan Pašić, PhD

Associate Professor,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
adnanp@af.unsa.ba



Nihad H. Čengić, PhD

Assistant Professor,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
nihadc@af.unsa.ba



Slađana Miljanović, PhD

Assistant Professor,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
sladjanam@af.unsa.ba

ENERGY EFFICIENCY IN ARCHITECTURE, URBANISM AND STRUCTURAL DESIGN - REVITALISATION OF LOST KNOWLEDGE

ABSTRACT

Integrated design, social infrastructure accessibility, structural conceptual design and building materialisation, in the field of architecture and urbanism in context, reaffirm comprehensive design methodology in education and practice through the revitalisation of lost knowledge. Architectural design aims to develop the design approach through the integration of two fundamental, yet opposite design concepts - object-oriented and context-oriented - into architecture of integrated functional, spatial, structural and material aspects of specific natural or built context. Design principles and criteria are derived from the specifics of different scales, building typologies and contextual circumstances.

The debate over the role of technological tools against non-technological ones in dealing with energy inefficiency is continuous. On an urban scale, two well-known, but ignored basic tools are selected to demonstrate the power of lost knowledge - the system of city centres and urban grain. Creation of a balanced system of city centres serving its gravitation field and accessibility of social infrastructure are decisive in the choice of movement mode and quality of urban life. Modelling urban grain with the purpose of making access to solar energy easier, contributes to the creation of a healthy environment. Both tools build capacities of the city to operate "under natural conditions" and to become energy-efficient.

The structural conceptual design is the process of developing the preliminary solution of the structural system of the building, which involves safety, functionality, rational design, materialisation and economic feasibility, to satisfy the social and aesthetic criteria to the highest standards, taking into consideration the possibilities of performance, energy consumption and limited resources, and the possibilities of the change of use and recycling.

Keywords: *integrated design, city centres, urban grain, structural conceptual design.*

INTRODUCTION

This paper is the result of collaboration in the 2015's Architecture and Urban Design Studio, held as an elective course on the second year of Master study programme at the Faculty of Architecture, University of Sarajevo. City planning, architectural design, architectural physics and structural design, through the phenomenon of energy efficiency, were integrated in the Design Studio as a platform for integral design approach for cultural facilities in Novi Grad municipality in the City of Sarajevo. Initial debates directed the project towards design of energy efficient buildings without the use of additional high technologies (soft-factors), or urban and architectural design solutions, which would achieve the reduction of energy consumption by planning and well-conceived conceptual design.

One of the most striking phenomena of the contemporary global urbanisation is its gradual acceleration through time and invasive expansion through space. In the beginning of the 21st century, for the first time in human history, more people are living in cities and towns, than in the countryside and rural settlements. In 2011, this proportion was 53:47. Cities occupy about one-fifth of the land area on earth; and 33% of urban residents live in slums. Furthermore, approximately 75% of global greenhouse gas emissions can be attributed to cities (Burdett and Rode, 2011, p. 8-25).

This paper is about cities and their architecture, as well as about planning and urban design. Energy efficiency as well as embodied and energy flow is certainly part of the architecture and cities. (Durmišević, Pašić and Colakoglu, 2015).

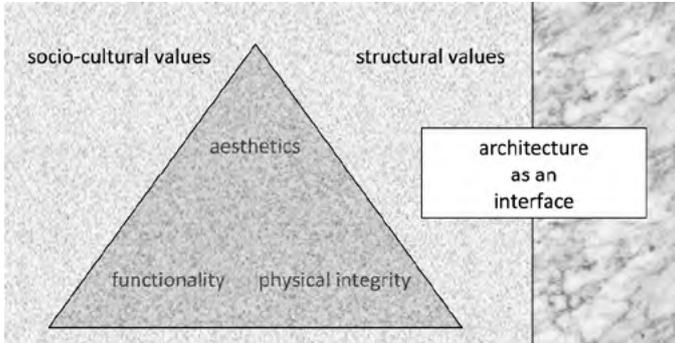


Figure 1. Architectural fundamental qualities defined by socio-cultural context and indicators of physical qualities of artefacts (Source: Pašić, Durmišević, 2012)

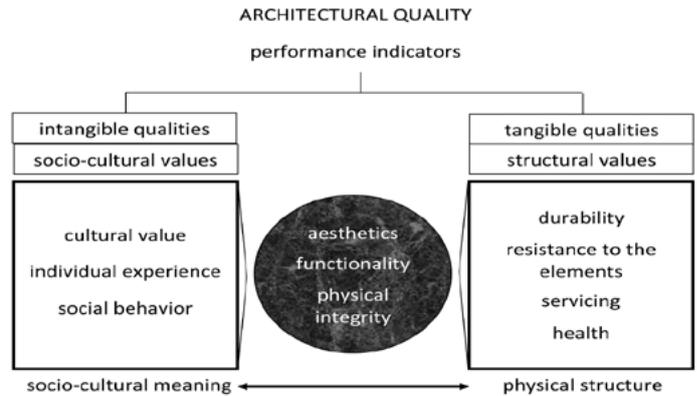


Figure 2. Architectural quality as a function of intangible and tangible qualities (Source: Pašić, Durmišević, 2012)

ARCHITECTURE AND CITIES IN THE 21ST CENTURY AND ENERGY EFFICIENCY

FUNDAMENTAL ARCHITECTURAL QUALITIES AND ENERGY EFFICIENCY

Integrated architectural design is aiming to develop the design approach by integrating different disciplines, aspects and conceptions of architecture into a technical and conceptual design methodology which comprises of planning, programming, designing and constructing buildings and cities, conceived as complex systems integrating material, conceptual, technical, economic, social and environmental points of view. One of the most important issues in integrated architectural design is the paradigm of sustainability of which energy efficiency is a key component.

The basic diagram introduces the fundamental qualities of architecture. Since Vitruvius, architecture has been interpreted as an interface of aesthetics, functionality and physical integrity. It can be conceived as bi-polar – socio-cultural values on the one hand and structural values on the other (Figure 1).

Integrated architectural design on a conceptual level has as its purpose the integration of two design concepts which can be seen in the previous diagram - context-oriented (focusing on socio-cultural values) and object-oriented (focusing on structural values). Design qualities and values in specific tasks are derived from different architectural programmes, building typologies and contextual circumstances. Further on through analysis of different use scenarios and contextual qualities are developed into architectural design proposal which integrates important functional, spatial, structural and material aspects. Energy issues in the entire process are a derivation of physical integrity and an obvious part of a much bigger whole. In the next step, the socio-cultural and structural values are transposed into intangible and tangible qualities and further developed through specific aspects where all of them are integrated into fundamental architectural qualities of aesthetics, functionality and physical integrity (Figure 2).

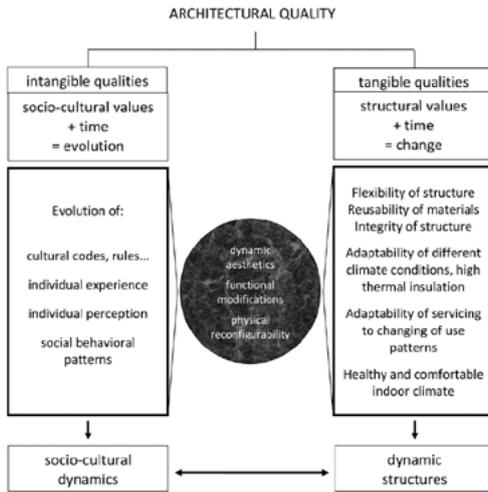


Figure 3. Introduction of dynamics as a new demand and indicator into the diagram of fundamental qualities of architecture (Source: Pašić, Durmišević, 2012)

INTEGRATED ARCHITECTURAL DESIGN AND CONTEMPORARY ARCHITECTURAL DEMANDS

The growth of cities and, thereof, of the population, on a global scale, poses questions about the application of traditional architectural qualities of fixed use scenarios for the existing buildings and the design of new ones, in dynamic societies, cultural interactions, technical and present-day economic demands. The contemporary paradigm of sustainability recognises the mobility, dynamics and flexibility of architectural edifices and cities as new and desirable demands, if not qualities demanded by the clients. Dynamics as a new quality demand and indicator is introduced into the revised diagram of fundamental architectural qualities (Figure 3).

The last step in the development of fundamental qualities of the 21st century architecture and cities is the integration of traditional and contemporary qualities (Pašić and Durmišević, 2012). The result is to merge the dynamics of contemporary societies, technological development and environmental awareness into a new value of architectural quality, which will balance tangible and intangible qualities in contemporary architecture and cities (Figure 4).

ENERGY EFFICIENCY IN URBAN PLANNING AND DESIGN

The question of how we discuss energy efficiency is central. There are those who claim that technology is the key to all things, and there are those who oppose it, holding that there must be some simple tool towards energy efficient human-made environment.

Great expectations from technological development were raised in the last century. It was strongly believed that technology will "[...] enable society to overcome local limitations and to offer ample resources to solve architectural and planning problems". But it was also clearly stated that "[...] technology is a means and not an end" (The Charter of Machu Picchu, 1979, p. 8). Realistically, which technology can turn the flow of urban development from the growing global ecological footprint into a balanced and sustainable one? Still, technology is seen as a powerful force in reducing energy costs and environmental damage caused by its own development.

There are others who hold technological development insensible to other processes,

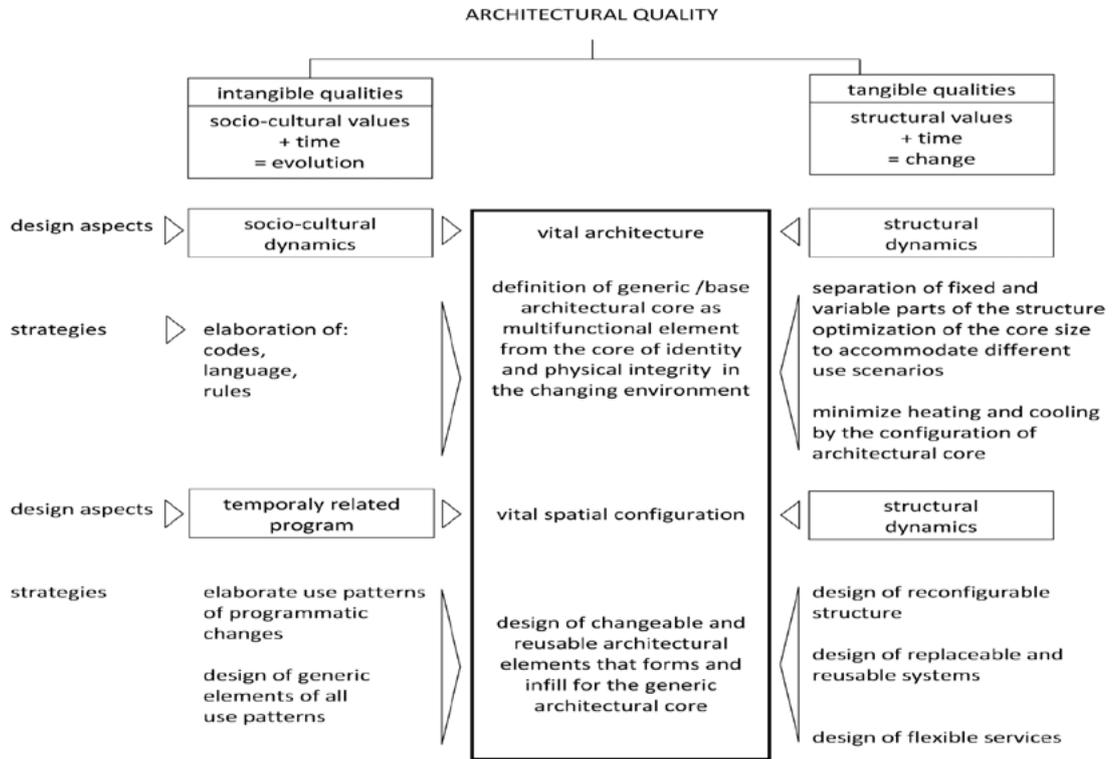


Figure 4. Integral architectural quality as a function of intangible and tangible qualities (Source: Pašić, Durmišević, 2012)

like social development, and that there are no technological shortcuts to energy efficiency. Urban planners will stand against the gated community even if it is energy efficient. Before beginning the search for a technological solution to an urban future, it is imperative to identify and engage inner powers of a targeted system in solving the future. Inner powers can be modelled in such a way to produce an effect contributing to energy efficiency. The approach is synchronous with the call for “going back to the basics” and the recommendation that “[h]arnessing the ‘hidden fuel’ of energy efficiency offers many opportunities

to help rapidly growing cities achieve energy security, energy savings, and reduce costs and emissions” (The World Bank, 2014).

THEORY AND THE BASICS

Urban theories that incorporate urban energy efficiency in the last 150 years are ranging from I.S. Cerda’s egalitarian and functional city, through R. Erskine’s ecological and “good citizenship” winter city and R. Knowles’ city of “solar ethics”, to R. de Graff and R. Koolhaas’ summer city of “absolute necessity” (Figure 5).

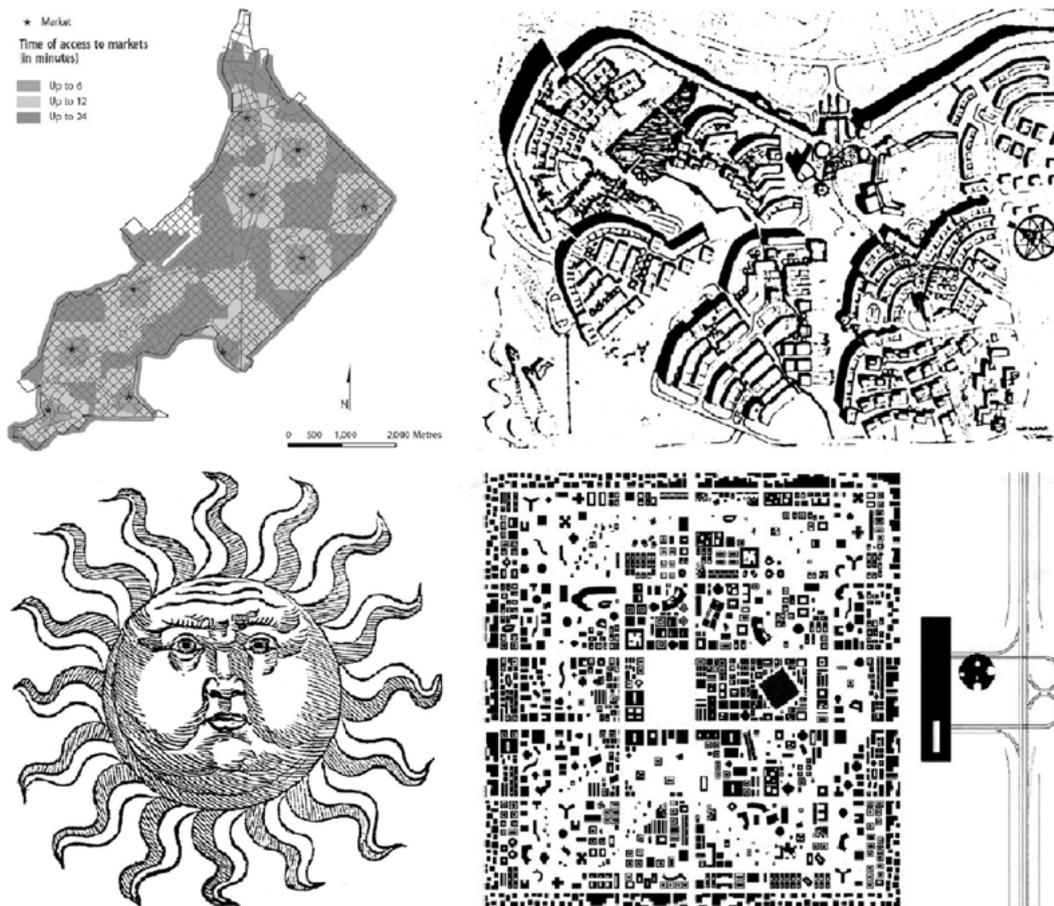


Figure 5. Four theories of energy efficiency: (Top left) New Barcelona, city of accessibility, Cerda, 1861 (Source: Pallares-Barbera, p. 132); (Top right) Svappavaara ecological winter city, Erskine, 1962 (Source: Zrudlo, 1988, p. 90); (Bottom left) Solar access ethics, Knowles, 1982 (Source: Knowles, 1982, p. 24); (Bottom right) Ras al Khaimah summer city of “absolute necessity”, de Graaf and Koolhaas, 2007 (Source: OMA, adapted)

The crucial thought that stands behind these theories is that “[...] architecture [and urban planning and design] should be a process of creating spaces and environments capable of functioning under natural conditions” (The Charter of Machu Picchu, 1979, p. 8). Precondition to the former is that „[p]rivate interests must be subordinated to the collective interest [...]“ (Le Corbusier, 1973, p. 105). Sampling the past, the model for discussion of the relation between the city and the energy efficiency is reinvented.

THE SYSTEM OF CITY CENTRES

In reinventing the topic of energy efficiency in the context of urban planning and design, powerful tools were found in the contemporary urban theory, embedded in the Urban Plan of Sarajevo 1986–2015 (UPGS). In distant but coherent morphological and functional scales, two powerful tools are selected as representatives of hidden and somehow lost or neglected knowledge on city and energy efficiency – the system of city centres and urban grain. It is argued that urban energy efficiency should be discussed in the sense of

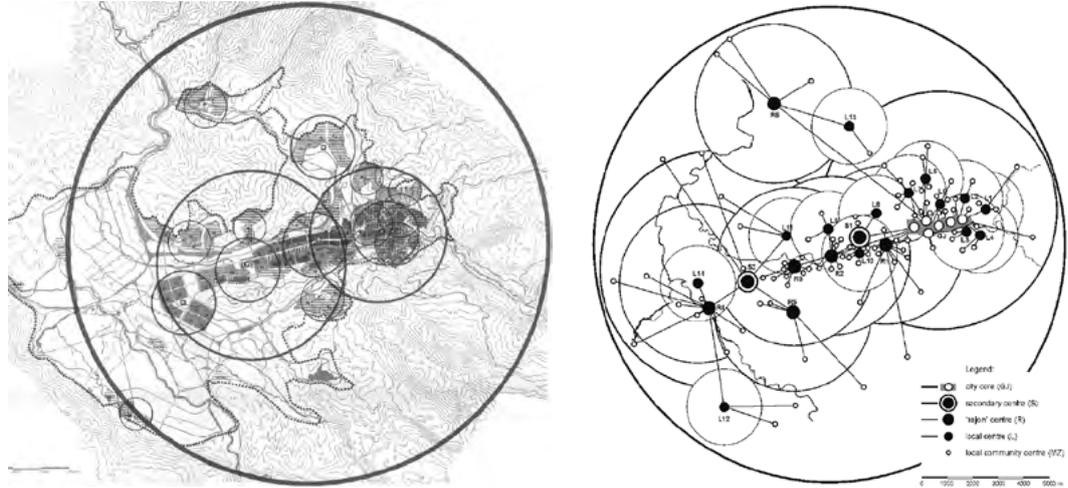


Figure 6. Gravitation field of urban centres of Sarajevo – towards a balanced development of the centre and periphery: (Left) General Urban Plan, 1965 (Source: ARH, 1963, enclosure); (Right) Urban Plan, 1986 (Skupština grada Sarajeva, 1990, adapted)

planning of the nature, location and capacities of social infrastructure, and modelling of the urban grain.

The concept behind the UPGS is unity of the built structures with the environmental resources and spatially balanced development of the centre and the periphery. The goal is to create connected, coherent, and polyfunctional urban structures (Skupština grada Sarajeva, 1990, Specific goals). Therefore, the system of city centres is designed so that every centre, from local community centre to the city core, has a predefined gravitation field and structure of social infrastructure facilities, defined in accordance with the level of the centre in the hierarchy and population size it is servicing (Figure 6).

The system is designed as an open one, meaning that a certain centre may grow to a higher level than planned, and in which all citizens use all facilities in all centres. There are two preconditions for the system to function towards the creation of a balanced spatial development and to be capacitated for good service of the gravitation field. The first one is a balanced development and

distribution of central facilities, and the second one is spatial coincidence of social infrastructure and population.

The nature and quantity of facilities, commercial and social ones, is carefully and precisely defined. Commercial facilities refers to shops, restaurants and cafes, personal and home services, financial and business services, while social facilities refers to education, science and research, culture, arts and information, physical culture, health care, child and social care, governing, non-governing and religion. Existence and suitable distance that stands for the ease of access, defines the essence of the Plan – to construct a good quality of urban living, to reduce undesired intraurban trips and to enhance the pedestrian and cycling mode of transportation. Elimination of undesired trips becomes the target on a way towards energy efficient, socially equitable, spatially and functionally balanced and environmentally healthy urban development. Reduction of pollution and energy consumption, community coherence, sense of place and equity, are the strongest attributes that result from the potentials of planned and functional system of urban centres.

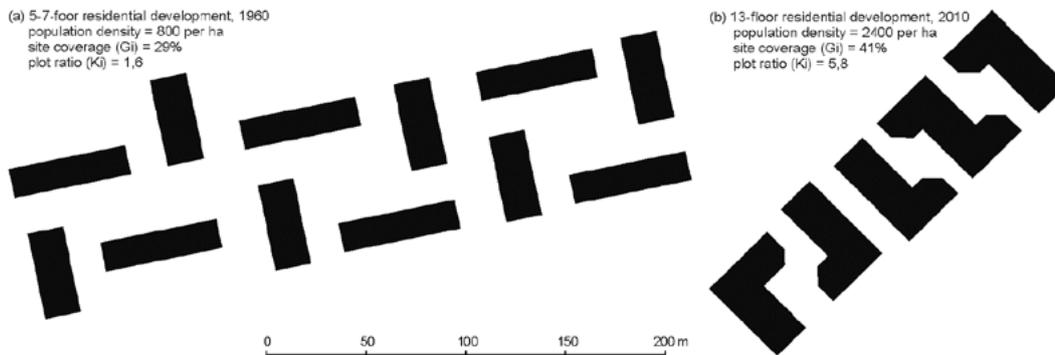


Figure 7. Urban grain – standardised and relativised solar access and ventilation in residential areas: (a) Grbavica II, 1960 and (b) Stup-Tibra II, 2010 (Source: Čengić)

THE URBAN GRAIN

The section of UPGS that refers to human and environmental protection is about the urban grain. Urban planners relate urban morphology and its role in the change of natural conditions of the place. UPGS is explicit that the practice of building the city, namely high-rise buildings in the axis of a narrow valley, has caused a dramatic change in wind flows and heavy pollution. Therefore, it is not recommended to continue with such a building practice, even more so, it is suggested to find ways to fix the mistakes produced in the past.

Urban grain, in BiH practice, is predefined by “urban-technical” indicators, namely, site coverage and plot ratio. In the early 1960s, a concept of solar access of inner and outer space was introduced in BiH, aiming for good and healthy access to solar energy, free wind flow, natural conditioning and microclimate control. Standardised regulations defined the size of the elements, positioning as well as distances between them.

Together with socio-economic transition, urban construction land has been privatised, as well

as the process of decision-making, causing the change in urban grain design. The new form of ownership over urban land raised new perceptions on building rights, confronted with public interest, while urban development exhibits continuous and growing trend of relativisation of all things. Good practice is denied, and bad practice becomes the measure of all things (Figure 7). Pessimists would describe the state of the city as „our reality“, while new historic players perceive our reality both as a potential and an excuse for all things.

STRUCTURAL CONCEPTUAL DESIGN

The early epoch of engineering development includes application of conventional materials, and the experience gained in the construction of buildings results with structures in which all elements (materials, structural elements and their assembly, building style) made unity. Historical development of various structural systems in construction is caused by the application of materials such as stone, wood, clay, brick, metal, steel, concrete, reinforced

and pre-stressed concrete, artificial fibres, etc. The rapid development of iron and steel during the 19th century influenced the development of architecture, resulting in objects subordinated to function and cost of construction, ignoring the optimal behaviour of the structural system. The form of a structure is set by the technical conditions of bending, the theory of plates and shells.

Developing trends of contemporary structures in the world impose more compounds and combinations of different materials, where new possibilities of budget analysis of elements and details, as well as construction in general, and the possibility of “regulation” the size of stresses and strains, indicate an opportunity for further development of lightweight structures. These certainly very attractive structures, with proper selection and use of materials are used in various types of architectural and engineering facilities, and because of the possibility of complete industrialisation of their construction they justify its economy. Today, structures caused by coupling of various materials are successfully created, which results in increasing the capacity and reducing the cost of construction.

The term “structural conceptual design” means the process of conceptual design of the structural system of the building, which ultimately means safety, functionality, rational design and materialisation, economic justification and the satisfaction of social and aesthetic criteria to the highest standards. Examples of this design are provided in the past, where many famous architects and engineers were using calculations, experiments and experience for the development of sources for their ideas, aware of the importance of implementation, struggling with technological problems, (Kawaguchi, 1996). In this way many innovative solutions for objects and their structure were developed.

Today, with all the technological advances, the conceptual design must include a complete quality of structure. A precondition for successful conceptual design of the structure is in knowledge and imagination of engineers to provide a safe, economical, durable and aesthetically acceptable building, interacting with nature and social needs, taking into account the possibilities of performance, energy consumption and limited resources, and possibilities of change of use and recycling, taking into account sustainability

(Schlaich, 1996). It means that conceptual design involves a process that fully determines the quality and characteristics of the structure of the building. The first step in the development of the structure, according to the principles of conceptual design, was made by the appearance of pre-stressing, giving the possibility of reducing the cross-section and prefabrication of load-bearing elements. The origins of lightweight structures, such as hybrid and external pre-stressing systems, and their form violate the engineering conventions, and with additional requirements of adaptability of the form open a wide area for further research and application.

As for the performance of built structures, man always used the natural model, which served as a role model. The correlation between the natural and built structures is based on the preservation of the material form from the force impact on the same laws of mechanics. Based on these similarities natural forms are real models for the further development of the built environment, and usually an important source for the study of the connection between function, form and structure.

The emergence of modern materials and the possibility of combining them set a condition to adapt the structural system by requirements of geometry, mechanics, features, loads, material properties and form. For the further development of the structural systems it is necessary to achieve mutual dependence of the geometric layout of the supporting structure in the form with the possibility of receiving mechanical loads depending on the type of the materials. Thereby structural elements are grouped according to the behaviour when carrying loads in a geometric series that provides sufficient capacity and functionality of structures and optimization of material consumption. The solution for set requirements is found in the development of hybrid bearing systems that offered the possibility of changing the form and behaviour, as well as increasing the capacity of the “pure” systems from which they are incurred.

The historical trend in the design and construction of modern structures is the development of lightweight structures, which is basically minimizing their own dead weight. The efficiency of the structure is expressed by the ratio of corresponding dead and live load. From classic solid to modern lightweight structures, this ratio is reduced more than 100 times, owing to the knowledge and the efficient application of the

properties of new materials of high strength, combined with structural systems predominantly strained in tension (Gaß, 1990).

Given the fact that this type of structures, as a result of its own or implied stress on the tension, achieve stability during stress on the pressure or bending, they possess the optimal power of energy consumption in transfer of the load. Therefore, the developing trend of lightweight structures requires a new approach in the design of structures that includes consideration of the behaviour of the entire system.

STRUCTURAL SYSTEMS OF LINEAR ELEMENTS

The structure of the building consists of all parts of the facility that are under mechanical load. Determination of the effect of external loads on the parts of the structure and the mode of its transmission cause the breakdown of the structural system, regardless of the material they are made of, on the load-bearing systems whose elements possess: line, surface and spatial geometric elongation, depending on the direction of the mechanical stiffness of the element. According to that, these elements have the ability to transfer directed internal loads, so we can distinguish: linear, surface and spatial load-bearing elements.

Elements with the same geometrical deformation can be concluded in one “pure” structural system. Thus, networks, linear, surface or spatial systems can be developed from the linear elements, the membrane or shell of surface elements, while the spatial elements develop frame structures (Figure 8).

Structural systems of line elements can be performed in any number of geometric forms with different forms of mechanical behaviour. Line elements are burdened with this axial load tension or pressure, and mechanical behaviour of the system is directly linked to the number of connected elements in a single node. The internal structure of such systems is conditioned by the direction, scale and angle of load, and conditions for reliance and stiffness of individual elements significantly affect the mechanical behaviour of the system. Due to the possibility of geometric shift, systems formed in this way can be divided into movable and rigid systems. In addition to the conditionality of the mechanical behaviour of the system, the geometric arrangement of members is necessary to meet the requirements of usability and cost-effectiveness.

The usability of a load-bearing structure is characterized by geometry (shape) and variability (deformability). The usability of movable systems is defined by the direction of load, the method of suspension and boundary conditions. The

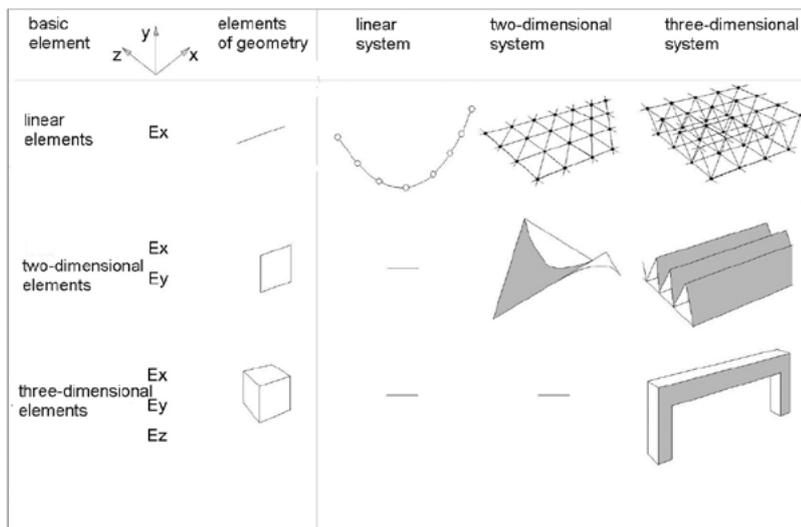
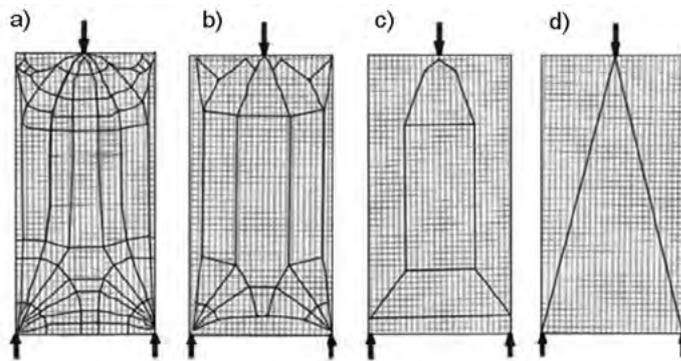


Figure 8. Development of structural systems using modular elements (Source: Miljanović, 2012)



a) The size and direction of principal stress at the continuum;
b) Continuum is divided into stress fields;
c) The main directions of stress;
d) Structure with the minimum material consumption.

Figure 9. Development of grid systems of one loaded continuum (Source: Wagner, Schl 172/13-1)

characteristic of these systems is their different deformation behaviour when changing the arrangement of the load, where for each load position a unique geometric condition of system's balance exists. In rigid systems, by increasing or changing the arrangement of the load, there is a possibility for change in the structural system with the appearance of plastic hinges, local buckling or cancellation of certain members.

Cost-effectiveness of the structure, in addition to the value of performance and maintenance, is also reflected in the flexibility of the system with changes in the exploitation conditions in terms of changes in the load, environmental conditions and capability of protection of the materials and individual elements.

THE PRINCIPLE OF MINIMUM ENERGY CONSUMPTION

Former traditional methods of design indicate structural possibilities of bearing structure mainly reduced only to material defined elements. Contemporary lightweight systems can be analysed in terms of their adaptability to changes regardless of the type of material, which provides opportunities for the development of the system with high-use values, while ensuring material savings (Wagner, Schl 172/13-1). The formation of rod bearing systems on the principle of energy consumption, at the same time meets the requirements of usability and cost-effectiveness. Within a continuum, directions of forces are determined by directions of greatest resistance, which is also the direction of least deformation. If the directions of flow of force in continuum develop, the network of members, with very specific nodes, provides the minimum energy consumption for load transfer. To get the grid structure with a minimum material consumption from the continuum, which has its boundary conditions, supports and associated load distribution, it is necessary to apply the following procedure (See Figure 9):

CONCLUSIONS

The proposed model for Integrated Architectural Design through the integration of traditional and contemporary architectural qualities is not only about intangible and tangible architectural qualities. It is also about the integration of all technical knowledge and skills in planning, designing and construction as well as that of all the important contemporary issues related to the sustainability paradigm, including energy efficiency.

Before employing technological solutions to energy efficiency at an urban scale, the basic tools, here reinvented, must be fully exercised. Design of a system of urban centres and urban grain modelling are key tools that enhance accessibility of social infrastructure facilities and solar access and ventilation. Urban practice of the 21th century is suggesting that we were smarter before.

The task of science is to determine the legalities and regularities in a number of phenomena and their temporal and spatial relationships. The knowledge of laws is obtained by observation and opinion formation. Innovative structures are the result of a series of experimental studies. The optimal structural form created in the “self-forming” process, represents a geometric review of the shortest load’s transfer distance, with the use of appropriate materials. Therefore, these innovative structures possess the optimal power of energy consumption in transfer of the load.

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METAMORPHOSIS OF
ARCHITECTURAL
EDUCATION
IN
(POST)
TRANSITIONAL
CONTEXT

III.
ARCHITECTURAL
HERITAGE
AND
SUSTAINABILITY



Lemja Chabbouh
Akšamija, PhD

Associate Professor,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
lemjaa@af.unsa.ba



Lejla Šabić, Arch.

Teaching Assistant,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
lejlas@af.unsa.ba

THE CONTEMPORARY 'TRADITIONAL' IN HISTORIC URBAN AREAS OF SARAJEVO

AN ANALYSIS OF TRADITIONAL MATERIALS AND THE STUDY OF ENERGY EFFICIENCY IN THE CASE OF SVRZO'S HOUSE

ABSTRACT

The impact of pronounced popularisation of individual housing construction and, even more, of the overall concept of housing based on the 'traditional', is visible in the historic urban housing areas of Sarajevo – the mahalas - which often represent a protective zone of the historical centre of Sarajevo and as such require a contemporary answer to the question of living comfort and a just and reasonable use of natural resources.

However, this response has so far been mainly formal! The popularisation of 'traditional' housing becomes banal and a purpose in itself.

The primary building unit of the Sarajevo city area – the residential house still remains in this context an unexplored terrain. Its structural role in the system of the urban fabric of Sarajevo has stemmed from the interaction of topography, climate, social, political and cultural conditions of the area. Studio, as a pioneer project analysis of energy efficiency of a traditional residential house in Sarajevo - the Svrzo's house, has begun a complex story about the integration of the original value, the contemporary urban expansion and crevices in which architects operate.

Through direct 'in situ' and practical actions, students have tactilely explored the 'traditional' in an original context, but also the 'traditional' in a changed surrounding, to be able to form opinion about something that can be named 'contemporary traditional'. This exploration process also included and considered many aspects of just construction as such – the actual potential of using local materials and knowledge about structure (degree of 'localness' and sustainability), recent sociological contradictions, (not) logic cost saving at the expense of living comfort, expectations of the community in relation to the question of habitation...

Keywords: *traditional urban housing; energy efficiency, living comfort, architecture*

INTRODUCTION

Often, the traditional concept of housing in protected historical areas of Sarajevo - *mahalas*, is, *ad hoc*, being used as a sample for the modern concepts of a sustainable housing design, without a deeper analysis of those elements, which could actually serve as a justified pattern of such contemporary approaches. This study was firstly conceived as a comprehensive research project of defining elements of the traditional housing concept, which is the basis for questioning the correlation of the traditional-modern, divided (for analytical purposes) on economic, environmental and social components of sustainable requirements of the modern design (Harribey, 1999). These requirements are very complex, also defined as universal and authentic/local, on the one hand specified by legislation and regulations, and, on the other hand, very intangible and ambiguous. Achieving a harmonious relationship of all these components is a delicate decision-making process, where such objective data will narrow the framework within which we can move.

The initial detail research of all elements of the traditional forms of chosen examples of houses will serve as the basis for further and a more complex study with an ambitious final goal of answering the question – how can sustainable architecture actually be materialised in this specific historic urban area, in this specific phase of our social development?

Which of the elements of the original within the traditional concept of housing are eligible for transposition into modern concepts of sustainable architecture, and, in relation to the standard decomposition of sustainability, on the economic, ecological and sociological components of a harmonious existence?

Such questioning can be represented schematically:

- ORIGINAL *FEATURES* > (which are, of course, sustainable in their original space/time context, but not necessarily in the current context > into CONTEMPORARY *NEGATIVE* (for example, inability to use local materials, their economic infeasibility), and whether it is possible to correct such inconsistencies?
- ORIGINAL *FEATURES* > into CONTEMPORARY *POSITIVE* – possibilities of implementation?

This study did not deal with the design of sustainable architecture because of the extensiveness of that topic and has left this matter to the successors of the project; instead it focussed on the exhaustive collection of data in the process of research, documentation, base analysis of heritage and the procedure of determining energy efficiency of the selected traditional house and ultimately providing guidelines for future planning.



Figure 1. Scheme of the methodological approach to heritage, based on the de Angelis d'Ossat's analytic procedure (Source: Chabbouh, Sabic, 2015)

THE INITIAL ANALYTICAL PROCEDURE ON CASE STUDIES OF THE TRADITIONAL RESIDENTIAL HOUSE

In relation to the defined issues, at the selected examples of traditional residential buildings (in detail, as a whole, and in accordance to the environment) the following methodological procedure was carried out, based on a custom analytical procedure of de Angelis d'Ossat (Chabbouh, 2009):

1. Research of the original state
2. Research of the current state
3. Comparison with contemporary references
4. Analytical processing of data, divided into the constructive, artistic-aesthetic and cultural-historical aspect
5. The analysis of energy efficiency was carried out separately

Case studies are represented by three separate facilities – *the House of Alija Đerzelez* (Decision of the Commission to Preserve...2004), *the Saburina house* (Decision of the Commission to Preserve...2005) *the new Svrzo's house*, and *the old complex of Svrzo's house* (Decision of the Commission to Preserve...2004), all of which are representatives of the traditional housing architecture and housing concept of an exceptional value. The house of Alija Đerzelez, Saburina house and the old complex of Svrzo's House (old complex of Svrzo's House consists of three separate facilities – houses for women and men, a new house for women and a house for servants) are being pronounced as national monuments. Research, documentation and analytical processes were carried out using the methodological procedure presented above (Figure 1).

A group of six students – divided into three groups – developed a detailed project of the explored original state, the current state (as a whole, in detail, and in relation to the environment) of the treated examples (Figure 2).

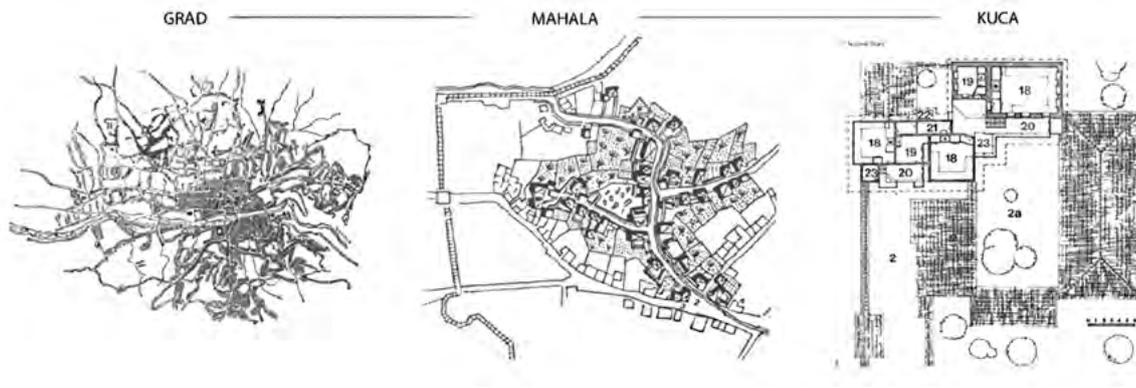


Figure 2. The public and private ratio in the historic urban area, seen through three categories: city-mahala-house

Within the third phase, which included the analytical procedure of data processing following the process of gathering documentation and research, the analysis was separated into:

1. The aspect of traditional construction and materialisation,
2. The artistic and aesthetic aspect,
3. Cultural-historical aspect – by way of analysing the applicability of ‘traditional’ postulates of all three aspect in relation to the ecological, economic and sociological demands of modern sustainable architecture with providing guidelines for future planning.

Directly integrated and inseparable from these aspects is the energy efficiency of a traditional housing construction. Although it is observed separately, conclusions and guidelines for future planning are given with regards to each of the mentioned components.

4. Since the material, derived from this study, is extremely comprehensive and beyond quantitative limits of this paper, only the examples of graphic documentation of the research phase, and examples of analytical data processing and the guidelines provided for future planning are presented here (Figures 3, 4, Table 1).



Figure 3. Examples of results of the investigation of the original and current state: section and facades of the original and current state of Svrzo's house (Source: HERD studio, 2015)

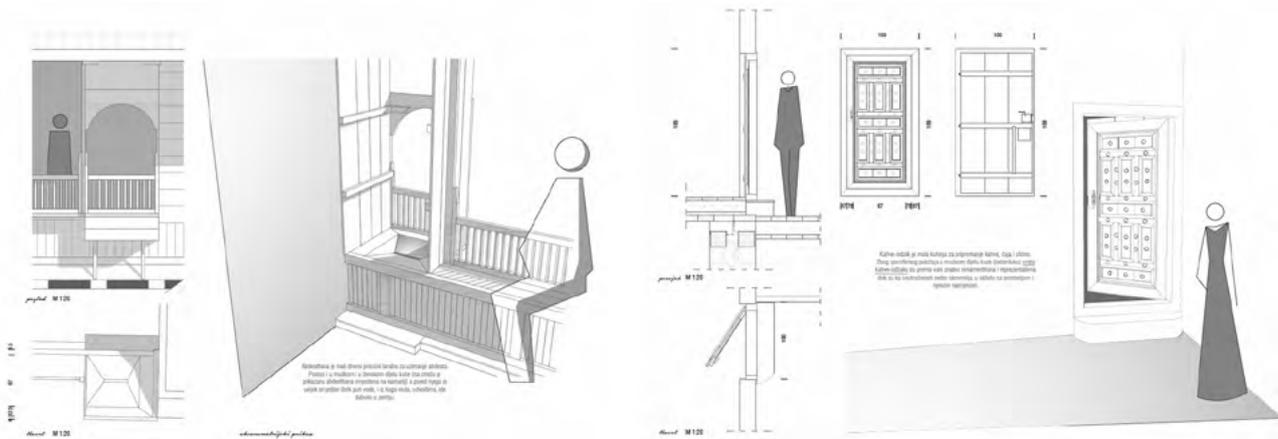


Figure 4. Examples of results of the investigation of the original and current state: details of semi-opened space (divanhana), and its use in a traditional sense (Source: HERDstudio, 2015)

Table 1. Possibilities of applying the traditional principles perceived on Svrzo's house, on the detected contemporary negative examples in the historic area, as a sustainable solution. Guidelines for future design emerged from the analysis of the collected data. For illustrative purposes, guidelines resulting from the analysis of artistic, cultural-historic and structural aspects are randomly presented (Source: HERD studio, 2015)

PRESENT	FUTURE – APPLICATION OF THE SVRZO'S HOUSE PRINCIPLES
Large supermarkets for a local community	*
Local community of 5,000 inhabitants	The formation of small communities within the local community supported by organisation on the principle of joint municipal courtyard shared by several families, from which they access their own - intimate courtyard. Within the common yard, the following contemporary needs are resolved: parking spaces, storage for tools, bicycles, and, at the same time, these courtyards are gathering and socialisation places for smaller communities.
Without division, or divisions into a residential area and business/work space	One-family buildings in residential and commercial areas can be organised by the jagged principle of Svrzo's house. Along with the outer courtyard, there is a commercial space, a living room and study; while a group of bedrooms is in the interior.
One-volumed house	Previously and described as positive in terms of organisation are more-volumed facilities, as well as from the one-volumed solution by dividing the yard into two parts, adding extra garage or storage spaces.
Standardised dimensions according to anthropometric measures	¹
Standardised height of seating and standard horizon	The use of low seating and levelling the floor to adjust the horizon

¹ There is no need for using the earlier principles, because the principle is generally accepted as better than the previous, and/or it is not legally possible to use the earlier principle, and/or is pronounced as unacceptable in this protected historical context.

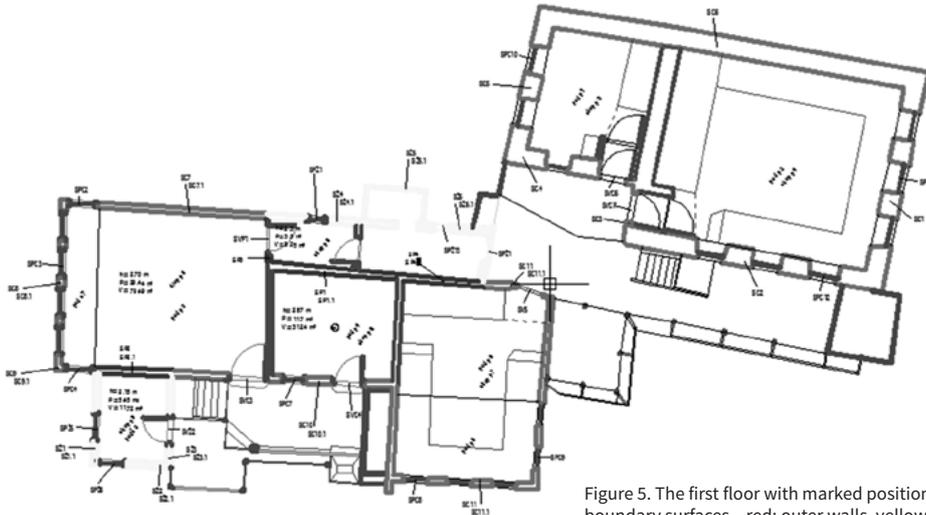


Figure 5. The first floor with marked positions of various boundary surfaces – red: outer walls, yellow: semi-opened spaces, blue: walls between inner and semi-opened spaces (Source: HERD studio, 2015)

ENERGY EFFICIENCY ANALYSIS ON THE CASE OF SVRZO'S HOUSE

A further step in the analysis of transposition of the original positive aspects in the modern concepts of housing, which, due to its specific nature, was separately analysed, was the analysis of the energy efficiency of a traditional house. Such technical data will shed light on the applicability of the positive aspects of the 'traditional' (materialisation, structure, form, layout, urban aspect etc.) vis-à-vis the contemporary requirements.

On the other hand, these data form unique source of information in the region, for future projects, which will eventually deal with improving energy efficiency of houses that have been preserved in their original states. In the old Svrzo's house, the house of the most expressive value, we carried out the classic procedure of analysing energy efficiency – a study of reducing the use of heat energy and thermal protection/calculation of thermal characteristics.

Calculation and inspection of thermal properties of the house was based on the analysis of the existing documentation of Svrzo's House (a net heated area of 452.5 square metres), which is heated to a temperature higher than 12°C. After examining the existing documentation, the need

for changes in its thermal characteristics, in order to meet the requirements of the aforementioned Regulations, was identified.

During the calculation of the heat transfer coefficient "U" [W / m²K] at the outer shell of the building (walls, ceilings / roofs, floors and openings) of the Svrzo's House Museum in computational analysis and evaluation of thermal physical properties of building components and construction of the building concerned, it was found that the values of the shell are not in accordance with the legal requirements, and need to be identified (Figure 5). The values concerned are defined for the interior heating temperature $\approx 18^{\circ}\text{C}$, considering respective climatic conditions, i.e. an average monthly air temperature in the city of Sarajevo.

Table 2: The results of calculations of the required heat energy for heating and thermal energy for cooling, for a building heated to a temperature of 18 ° C or higher:

The surface of the heated part of the building	A = 676.40 [m ²]
Usable area	A _k = 144.80 [m ²]
The annual heat demand for heating	Q _{H,nd} = 37851.00 [kWh/a]
The annual heat demand for heating, per unit area of usable area of the building (apartment buildings)	Q'' _{H,nd} = 261.40 (max = 95.01) [kWh/m ² a]
Annual energy use for cooling	Q _{C,nd} = 2529.00 [kWh/a]

Based on the reviewed project documentation, the analysis of the study of the rational use of energy for the current condition of the property and the analysis of the thermal characteristics of the museum Svrzo's House in accordance with Article 7 of the Regulation on technical requirements for thermal protection of buildings and rational use of energy of the Federation of Bosnia and Herzegovina, the following conclusions were drawn:

Based on the Regulation of Energy Certification of Buildings ("Official Gazette of BiH", no. 50/10), and a valid classification of objects according to energy classes in the Federation, the museum Svrzo's house belongs to the energy class "F" (Figure 6).

In relation to the requirements of the Regulation on Technical Requirements for Thermal Protection of Buildings and Rational Use of Energy of the Federation of Bosnia and Herzegovina ("Official Gazette of BiH", no. 49/09) in terms of thermal physical properties of the building envelope or the coefficient of heat transfer, no element of the building meets the requirements of the Regulation in question (Table 2), which is not surprising since no surface of the object has established insulation.

Energy performance: $E_p = 261.40$ kWh/m² annual

Energy class: F

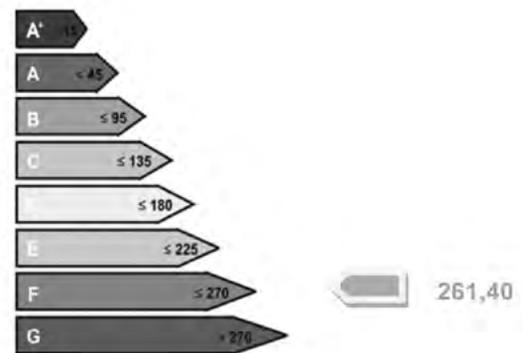


Figure 6. The current situation of Svrzo's House in relation to the energy class (Source: HERD studio, 2015)

Although this issue of the relationship of authenticity and improving energy efficiency of heritage is very specific and can be discussed as a separate topic, here we will only briefly reflect on it, considering that students roughly dealt with the problem of improving the energy efficiency of the Svrzo's house.

Such data about energy efficiency raise many questions about the correlation between heritage and energy efficiency, which is based solely on the rational use of energy, regardless of the value of the preserved object. This low grade of energy efficiency would require very invasive procedures, which would definitely ruin the delicacy of what constitutes authenticity of heritage (ICOMOS, 1994).

If we follow Stovel's definition of authenticity (Stovel, 2004, p. 3), which states that authenticity is a measure of the level of truthfulness of attributes supporting the basic significance of heritage (which was essential for the development of UNESCO/ICOMOS authenticity treatments - primarily in Operational Guidelines since 2005), then a correlation of authenticity-energy efficiency becomes an issue of saving this specific found and determined level, as well as trying to improve energy performances of the heritage treated. The very process of determination of the level of authenticity is by itself complex, all the more so in this new modern challenge. Therefore, primary emphasis is on authenticity and integrity, and measures of degree to which we should go in order to establish a harmonious relationship of energy efficiency and the basic significance of the building. The process is being slightly relieved due to the defined meaning of authenticity, which is neither an absolute concept, nor a value for itself (Stovel, 2007, p.28, 29), but rather bound to attributes supporting the basic significance of

heritage. These attributes are: form and design; material and substance; use and function; traditions, techniques and management systems; location and setting; language, and other forms of intangible heritage; spirit and feeling; and other internal and external factors (UNESCO - WHC, 2013, p.82). Here, space can be found for upgrading some attributes without violating their truthfulness.

For this reason, in the further analysis of these two components, namely energy efficiency and authenticity, the analytical procedure is expanded (Figure 7), exploring the possibility of improving the energy efficiency through different attributes (Chabbouh, 2015).

Following numerous examples of interventions on heritage, and at the same time being aware that legislation for such cases has not been established and adopted in Bosnia and Herzegovina, we have established approximate measures for improving the energy efficiency of traditional houses with a high degree of authenticity:

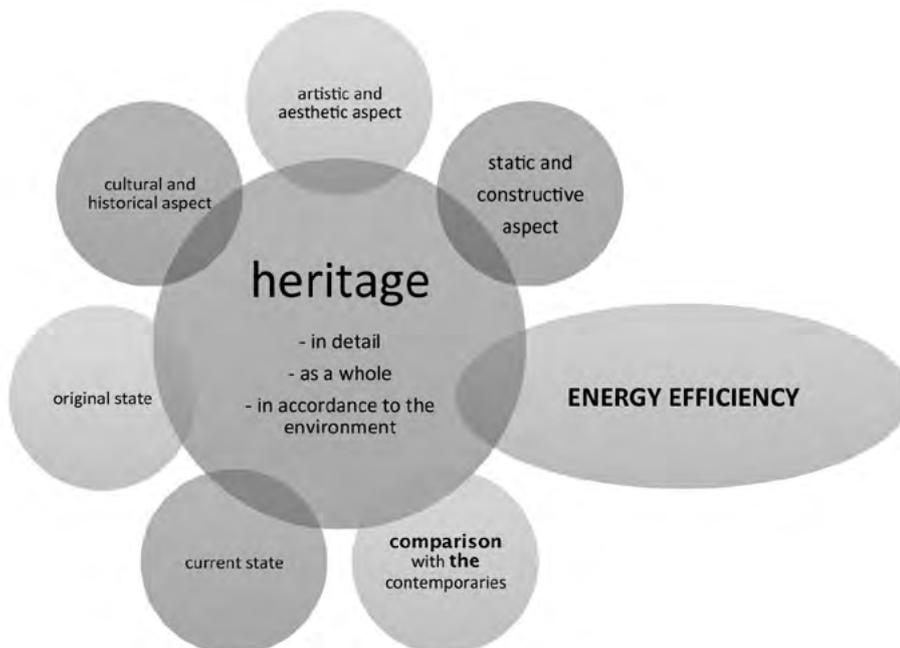


Figure 7. The scheme of the methodological approach to heritage adapted to the specific aspect of research (Source: Authors of the paper, 2016)

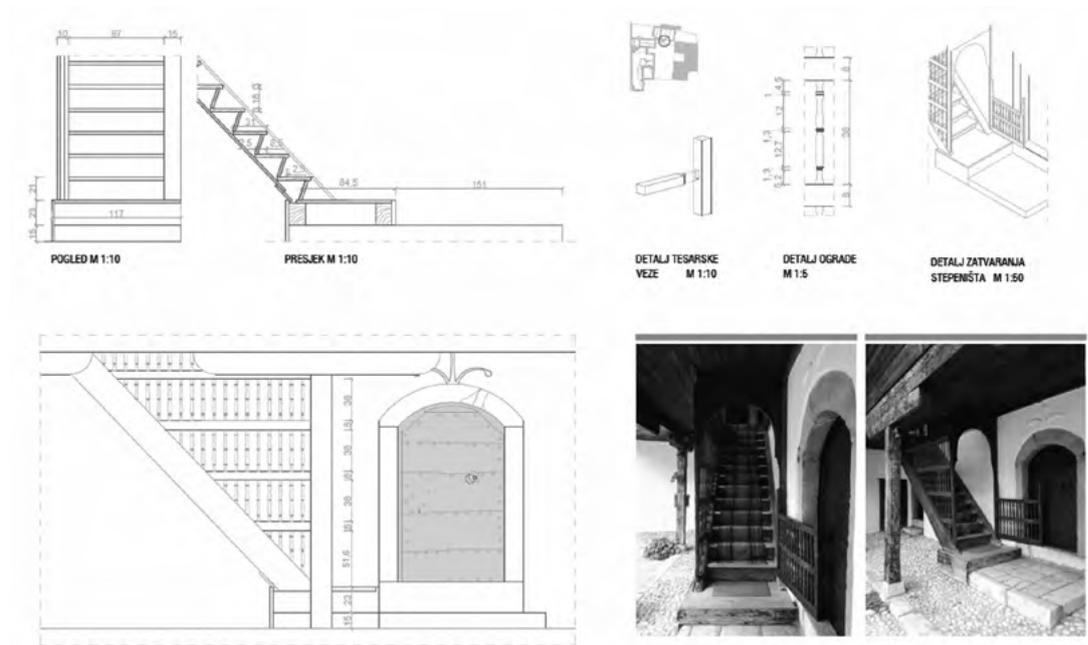


Figure 8. Drawing of details of construction and materialisation on which measures for improving of energy efficiency can be applied – proposals for changes according to the maintenance of authenticity and integrity (Source: HERDstudio, 2015)

M1 – replacing windows according to the accurate current state.

M2 – exterior walls – with regards to the protection of authenticity, the façade can only partially be coated with thermal insulation on the inner side of the walls.

M3 – floors on the ground – vertical digging and removing all layers of the floors, for insertion of thermal insulation, in order to maintain the storey height,

M4 – ceilings above unheated space – insertion of thermal insulation, respecting the original storey height

M5 – roof structure – insertion of thermal insulation on the inner side of the roof (Figure 8).

CONCLUSIONS

The problem of the design of sustainable architecture in this region, and specifically in the area of Sarajevo, and in its most delicate zone, the protected historic residential zone – is still in its infancy. The concept of sustainability is incidental and mystified in the process of education at the Faculty of Architecture in Sarajevo, and therefore in the field of protection of architectural heritage (contradictory, principles of vernacular residential architecture, such as the residential architecture of Sarajevo, represent the most direct source of information about successful ways of transposing in sustainable design), which is understandable regarding the broadness, delicacy and specificity of the problem, requiring a separate space in the educational process and coordination of the various areas which deal with these issues. All existing examples of transposition of these values in contemporary architecture, in treated areas, have been unsuccessful for the most part of the constituent elements of what defines sustainable architecture, and in the protected zones are tied solely to the formal common denominators. A detailed database and an analysis of components of the traditional residential home was lacking in order to make any conclusions. The results of this research represent an extensive and comprehensive database about traditional housing, based on the scientific principles of the doctrine of protection of architectural heritage.

Research of the original, current state, the comparison process and analytical method of data processing, have resulted in the framework guidelines, which regulate the relationship of contemporary design to the 'traditional', and define the scope of those principles of the 'traditional' to provide a starting point in designing the architecture of protected areas with the accent on sustainable. Separately, the results of the performed analysis of energy efficiency, in addition to being an important element of defining guidelines, will provide the basis for projects of upgrading energy efficiency of the preserved original traditional objects.

In relation to this method of work, the students have undoubtedly been introduced to a new way of observing architecture, space and its universal notions in the passage of time, and the actual value of the architectural creations. This complex reasoning includes unlimited resources and tools of understanding, designing of research during the very process of teaching and fluid structuring of the methodology of research, with the key elements of success being the meaningfulness of the set problem and clearly defined objectives.

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**Aida Idrizbegović
Zgonić, PhD**

Associate Professor,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
aidaiz@af.unsa.ba



Amir Pašić, PhD

Full Professor,
Faculty of Architecture,
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
pasicamir@gmail.com

PROTECTION AND DEVELOPMENT OF HISTORIC URBAN AREAS

CASE STUDY: POČITELJ AND VRANDUK

ABSTRACT

The more we know architecture, it seems that we know less about space! In particular, we know less about spatial logic, that seems so obvious when we look at historical urban settlements and their responses to environmental circumstances. With this in mind, a specific task for the HERD Course was made for students – a critical analysis of spatial forms and processes behind the unique formations of historic cities of north/central B&H (continental climate Vranduk) and south B&H (Mediterranean climate Počitelj). The two settlements share a large number of common features, such as topography, vicinity of a river, size, and fortification character.

The primary aim was not the design of contemporary structures but a comprehensive analysis and comparison based on parameters (particular and universal) - interaction between natural, anthropogenic conditions with the inclusion of contemporary mitigation of values (positive and negative).

The outcome did include proposals for interventions through research and preservation of local solutions and adaptation to natural and cultural circumstances, but most of all, it was a study on the logic of space: land-use patterns, spatial organization, visual relationships, archetypes, materials and the intangibles - social interactions, cultural patterns and meaning

Keywords: *historic urban landscape, climate and topography, analytical comparison of urban and architectural patterns, building techniques, education*

INTRODUCTION

In the Faculty of Architecture, students have always been interested in designing new objects, structures or concepts. When the prevalent 'status quo' is complex and sensitive, the interest in understanding it is not as well-developed as it ought to be. Some courses do emphasize on the importance of such understanding, but students, by large, are content with dreaming about a 'clean-slate' world in which they can express themselves as designers and architects.

The structures currently built in Sarajevo or for that matter in the rest of Bosnia and Herzegovina are stereotypes of what contemporary architecture should look like.

It was with this in mind that a few courses were introduced in the Department of Theory and History and Preservation of Heritage was created, in order to learn once again about the logic of space that was once a part of collective vernacular wisdom.

The main goal of this HERD course was the analysis of the urban form of two small historic cities that share a number of similarities (size, fortification, river) but also differ in climatic conditions, available materials in order to explore the forces behind the genesis of these specific urban formations, and then try to implement the knowledge through small contemporary interventions that can have a positive impact on the existing environment. In architecture, contextualism has often been

equalized with nostalgic regionalism. Current tendencies are broadening this definition that it is the use of uniqueness and specificities of a certain space that provide a platform for creation of contemporary concept.

Specific goals were:

- Preservation of the built heritage of the historic city of north /central Bosnia (continental climate Vranduk and south (Mediterranean climate Počitelj) through integral plans for sustainable conservation and development.
- Comparison based on parameters - interaction between natural and anthropogenic conditions with the inclusion of contemporary changes (positive and negative).
- Proposals for interventions through research and preservation of local solutions and adaptation to natural (morphological, climatic) and cultural circumstances.
- Preservation and development of heritage based on the principles of traditional knowledge and logic of space use as well as current energy efficiency in architecture and urbanism.

BRIEF HISTORICAL OVERVIEW OF VRANDUK AND POČITELJ

Vranduk is a fortified city in the valley of the river Bosnia. It is located on what was a trading route in medieval times; and finds mention in documents of the early 15th century.

The settlement with residential objects lies to the north and south of the tower. The terrain is spectacular, steep with a meander of the river - creating a river peninsula (Figure1). This was probably the reason why the fortress was situated at that location. The architecture of residential objects is predominantly wood-frame with infill and steep roofs with wood shingles. It has its urban matrix preserved but objects have been transformed by the use of poor materials such as concrete blocks. The community has about 200 residents of all ages, it is quite vital and visited occasionally by tourists in summer time.

Počitelj is placed at Neretva river canyon, on a slope that forms an amphitheater with fortification facilities on the top and partly embracing the city, built sequentially from the XV to XVIII century. Počitelj has more public facilities, built in the Ottoman era, domed mosque, *medresa* (school), *han* (early form of guest house), clock tower and large residential area that spreads from top to bottom of the hill interlaced with paths and greenery (Fig.1). It provides a spectacular view,

but is sparsely populated at the time of writing. It has about 20 permanent residents and serves as a weekend/holiday resort for about 50 more. It is a tourist attraction and a convenient stop en route from the hinterland to the sea coast.

STRUCTURE OF ANALYSIS AND METHODOLOGY

The cities can be analysed through two crucial aspects, one that is identity, meaning - its historical significance, its context and social circumstances and also as a place of focus of collective memories, and on the other hand - as a visual spatial reference point that has defined the urbanity and landscape of the city that derived from *the urban form and urban process* (Kostof,1991).

These two aspects are linked through the constant modifications of the space throughout various social and historical contexts. Modification is the only constant feature of this space, and needs to continue so that this space can be preserved. Transformation of urban tissues is not a new process, it has been omnipresent within cities, but it has been gradual, well-adjusted to local cultural and climatic conditions. In general, the overriding principle has been that the cities in which the settlements are, have evolved in concord with the physical layout of space.



Figure 1. Photographs of Vranduk on the left and Počitelj on the right, showing the interaction between natural and built environment. (Source: <http://pogledaj.ovojebih.com/media/stari-grad-vranduk>; <http://www.lahistoriaconmapas.com/atlas/country-map03/pocitelj-bosnia-map.htm>)



Figure 2. Maps showing urban patterns, relationship with the fortification of Vranduk on the left and Počitelj on the right side. In both cases, the fortifications are on the most prominent location with the residential areas, compactly placed within city walls in Počitelj, while in Vranduk the walls are replaced by natural form of peninsula. (Source: Author, 2016)

The analysis was conducted through parameters defined by a group of students and lecturers:

- Urban/morphological parameters: characteristics of topography, incline of terrain, insolation, contact with river, street and urban patterns, relationship with the fortress,
- Architectural parameters/features: materials, forms, archetypes, relation between objects, land use,
- General contextual and intangible parameters: local, particular, universal values of settlement, current tendencies, social structure, functions, history.

The method of preservation that is suitable for these settlements is UNESCO Historic Urban Landscape Approach (the UNESCO HUL approach) that “looks at urban settlements as a layering of historical, cultural and natural values, beyond the notions of ‘historic center’ and ‘ensemble’, to include their surroundings and their broader geographical setting...includes social and cultural practices and values, economic processes, and the intangible dimensions of heritage as related to diversity and identity ...“(UNESCO HUL, 2011).

The HUL approach is essentially a tool to manage physical and social transformation that provides us to see preservation as an active ever-changing and development process, rather than a static conservationist view (Bandarin, Van Oers 2012). By adopting this approach, together with the aforementioned parameters, one is able to create an active platform for learning about the logic of space.

Most of historic urban settlements are created through logical space – by following the natural conditions of sites (river valleys, hillsides etc.), but some settlements and spaces were created through ideological premises (fortification - Palma nova, religious - old Baghdad). Currently most of the space is created ideologically – due to architectural concepts, capitalism mostly, but also due to the fact that the basic knowledge of space use/context is somehow undervalued in current architectural education system.

RESULTS OF SPATIAL STUDIES

Using the tools and parameters described above during the course, students have come up with interesting results. Each settlement has been processed individually, and a comparison has been made in order to establish connections between different circumstances and spatial forms that resulted from them (Fig.2). Comparison of two sites provided additional evidence in research of the factors that impacted the physical shape of the area.

SPATIAL IMPACT FACTORS

Primary impact factor: In both cases, landscape and climate have been identified as having a crucial impact for urban and architectural forms. Working with what exists, rather than trying to extensively change the circumstances, was the easiest and most logical approach to building. Inhabitants of Vranduk built along the axis north south, following the terrain, capturing most of the eastern and western sunlight, since this is a continental climate zone. Access to the river is in most parts steep and objects are quite well

protected against flooding. Some of the areas to the river are used for recreation and some as gardens. The axis is further accented by the fortress, that dominates the skyline and is the main visual reference point.

Počitelj is spread like an amphitheater, providing excellent viewpoints for all objects. It is mostly oriented towards western sunlight, which for Mediterranean climate is not the optimum solution. In order to mitigate the negative impact houses are built with high protection walls, deep porches and trees to create shade. Objects correspond with the terrain in a stepped manner providing place for paths and creating shaded areas and small gardens.

Second factor in shaping the environment was safety and prominence, where the main fortifications and sacral objects were situated/ located at prominent, visible locations in order to control and also symbolically dominate the surroundings. What is interesting to point out is that the shape of the fortification mimics the overall urban shape of the settlement. Prominent buildings and vertical accents were also built strategically in order to accent their role and importance within the area (Figure 3).

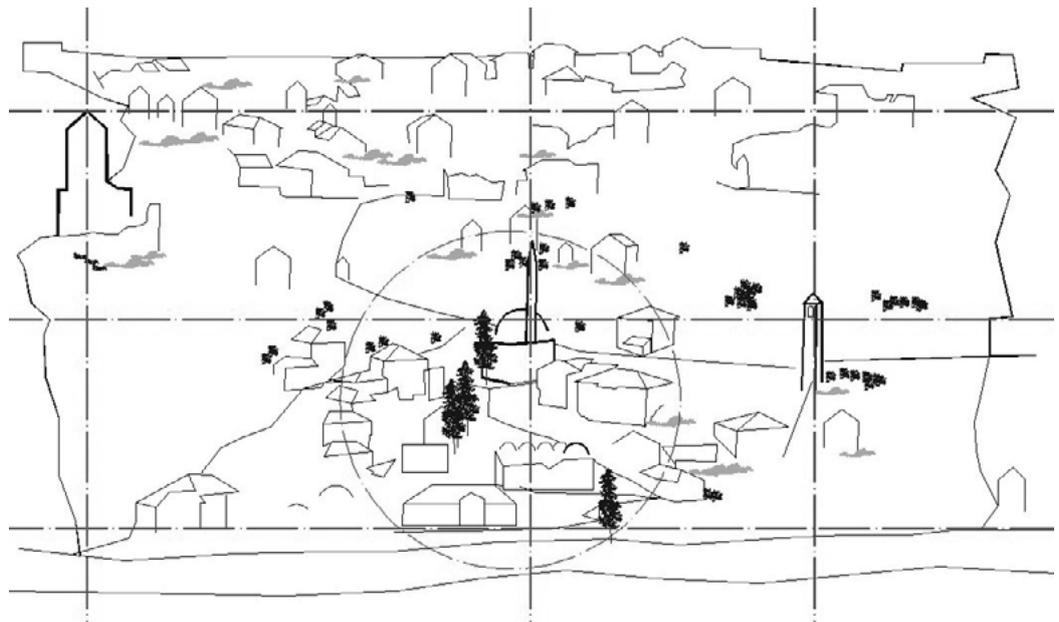
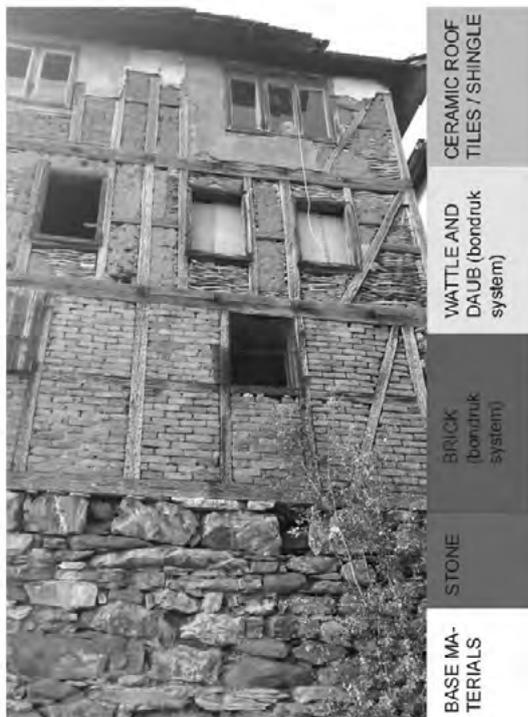


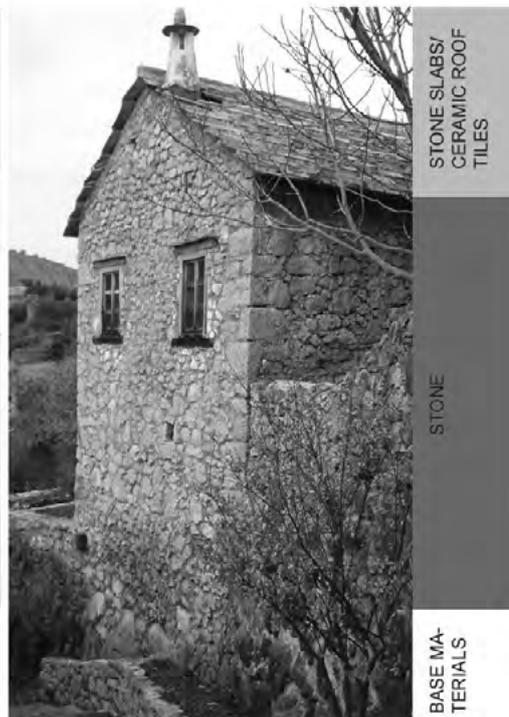
Figure 3. Study of visual components of Počitelj, with dominant vertical accents and the cluster of central functions forming the focus of the settlement. (Source Author, 2016)

The third factor is connectivity/accessibility. - Access roads and paths were formed entwined with the landscape providing an urban network or plan for formation of objects and structures. The task for students besides the analytical part, was to uncover the logical tendencies for eventual future building and to come up with a strategy (or a set of comprehensive guidelines) for spatial development or transformation – a permanent process of modification and mutation of existing space in order to accommodate new structures and functions. It was during this part of the course that certain weaknesses were exposed that arrive from the classical architectural training. Some of the groups struggled with the notion that their project must be just another part of the overall mosaic, of its place however contemporary. Most student groups involved in the project came up with sensitive and appropriate urban solutions on various sites, regarding the placement and scale of the new structures. It was mostly the architectural outcome of the solutions that did not reflect the sophistication needed for such an intervention.

Traditional materials and structures



VRANDUK



POČITELJ

Figure 4. The study of materials on two typical properties in Vranduk and Počitelj shows the available traditional materials and types of structures. Wood and brick dominate in Vranduk; stone in Počitelj. (Source: Student works Herd course 2016)

ENERGY EFFICIENCY ASPECT

In general, the issue of energy efficiency in historic objects can be divided into two main components:

- vernacular buildings use local knowledge and materials in order to place and build structures to gain as much as possible from natural resources, and are in general, energy-efficient,
- these buildings do have some weak spots like openings, that are not easy to retrofit especially on buildings of high architectural and monumental value.

For potential new structures, the obvious solution would be to combine both components, local and contemporary practice, that was the essence of knowledge for the students to consider.

Materials and architectural details used in the two case studies are excellent examples of adaptation to local conditions. Additionally, the

use of awnings and other solutions for providing shade, contribute to the efficiency aspect. What is currently ongoing mostly in Vranduk is the replacement of the traditional materials with plastic or even asbestos awnings, and the use of concrete blocks for walls. This is not only spoiling the visual aspects but also has a negative impact on health and soil. The reasons are mostly poverty and lack of knowledge about these materials and even more it is a trend that is not likely to cease in the near future.

SOCIAL INTERACTION

What was particularly interesting was how current residents and visitors influence the land use and spatial transformation. Residents have developed various strategies for coping with lack of space for car-parking and storage by building small additions wherever possible but not deviating much from the existing logic and pattern.

In both cases, the loss of the basic urban functions or facilities is a major disruption in everyday life and incorporating these could be a step in the right direction if urban living conditions are to be improved by adding new structures. A social component of the study was made through interviews with local residents, and in both cases, it was established that the community does not have basic facilities and does not fulfill the requirements for the current life of inhabitants. In general, the people were overall more satisfied with the life in Vranduk (even though living conditions, and social economic status was lower than in Počitelj), probably due to vitality of population.

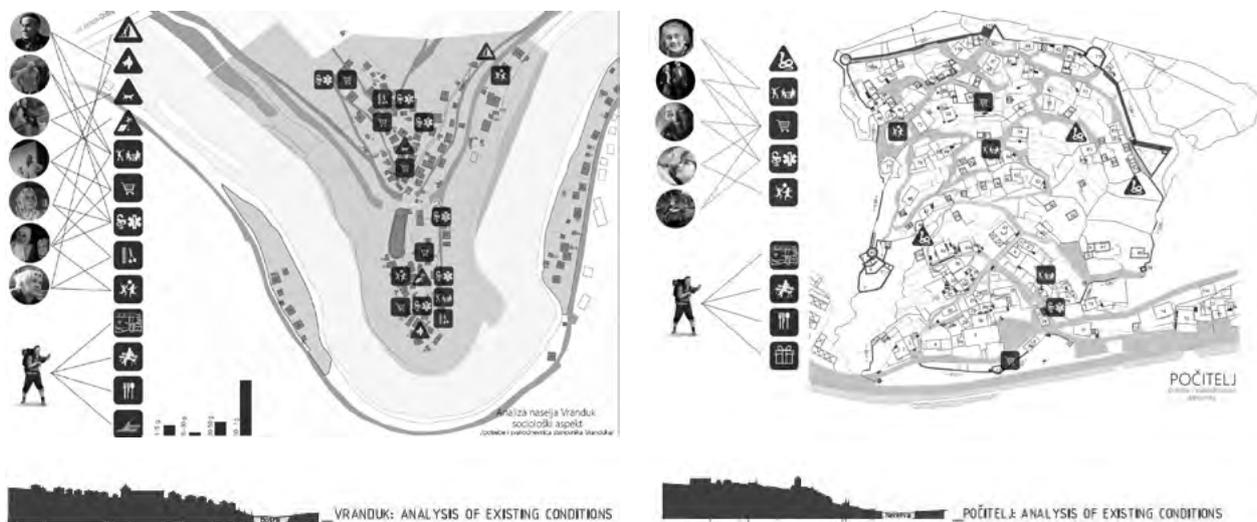


Figure 5. Social/function study Vranduk on the left and Počitelj on the right side, in which the residents expressed the need for more facilities, shops, pharmacy, children's playground which is not found in the traditional functioning of the settlement and is difficult to accommodate at the site.

Below is a silhouette study of both places with fortifications being on the most prominent spot, and the structures following the incline of terrain up to the riverbanks. (Source: Student works Herd course 2016)

CONCLUSIONS

Globalism and regionalism have both become constraining forces in creating an architecture that will express all specifics of a certain place. They can no longer answer to the situation and circumstances of permanent metamorphosis, and sedimentation of city tissue (Baudillard, Nouvel 2005). We must recognize that the urban tissue consists of fragments of authentic, new and “improved and revised” traditional architecture.

The main objective of this course was to show simple and innovative architectural tools and methods in engaging with the complexity of all layers of historic context, and to teach about the use of the existing organic chaos, irony, introspection, mimicry, collage – into a synthesis that can lead us to new solutions.

In order to be fully objective in evaluating the HERD course, as well as similar courses it would be fair to state that it has generated partial success. It was productive and meaningful in its first analytical phase where the students provided excellent insight into the underlying causes of urban and architectural forms of Vranduk and Počitelj. The second phase of translating the findings into new strategies and development resulted in interesting but somewhat still superficial design. Having said this, it is important to note that the effort on behalf of students is fully appreciated. It is more of an indicator for us - the teaching staff - to emphasize the contextual, transformational character of space throughout the entire architectural education.

Our need for asserting, pressuring the existing fabric into submission is a product of contemporary architectural expression.

In search for traditional vernacular wisdom, logical use of space, one must ask the question: Do we no longer possess the skills of spatial recognition/ What are the primary forces behind the architectural output today?

The current processes seem to be based on m^2 , EUR/ m^2 , superficial spectacle, creating geographical places, and this seems to be even more visible in the so-called “countries in transition”. By the time, we transform ourselves into a fully-developed society, there will be almost nothing left of meaning, layers, identity or place. It is the students who will be in the forefront of this permanent “battle” between respect and resistance in relation to the existing.

Logical and ideological spaces are inherently parts of urban and architectural history; they are generators of identity of space. The potential for future use and transformation lies in a deeply rooted sense of place, only then one can start the resistance - through being *avant-garde*, contemporary or according to Kevin Lynch “*our urban environment should not only be organized, but also poetic and symbolic ...with elements of mystery, labyrinth and surprise*” (Lynch,1960).

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METAMORPHOSIS OF
ARCHITECTURAL
EDUCATION
IN
(POST)
TRANSITIONAL
CONTEXT

IV.
INCORPORATING
THE
SUSTAINABILITY
PARADIGM
IN
ARCHITECTURAL
EDUCATION



**Venkatesh
Govindarajan, PhD**

Senior Lecturer,
Faculty of Health,
Science and Technology,
Karlstad University,
Karlstad, Sweden
venkatesh.govindarajan@kau.se



Markus Schwai, PhD

Associate Professor,
Faculty of Architecture
and Fine Art, NTNU
Trondheim, Norway
markus.schwai@ntnu.no

OVERHAULING HIGHER EDUCATION BY FACTORING SUSTAINABILITY INTO UNIVERSITY CURRICULA:

ABSTRACT

The purpose of this paper is to glean the prospects of, and the inclination towards incorporating the sustainability and energy efficiency paradigms in university pedagogy. The individuals contacted (by e-mail) with the survey questionnaire were professors, associate professors, adjunct professors and lecturers at universities around the world. A sizable percentage of respondents were, needless to say, from the faculties of architecture of the Norwegian University of Science and Technology and the University of Sarajevo in Bosnia and Herzegovina, partners in the project of which this paper is a deliverable. Among the observations made, over 50% of respondents consider the bridge-building among academia, industry government and society, as something that cannot be ignored. Over 60% believe in the indispensability of multi-disciplinarity in academics, if sustainability has to be 'taught'. Close to 95% say that they have been and will continue to strive to impress upon their students the imperative of converting sustainable knowledge into action. It is surprising that some respondents claim that they are not sure if there is a difference between 'improving energy efficiency' and 'reducing absolute energy consumption'. The authors of this paper are of the opinion that universities ought to gear up to keep up with the demands of the changing times, and incorporate modern and relevant concepts – sustainability and energy efficiency being two of them - into the courses they offer and the subjects they teach.

Keywords: *Sustainability, sustainable development, energy efficiency, urban design and planning, architecture, higher education, research and development*

MOTIVATION AND INTRODUCTION

The authors of this paper drafted a report under the aegis of the project – **Higher Education, Research and Development / Energy: Rethinking architecture and energy efficiency in buildings and sustainable development** – of which the Faculty of Architecture of the University of Sarajevo in Bosnia and Herzegovina and the Norwegian University of Science and Technology, Trondheim, were partners. The purpose was to glean the prospects of, and the inclination towards incorporating the paradigms of sustainability and energy efficiency in university pedagogy. The aforementioned report did not and therefore this paper also does not claim to provide silver-bullet solutions to reaching the perfect state of affairs as far as the incorporation of sustainability and energy efficiency in higher education is concerned.

The authors, however, using the responses to the survey questionnaire (presented in the Appendix) as a base, attempted to provide an overview of the ‘what-is’ and ‘what-can-be’, in the report referred to. Work on this paper is a sequel to the aforementioned report, and is based, *inter alia*, on literature review, further brainstorming, and fresher insights gained after the drafting of the report and general feedback received.

LITERATURE REVIEW

Savageau (2013) described the integrated course – Introduction to Sustainable Design – offered at the University of California-Davis, USA, which entails a self-audit exercise, intended to provide intrinsic motivation to students for sustainable living. The aforementioned paper has referred to literature incorporating sustainability into education and research in engineering, business management, art and design, architecture, ecology, agriculture, public policy, sociology, environment and psychology – practically the entire swathe of academic disciplines indicating at once the multidisciplinary nature of sustainability studies. Some students, according to Savageau (2013) found the concept of sustainability ‘overwhelming, distant and impersonal’, but, after the self-audit, they were of the opinion that sustainability ought to be integrated into the university curricula.

Marshall et al. (2013) observed that there is some degree of change in the integration of sustainability into business schools. They refer to the strand of learning available for all students at the University of Leeds – Creating Sustainable Futures – which is based on the transition from ‘Learning about sustainability’ to ‘Learning for sustainability’. Teaching for sustainability calls for creative approaches and new ways of teaching, focus on real-life problems, use of fun, art (film, photography and drawing) and aesthetics in

pedagogy. At the Birmingham City University, students are encouraged to question conventional business practices by first examining one's own values and then by using dilemmas, highlight difficulties behind sustainability challenges.

Acevedo et al. (2013) defined sustainability studies as 'a life-long learning process embedding practices and discussing ideas around the socio-cultural, economic and environmental impact that students, lecturers and practitioners will make in the transformation of current lifestyles and practices.' 'Systems-thinking', 'Creativity' and 'Cooperation' stand out as keywords, or rather key constituents of sustainability-education. These authors emphasise the indispensability of the integration of experiential learning opportunities into education, research, operations, to leverage student enthusiasm and foster creative approaches to real-world challenges. Collaboration is key and no one institution can ever become sustainable working in isolation from other sectors and institutions.

ACUPCC (2014) has maintained that higher education institutions need to be recreated, equipping them to be safe and secure in the face of the change, more actively engaged in solving real-world problems (and not dealing in ivory-tower concepts only), and reorganised to provide better education and research needed to create and maintain a sustainable society. This report also emphasises the need to update curricula across a diverse range of academic disciplines to address climate adaptation – from business practices to the ecosystem management, from law to community planning, and from architecture to healthcare. The view that climate adaptation education cannot be limited to the Science-Technology-Engineering-Mathematics quartet is rightful: scientific information needs to be translated and made available to many types of audiences/readers. As part of the Ponderosa Project in the Northern Arizona University, sustainability was incorporated into disciplines like Medieval Art, Archaeology and Organic Chemistry.

Dobson et al. (2013) pointed out that at the University of Manchester, Sustainable Development is a compulsory component of engineering degrees, for students intending to become chartered engineers. Education on sustainable development entails encouraging students to personally become better citizens, applying their disciplinary knowledge to global

problems and understanding how to apply models, theories, tools and techniques learnt in the classroom to different types of scenarios and acquiring transferrable professional skills. Creating interdisciplinary, diverse and balanced teams is essential to optimise learning about (and for) sustainability, but it can be difficult to achieve in practice.

NACUBO, USA / Second Nature, USA (2014) contend that higher education institutions need to lead by example by resorting to wind and solar energy generation, geothermal and biogas heating/cooling systems, lighting upgrades to improve energy efficiency, water conservation, weather-proofing initiatives, waste minimisation and recycling, etc. After all, it is of paramount importance that one practises what one preaches; if one would want what one preaches (teaches, lectures or professes, in other words) to be practised by others!

At the Karlstad University in Sweden (to which the first author of the paper is affiliated), it is mandatory for PhD students in the fields of science and engineering, to try to find how sustainability concepts could be incorporated into their research. The Department of Chemical and Engineering Sciences offers courses in sustainable development to engineering students from different disciplines at different stages in their bachelors' and masters programmes.

METHODOLOGY

As the report is the main foundation on which this paper has been 'built', the authors start off with the methodology.

The individuals who were contacted with the survey questionnaire (by e-mail), were professors, associate professors, adjunct professors and lecturers in universities around the world. A sizable percentage of respondents were, needless to say, from the faculties of architecture of the Norwegian University of Science and Technology and the University of Sarajevo in Bosnia and Herzegovina. In addition to the academicians in the partner universities, efforts were made to elicit responses from academicians in Spain, Italy, India, Singapore, Poland, Sweden, Thailand, and Germany. This last group comprises entirely of people from non-architectural disciplines. However all of them teach subjects related to sustainable development, industrial ecology or

urban infrastructures of one kind or the other. Appendix 1 lists the 15 questions which were sent to the potential respondents. The author started off with a list of 30 possible questions, and whittled it down to 15, bearing in mind that long survey questionnaires are often repulsive and do not elicit quick responses. The first 13 questions are of the multiple-choice type, while the question 14 is quantitative; it requests the respondents to rate their point of view (on a scale of 1 to 10). The last question expects an answer in one or two sentence/s. The questions encompassed *inter alia* pedagogical aspects, outputs / results, collaborative approaches, integration with other disciplines and other sectors outside academics. The range of questions is in keeping up with what the acronym HERD stands for – Higher Education, Research and Development; Education facilitating research and research being necessarily (and advisably) linked to (sustainable) development. While MS-Excel was chosen as the first-choice tool and all the non-Bosnian academicians were approached with it, a SurveyMonkey version was designed for the Bosnian counterparts. Both the ‘multiple-choice’ and ‘dropdown’ options were availed of in designing the SurveyMonkey questionnaire. All the e-mails were sent out on 10 and 11 March 2015. The Bosnian faculty members at the University of Sarajevo were also provided with the option of responding using the Excel-based questionnaire. Responses started streaming in from 10 March already. The respondents were provided one week to send in answers. On 17 March 2015, when this seven-day period expired, those who had not responded were reminded again – with the Survey Monkey version.

The final deadline for acceptance of responses was 24 March 2015. Fourteen days were considered to be sufficient to answer 15 questions, and the authors felt that even with busy schedules, respondents could find the time to send in their responses. After the first round and filing of the report, one of the authors (Schwai) decided to contact those who had not responded again. This was done on 20 May 2015. The purpose of course was to try and receive more responses for the sake of this paper. Schwai also visited Sarajevo and used the opportunity to coax the Bosnians who had not answered the questions in March, to send in their responses. He also interviewed some of the respondents there later in October 2015 in order to gauge the rationale behind their responses.

RESULTS AND DISCUSSIONS

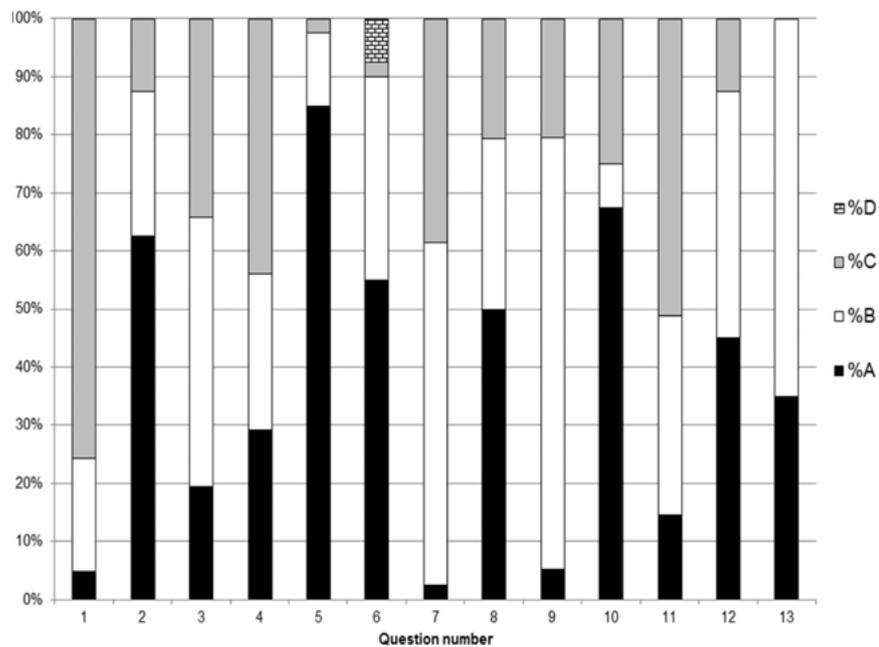
Of the 102 people written to (through Survey Monkey and/or e-mail (Excel)), only 37 (37% approx.) sent in their responses in March. After the first round, the response rate for the University of Sarajevo was over 25% (14 of 52); and of these only 11 answered all 15 questions. The response rate for the Faculty of Architecture of the NTNU (the key partner of this project) was slightly better at 41% (14 of 34). Of these 14, however, only 50% responded to all 15 questions. Of the other 16 contacted (hailing from Italy, Spain, Thailand, other departments of NTNU, Poland, Sweden, India, Singapore and Germany), 9 responded. After the reminder sent on 20 May 2015, the overall response rate increased slightly, though not as much as the authors hoped it would. Finally, the authors had 45 sets of responses to work with (an overall response rate now of 44%). All the new additions came from NTNU, Trondheim.

Irrespective of the number of responses, the motivation of course, is simply to understand the potential for incorporating the paradigms of energy efficiency and sustainable development into university education. Readers may please refer to the Survey Questions in the Appendix and the multiple choices thereof, while browsing through Table 1 below. Permitting ourselves a little redundancy, Figure 1, which follows Table 1, depicts the results tabulated therein.

Table 1: Responses summarised – the first 13 multiple choice questions only

Question number	1	2	3	4	5	6	7	8	9	10	11	12	13
%A	4.9	62.5	19.5	29.3	85.0	55.0	2.6	50.0	5.1	67.5	14.6	45.0	35.0
%B	19.5	25.0	46.3	26.8	12.5	35.0	59.0	29.4	74.4	7.5	34.1	42.5	65.0
%C	75.6	12.5	34.1	43.9	2.5	2.5	38.5	20.6	20.5	25.0	51.2	12.5	N.A.
%D	N.A.	N.A.	N.A.	N.A.	N.A.	7.5	N.A.						

N.A. stands for Not Applicable, as most questions have only 3 choices

**Figure 1:** Results of Table 1, depicted graphically

A further breakdown of the responses can be presented by splitting up the respondent-set into three categories – NTNU-Architecture, University of Sarajevo and others. This has been done in Table 2 below. This may throw light on the possibility or otherwise of correlations between ‘geographical location of work’ (or to some extent nationality, as

most respondents from Sarajevo are Bosnians and most respondents from the Faculty of Architecture at the NTNU are Norwegians) and the proclivity for a particular response. Of course, as mentioned earlier, the number of responses is too small to make any confident generalisations regarding the presence or absence of such correlations.

Table 2: NTNU-Architecture, University of Sarajevo and others – a vis-à-vis

Q No.	NTNU-Architecture Faculty				University of Sarajevo (Faculty of Architecture)				All the others			
	A	B	C	D	A	B	C	D	A	B	C	D
1	1	3	13	N.A.	1	2	11	N.A.	0	3	6	N.A.
2	13	2	1	N.A.	5	6	3	N.A.	7	1	1	N.A.
3	1	11	5	N.A.	6	2	6	N.A.	1	6	2	N.A.
4	6	0	11	N.A.	2	7	5	N.A.	4	3	2	N.A.
5	12	3	1	N.A.	13	1	0	N.A.	8	1	0	N.A.
6	8	7	1	0	8	4	0	2	6	2	0	1
7	1	11	3	N.A.	0	7	7	N.A.	0	4	5	N.A.
8	1	6	6	N.A.	10	1	1	N.A.	5	3	0	N.A.
9	1	13	2	N.A.	1	10	3	N.A.	0	5	3	N.A.
10	10	2	4	N.A.	8	0	6	N.A.	8	1	0	N.A.
11	1	6	10	N.A.	3	5	7	N.A.	2	3	4	N.A.
12	5	9	3	N.A.	5	7	2	N.A.	8	1	0	N.A.
13	9	9	N.A.	N.A.	1	12	N.A.	N.A.	4	5	N.A.	N.A.

N.A. stands for Not Applicable, as most questions have only 3 choices

The discussion hereafter is on a question-by-question basis, starting from Q15 and going up to Q1. The reverse order is an arbitrary choice.

QUESTION 15

This was not a multiple-choice question, but one that asked the respondent to answer in one or two sentences. The question was related to a hypothetical master's degree programme in energy efficiency and ways in which the respondent could contribute to it. While 14 respondents from the University of Sarajevo answered this question, the corresponding numbers for the Faculty of Architecture at the NTNU and the group 'Others' were 10 and 9 respectively. Let us list the keywords from the responses sent hereunder:

NTNU-Architecture

- Bio-climatics
- Building material quality
- Daylighting
- Use-phase of buildings
- Building physics / Insulation

- Focus on slum and squatter settlements
- Urban form
- Environment-friendly transport

University of Sarajevo

- Inculcation of importance of energy efficiency
- Informal settlements
- Cycle tracks
- Cultural anthropology and effect on energy efficiency
- Structural design details and relevance to energy efficiency
- Spatial and functional qualities of buildings
- Practical implementation – challenges and opportunities
- Optimisation
- Traditional wisdom

Others

- Water services
 - Sustainable water consumption
 - Wastewater handling (greywater reuse, etc.)
 - Water treatment
- Life-cycle thinking
- Buildings and infrastructure in general
- Tools – technological and otherwise
- Holistic analysis of systems
- Chemistry

The range of contributions which the respondents are willing to make to the proposed hypothetical master's degree programme in energy efficiency is quite vast. It ranges from the aesthetic and creative on the one hand to the practical and down-to-earth on the other, indicating that both art and science can work in tandem to improve sustainability of cities and achieve an improvement in energy efficiency. One respondent has pointed out that cultural anthropology is a must-learn when it comes to understanding the opportunities and challenges that one may have/face while embarking on planning for energy efficiency and sustainability. Life-cycle thinking and holistic systems analysis figure as well, as integrating tools of all the other individual specialised subjects that will enable students to understand the nitty-gritties. Water services (upstream and downstream aspects) figure as well in the 'Others' list, chiefly because some of the respondents are from the Hydraulic and Environmental Engineering Department of NTNU. Of course, there is a lot more which can go into a soundly-structured post-graduate degree programme in energy efficiency in general. One instantly sees that it is well-nigh difficult to structure a perfect programme as it would have to be well and truly multi-disciplinary – physics, chemistry and mathematics (pure and applied), economics, management, psychology, cultural anthropology, architectural design, thermodynamics, energy engineering... the list goes on. The sample set considered here does encompass a good deal of what would be required, but yet not all. Such a master's degree programme, in the opinion of the authors, is surely not redundant and could fit well into faculties of architecture / urban planning / sustainable development.

QUESTION 14

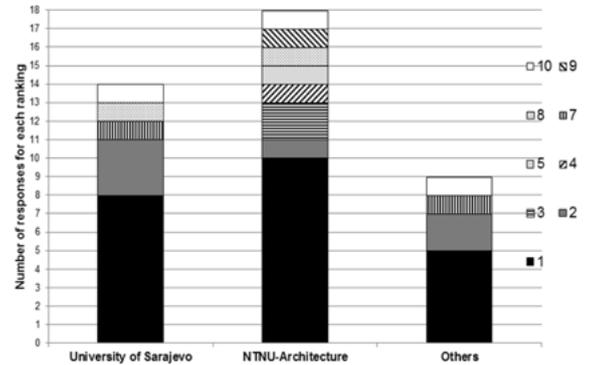


Figure 2: Distribution of responses to Question Number 14, group-wise

This question wanted the respondents to rate the importance of building bridges between academics on the one hand and the government, industry and society on the other, on a scale of 1 to 10, with the priority of such bridge-building decreasing (linearly) as one moves from 1 to 10. Figure 2 depicts the results graphically.

Not surprisingly, over 50% of respondents from each of the three groups consider the bridge-building as something which cannot be ignored. Here the authors would like to point out that research and pedagogy cannot be merely about ivory-tower concepts and armchair ideas. Gone are the days when this was perhaps the norm in some parts of the world. University education has evolved from being an island to a 'contiguous landmass' linked to society, industry and government and working in close collaboration with these three, to solve practical problems which the world is facing at the moment. Education nowadays, must perforce be an enabler of sustainable development out in the world. And energy efficiency is a branch on the tree of sustainable development, if the authors could be permitted to use this metaphor. Interestingly, and a bit surprisingly, there is one respondent in each of the three groups who believes that such bridge building is not necessary at all (rank of 10 on the scale).

QUESTION 13

When asked if language is a constraint in communicating clear messages about sustainability and energy efficiency to students (who may hail from different nationalities and whose grasp and understanding of the language of the instruction in the university may not be very strong), about 2/3 of the respondents say that it is not so. From Table 2, we can see that for the first and third groups, there is an almost equal split between those who think that language is a constraint and those who think otherwise. Surprisingly, for the second group – University of Sarajevo – there is just one respondent who feels that it is a constraint. This could be probably because the number of international students at the Architecture Department in the University of Sarajevo may be negligible (and thereby the language of instruction would be the native tongue of almost all the students).

Extending the implication of this question a little further, the phrase ‘talking the language of the masses’ comes to mind here. One could replace the word ‘masses’ with the word ‘students’. It is not just about linguistics, but also the manner in which messages are conveyed to the students in the classroom. Rhetoric for instance, may not serve the intended purpose in all cultures, as trust in mere words is minimal. Verbose also proves to be ineffective at times. Plain talk – minimum number of words for maximum effect; hitting the nail on the head – may actually give the desired effect. Further, it is also necessary to walk the talk, to eliminate any limitations or constraints that language may impose. Actions, after all, speak louder than words.

QUESTION 12

It is necessary for universities to contribute to the wealth of literature on sustainability and energy efficiency that is available publicly. It is seen that many professors / associate professors encourage students writing their master’s theses to think in terms of converting it into publishable journal papers. This benefits the students, the professors and the department, and also sustainability and energy-efficiency researchers the world over.

A majority of respondents from all three groups (overall percentage of close to 50%), tell the authors that they have been adopting this approach proactively. About 40% like the idea, and

would like to see if they can adopt it in the future; which in effect means that 90% of the respondents of this survey may continue to encourage / start encouraging their master’s students to convert theses to scientific journal publications in the very near future. There is a small minority which believes that while there are PhDs and PostDocs entrusted with this task, hence master’s students need not run the extra mile.

QUESTION 11

The hallmark of a good pedagogue is the ability to make lectures interactive. A free interchange of ideas, openness on the part of the students to disagree, contradict and ask questions, indicates on the one hand that the students have been paying close attention to the lecture/s, and on the other hand, it is a clear sign that the pedagogue is able to engage the attention of students. Paradigms like sustainability, sustainable development and energy efficiency are multi-faceted and students of different nationalities, cultures and backgrounds have different notions about them. The pedagogue is expected to invite criticism, be willing to accept different points of view, and while trying to understand the reason for the differences, be able to ultimately convince students about the imperativeness of using energy (and resources in general) optimally and aid sustainable development. About 50% of the respondents claim that they give their students the freedom to voice their opinions and that every class produces new ideas which benefit all the students. One-third of the respondents confess that students do have the freedom, but somehow they, as teachers, are not able to motivate them to make the lectures as interactive as they would like them to be. The remaining one-sixth say that students are a bit reticent and it is perhaps a part of the culture of these students not to challenge the teacher, but find answers to the questions which arise in their minds, themselves, by introspection. Introspective or extroverted, it is advisable not to accept what is read or heard about sustainability / energy-efficiency blindly. The subjectivity associated with these paradigms necessitates rational thinking and critical analysis.

QUESTION 10

This question may seem to be slightly related to Question 13, but it is in sooth more overarching than that. Students from different parts of the world –

developed, developing and transition economies – bring with them a lot of practical knowledge gained from experience. Sustainability or energy efficiency is never achievable by adopting a one-size-fits-all approach. Sustainable development makes sense when the whole world benefits from the process. And to make this possible, one needs to tailor-make solutions. Preaching environmental sustainability as a must-pursue to a class which has some students from the developing world (say Africa), is a bit unfair, as those students have every right to wonder why they should be deprived of the right to focus on economic growth first. Energy efficiency (even advising on cutting down absolute energy consumption) may still be fine when one is addressing a class full of students from the developed world – USA, Japan and Western Europe for instance. However, the African students may first want to know how to augment their respective national energy productions in the first place.

The majority of the respondents – over 63% (see Table 1) - are of the opinion that having a multinational class, is rewarding for all the students and the teachers themselves. A very small percentage feels that it is a challenge more often than not, owing to those very differences. This needs to be overcome, if meaningful sustainability education has to be imparted. About one-fourth of the respondents, it seems, have not really thought about this or have not had yet got the opportunity to teach a class with a substantial percentage of students from different parts of the world.

QUESTION 9

As was mentioned in the sub-section dedicated to Question 15, energy-efficiency or for that matter sustainability is highly multi-disciplinary and cannot be learnt by students who are biased towards certain disciplines. The authors wanted to know from the respondents if they would invite guest lecturers from diverse disciplines like applied sociology, applied psychology, etc., to teach a class or two about how these disciplines are necessary to understand the challenges and opportunities that need to be encountered and availed of, in reality, while attempting to promote sustainable development and developing solutions for improving energy efficiency. Over 60% of those who responded to this particular question say that they have been doing this and will continue to do so. Percentage-wise, there are

more respondents in the third group who just wish to sit on the fence, and be ‘undecided’.

QUESTION 8

Joint master’s programmes are quite ‘fashionable’ these days. The authors feel that if any subject would benefit immensely from such programmes, it would be sustainability/sustainable development and its sub-disciplines – energy efficiency being one of them. Refer Figure 3 and take note of the conspicuous difference in the viewpoints between NTNU-Architecture and the University of Sarajevo’s Faculty of Architecture.

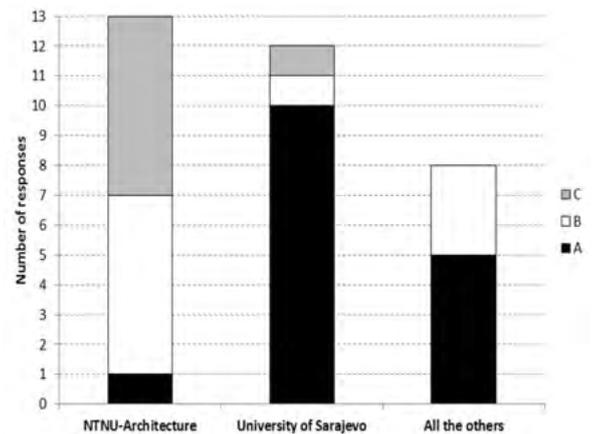


Figure 3: Distribution of responses to Question Number 8, group-wise

Nine of the ten respondents to this question, from the Faculty of Architecture, NTNU, feel that a joint masters programme is either a wasted effort or not something one must focus too much on. On the other hand, their counterparts from Bosnia (10 of 12) are strongly in favour of such programmes. Why the difference? Is it systemic or is it cultural? Is it because of the difficulties associated with administering such a programme? This needs to be ironed out, as it goes without saying that opportunities for joint master’s programmes, whenever they present themselves, can be grabbed with both hands.

QUESTION 7

As was pointed out before with reference to another question, knowledge needs to be converted into action, otherwise it is of no use; ideas need to be put to test, words and thoughts need to metamorphose into deeds, slowly but surely. Pedagogues ought to try to walk the talk, and practise what they preach, can motivate students to do likewise, and go out into the wider world and make a difference. Over 95% of the respondents say that they believe in this and have been and will continue to strive to impress upon their students the imperativeness of converting knowledge into action.

QUESTION 6

This question was based on life-cycle thinking, the leitmotif of sustainability studies. In the absence of life-cycle thinking, sustainability does not exist! Most of the respondents say that they are aware of the need for life-cycle thinking and believe it is indispensable if sustainability and energy efficiency have to be properly understood. It is good to see that a majority of them always introduce life-cycle thinking to students in their lectures. Of course, the nature of the subjects which the respondents teach, imposes some restrictions on the importance they could give to life-cycle thinking, but certainly the scope always exists. In architecture especially, life-cycle thinking is very critical, if what is designed and implemented has to be sustainable over a long period of time. Life-cycle thinking would motivate one to think in terms of reducing life-cycle costs, by risking higher capital investments and managing to reduce the long-term maintenance expenses. How something designed and built today would 'behave' in the years to come, in the face of rapidly-fluctuating external factors in a highly-globalised world, is what one is taught to think about, through 'life-cycle thinking'.

QUESTION 5

This question has to do with what is known in industrial ecology and sustainability studies as the rebound effect. You make something more energy-efficient and more and more people (even those who had not thought of using it before), will flock to get that 'something'. So, even though efficiency is improved and the life-cycle energy consumption of this 'something' would be much lower than it

had been before, a lot more people would end up using it, and thereby the absolute energy demands would increase, exerting pressure on the power sector, and perhaps leading to the establishment of more thermal power plants burning dirty coal, and exacerbating climate change. It is good to learn that most of the respondents (over 80%) believe that it is necessary to explain the difference between just improving energy efficiency and making efforts to reduce overall energy consumption. The world needs both these today working in tandem. One may purchase an electric car and feel that one is doing a great deal of good to the environment. While holistic thinking will make one realise that perhaps the source of the electrical energy used to recharge the battery is actually coal, the afore-explained difference will make it clear that increasing the dependence on the electric vehicle and clocking many more kilometres than before would mean drawing more coal-powered electricity from the grid! One of the authors observed that a so-called 'Green Building' came up in Trondheim (a school, called *Åsveien Skole*). But most of the lights inside the building are kept on even when there is no one inside, and that too, on Sundays as well!

It is surprising though that some respondents claim that they are not sure if there is a difference between 'improving energy efficiency' and 'reducing absolute energy consumption'. Well, not many though. So, that is a relief!

QUESTION 4

When the talk is about sustainability, life-cycle thinking and holism, we recall the triple bottom line approach, introduced by John Elkington in the early 1990s. The Figure below (which uses the People-Profit-Planet idea to explain how the triple bottom line approach works), will serve as a mnemonic of sorts to remind students of sustainability and energy-efficiency to understand the complexities associated with converting knowledge into action (also a reference here to an earlier question).

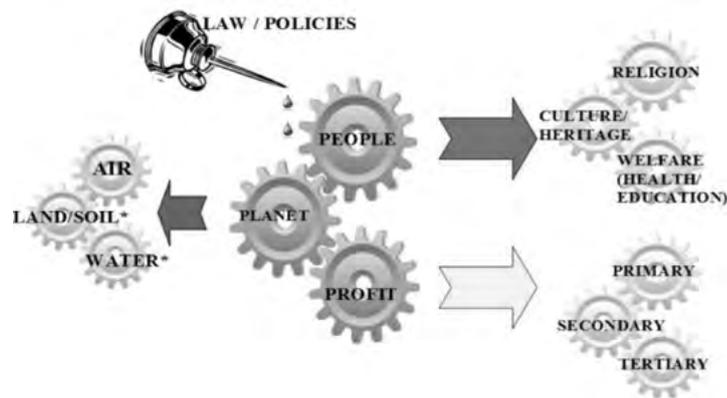


Figure 4: The triple bottom line approach to sustainability thinking¹

The understanding that one cannot ever blindly pursue a specific goal without being aware of the wider implications, needs to be driven home very strongly to students of this century. Interestingly, there are as many respondents who are aware of the triple-bottom-line approach and who teach it to their students, as there are who either have not heard about it, or feel that it is not relevant at all to the subject/s they are teaching. The authors contend that it is possible to introduce the concept of holism in most subjects, by being a little creative about the pedagogical approach one adopts. Holism essentially is the overarching Truth that ‘everything is somehow related to almost everything else.’ Quite like psychosomatics with respect to human ailments and illnesses.

QUESTION 3

Technology is often looked upon as an elixir, as a panacea, as a cure-all. But it is not so, and that need not be proven. Human behaviour and the way humans understand and use technology is what matters. The Internet is a marvellous invention but it has its dark underbelly, as we all know and agree.

Hence, it is really very surprising (and alarming) to note that a majority of respondents from Sarajevo say that they would teach students that technology is a ‘cure-all!’ On the other hand,

just one respondent from the NTNU’s Faculty of Architecture thinks so. Also the fact that quite a few respondents feel that they are ‘not really sure’ comes as a surprise to the authors.

If sustainability is to be taught and energy-efficiency programmes are to succeed, it would be a folly to start off with the premise that technology can solve all our problems. It is here that the authors see a strong need to convince teachers that this is not the case, and it would not be a good idea to drill this into the minds of students. These students are the ones who will go out into the world in the near future and tackle real-life problems and challenges, and the education imparted to the ought to help them to succeed in this.

QUESTION 2

When the authors despatched the questionnaire, they were aware of the fact that sustainability may not be a component of the subject/s all the respondents are teaching at the time of writing. However, the responses are not very discouraging. About 60% feel that sustainability is very much a part of the syllabus of the subjects they teach. Close to one-fourth of those who responded to this question, agree that it could be made a part of the syllabus in the future (though it is not currently). A relative minority turns it down as being beyond the scope of the subjects they teach. The authors would not really contradict the viewpoint of this minority but would surely wish to work closely with them and identify possible, creative approaches to incorporating at least

¹ Sourced from G Venkatesh (2012). Future prospects of industrial ecology as a set of tools for sustainable development. *Problems of Sustainable Development*. 7(1): 77-80.

sustainability and if possible, energy-efficiency, into their respective syllabi.

QUESTION 1

All the responses, can actually be viewed from the framework of the responses received to this question, the very first in the questionnaire. The authors wished to know about the duration (number of years) of teaching experience the respondents had, at the time of sending in their responses. Up to 75% of the respondents have been teaching at university-level for over 3 years. This most-experienced cohort dominates all the three groups of Table 1.

A FOLLOW-UP INTERVIEW IN SARAJEVO

As mentioned in the methodology, Schwai interviewed five employees of the University of Sarajevo on his visit to Bosnia – two females and three males. The female interviewees had teaching/research experience of five and seven years respectively, while in the case of the males, this ranged from seven to twenty-eight years. These five had not responded to the original questionnaire sent by e-mail or SurveyMonkey. The same questions were asked of these five interviewees with the motive of obtaining specific feedback, which could not be sought by the surveys mediated electronically.

There was a strong confirmation of the yawning gap between academic learning (theory) and practical knowledge, which needs to be bridged urgently. Knowledge perhaps also has a so-called ‘shelf-life’ after which it becomes outdated and has to be changed to suit the times. With respect to the Q9 in the survey, ‘structural’ and economic difficulties were cited as the reasons behind not being able to invite experts from other disciplines and fields of knowledge as guest lecturers. Q11, it must be stated, is very much related to the socio-cultural differences that prevail, between the universities in the north and south of Europe. In response to Q10, the general consensus was that for a class of students from different countries of the world, to make it easier to teach subjects like sustainable development and energy efficiency, one ought to factor in the socio-economic climes and political realities of the countries represented in the classroom. The number of exchange students in the University of Sarajevo is quite small in number and thereby there is a general agreement on language not being a hurdle in communicating concepts of sustainability to students. There was a tacit agreement among the respondents – none knew what the others had answered in this regard – in focusing on teaching architectonic and urban principles in the field of sustainability. Structural support or rather the lack of it, figured again when asked about how easy or difficult it was to gain access to more knowledge in the field of sustainability.

CONCLUSIONS

It is certainly possible to look for correlations among responses given to different questions. There are many different ways in which the results could have been presented, graphically or in tabular form. However, there is also the need to keep the report concise and retain the interest of the readers.

This survey would have been richer still, if there had been more responses. However, what the authors of the paper/report managed to elicit, does not leave us any poorer, as far as knowledge is concerned. Needless to say, sustainability (and energy-efficiency which is one of the branches of this tree, as referred to before) is very much an in-thing these days, and universities ought to gear up to keep up with the demands of changing times, and incorporate modern and relevant concepts into the courses they offer and the subjects they teach. Teachers can keep making efforts consistently to think laterally and modify their approaches. Closer collaborations with other universities, government agencies, society and industry are very much necessary. There has been a paradigm shift in this regard, and that needs to be respected. Bilateral cooperation in education can contribute to the development of transitional economies and developing countries through joint masters programmes and more meaningful research activities. It is a fond hope that this paper will make an interesting reading which could then provide food for thought.... and action.

Acknowledgements: We are grateful to all the respondents (from NTNU and beyond) who made the survey possible, and were thus instrumental in the report's taking shape. Thanks to Mladen Burazor from the University of Sarajevo (Bosnia and Herzegovina) for assisting with the responses from his University.

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Appendix 1: Survey questionnaire

SERIAL NUMBER	QUESTION WITH MULTIPLE CHOICES	ENTER YOUR RESPONSE IN THIS COLUMN
1	HOW MANY YEARS HAVE YOU BEEN A UNIVERSITY TEACHER/LECTURER/PROFESSOR? A LESS THAN 1 B BETWEEN 1 AND 3 C GREATER THAN 3	
2	IS SUSTAINABILITY AND/OR ENERGY EFFICIENCY IN THE BUILT ENVIRONMENT A COMPONENT OF THE SUBJECT/S YOU TEACH? A YES, VERY MUCH SO B NO, NOT AT THE MOMENT, BUT WILL INCLUDE IN FUTURE C NO, THERE IS NO SCOPE FOR THESE	
3	WOULD YOU EVER TELL STUDENTS THAT WITH TECHNOLOGY EVERYTHING IS POSSIBLE, WHEN IT COMES TO OPTIMISING ENERGY USE, IMPROVING ENERGY EFFICIENCY AND ACHIEVING SUSTAINABILITY IN THE BUILT ENVIRONMENT? A YES, I ALWAYS TEACH THAT B NO, NEVER C NOT REALLY SURE	
4	HAVE YOU INTRODUCED THE TRIPLE-BOTTOM-LINE APPROACH TO SUSTAINABILITY IN ENERGY-RELATED ISSUES TO YOUR STUDENTS? A YES, I HAVE DONE THAT B NO, NOT YET, BUT WOULD LIKE TO C NO, AM NOT AWARE OF IT OR ITS APPLICABILITY TO MY SUBJECT/S	
5	WOULD YOU TEACH STUDENTS TO DIFFERENTIATE BETWEEN 'IMPROVING ENERGY EFFICIENCY' AND 'REDUCING ABSOLUTE ENERGY CONSUMPTION'? A YES, I WOULD B NOT SURE IF THERE IS A DIFFERENCE BETWEEN THESE TWO TERMS	
6	WHEN YOU TEACH (OR WILL TEACH) SUSTAINABILITY, DO YOU (OR WILL YOU) ENCOURAGE STUDENTS TO ADOPT LIFE-CYCLE THINKING WHILE PLANNING, DESIGNING OR SOLVING PROBLEMS? A ALWAYS B OFTEN C NEVER; DO NOT PLAN TO D NEVER DO CURRENTLY, WILL TRY TO INCORPORATE	
7	DO YOU THINK YOU ARE SUCCESSFUL IN ENABLING STUDENTS TO THINK Laterally AND Creatively AND BE MOTIVATED TO CONVERT KNOWLEDGE TO ACTION, THEORY TO PRACTICE? A NO, BUT WOULD LIKE TO BE B YES, MORE OFTEN THAN NOT C SOMETIMES, DEPENDS ON THE MOTIVATION LEVELS OF THE STUDENTS	

8	DO YOU THINK THAT JOINT MASTERS COURSES WITH UNIVERSITIES IN DIFFERENT PARTS OF THE WORLD HELP STUDENTS TO GET HOLISTIC AND REALISTIC VIEWS OF ISSUES RELATED TO ENERGY EFFICIENCY IMPROVEMENTS AND SUSTAINABILITY?
	<p>A YES, THIS IS TRUE AND I AM IN FAVOUR OF MORE JOINT MASTERS PROGRAMMES</p> <p>B YES, BUT ONE MUST NOT STRESS TOO MUCH ON THIS</p> <p>C NOT NECESSARILY; OFTEN IT IS A WASTED EFFORT</p>
9	WOULD YOU INTRODUCE YOUR STUDENTS TO LECTURERS FROM OTHER DISCIPLINES - APPLIED SOCIOLOGY, APPLIED LAW, APPLIED PSYCHOLOGY ETC. - IN ORDER TO IMPRESS UPON THEM THAT SUSTAINABILITY INCLUDES A LOT MORE THAN JUST SCIENCE AND TECHNOLOGY, AND THIS MUST BE ACCEPTED?
	<p>A NO, WILL NOT TRY THIS</p> <p>B YES, MOST CERTAINLY; HAVE BEEN DOING IT</p> <p>C I AM A BIT UNDECIDED ON THIS</p>
10	DOES HAVING A CLASS WITH STUDENTS FROM DIFFERENT PARTS OF THE WORLD MAKE IT DIFFICULT TO TEACH SUSTAINABILITY AND ENERGY EFFICIENCY?
	<p>A NO, NOT AT ALL; IT MAKES IT CHALLENGING BUT MORE REWARDING</p> <p>B YES, AT TIMES, OWING TO CULTURAL AND EXPERIENTIAL DIFFERENCES</p> <p>C HAVE NEVER REALLY THOUGHT ABOUT THIS / HAVE NOT TAUGHT INTERNATIONAL STUDENTS</p>
11	DO STUDENTS IN YOUR CLASS HAVE THE FREEDOM TO EXPRESS THEIR POINTS OF VIEW, DISCUSS AND DEBATE, WITH RESPECT TO SUSTAINABILITY AND ENERGY EFFICIENCY ASPECTS AND THE CONFLICTS WHICH OFTEN ARISE WHEN QUALITY OF LIFE IS FACTORED IN?
	<p>A NO, IT IS A CULTURAL THING; THEY DO NOT PARTICIPATE ACTIVELY</p> <p>B YES, THEY HAVE THE FREEDOM, BUT I AM NOT ABLE TO BUILD UP AN INTERACTIVE SESSION</p> <p>C YES, THEY HAVE THE FREEDOM, USE IT, AND EVERY CLASS THROWS UP NEW IDEAS</p>
12	HOW SUCCESSFUL HAVE YOU BEEN IN MOTIVATING STUDENTS TO CONVERT THEIR PROJECT REPORTS AND MASTERS THESES (WHICH MAY BE VERY GOOD AND RELEVANT CASE STUDIES) INTO JOURNAL PUBLICATIONS OR PUBLICATIONS OF OTHER TYPES, TO ADD TO THE VOLUME OF PUBLICLY-AVAILABLE KNOWLEDGE ON SUSTAINABILITY AND ENERGY EFFICIENCY IN THE BUILT ENVIRONMENT?
	<p>A VERY MUCH SO; I MAKE IT A POINT TO ALWAYS EXPLORE SUCH POSSIBILITIES</p> <p>B HAVE NOT THOUGHT ABOUT THIS; BUT A GOOD IDEA I WOULD LIKE TO PURSUE</p> <p>C DO NOT THINK THIS IS REALLY NECESSARY WHEN THERE ARE PHDS AND POSTDOC DOING THIS ALREADY</p>
13	IS LANGUAGE A CONSTRAINT IN COMMUNICATING KNOWLEDGE ABOUT SUSTAINABILITY AND ENERGY EFFICIENCY? IS THERE SOMETIMES A CASE OF 'LOST IN TRANSLATION' WHEN IT BECOMES DIFFICULT TO CONVEY TO STUDENTS SPEAKING OTHER LANGUAGES, THE REAL MEANING AND IMPLICATION OF TERMS AND CONCEPTS RELATED TO THESE SUBJECTS?
	<p>A YES, SOMETIMES</p> <p>B NO, I DO NOT THINK SO</p>
14	IN YOUR OPINION, HOW IMPORTANT IS IT TO BUILD BRIDGES BETWEEN THE ACADEMIA ON THE ONE HAND, AND THE GOVERNMENT, INDUSTRY AND SOCIETY ON THE OTHER, WHEN DEALING WITH ISSUES LIKE SUSTAINABILITY IN THE BUILT ENVIRONMENT? GIVE YOUR ANSWER ON A SCALE OF 10 (1= VERY IMPORTANT & 10=NOT IMPORTANT AT ALL)
15	A MASTERS DEGREE IN ENERGY EFFICIENCY! IF SUCH A COURSE / MODULE WOULD COME UP, HOW DO YOU THINK YOU COULD CONTRIBUTE TO IT? HERE WE ARE FOCUSING ON APPLICATIONS EXTENDING TO THE BUILT ENVIRONMENT (UTILITIES, TRANSPORT, BUILDINGS) AND INDUSTRY? (CAN YOU ANSWER THIS IN 1-2 SENTENCE/S?)

APPENDIX

“HERD” PROGRAMME DESIGN STUDIOS: A SELECTION OF STUDENT PROJECTS

Evolving stages of metamorphosis in architectural education, stirred by the academic research project entitled “Rethinking architecture and energy efficiency in buildings and urban development”, are essentially reflected in the work of the students who participated in the process. The introduction of new studios and courses within the implementation of the HERD programme, has not only contributed to the overall curriculum at the Faculty of Architecture, University of Sarajevo, but it also and above all impacted the courses’ teaching methodology at the small scale, in the form of internal networking among the academic staff at the faculty, as well in the sense of external networking of academics, professional experts and industry representatives from Bosnia and Herzegovina and Norway.

This appendix consists of a selection of student projects, completed within the new design studios, showing a variety of engagement of our students, the positions held with regards to concurrent and divergent positions in the conception of architecture, urban design, sustainability, as well as the way in which collaboration with colleagues from Trondheim, Norway, has helped create new perspectives.

Taking up the path of their earlier successful collaboration with industry in the prototype production, academic staff from the Department of Interior Design has launched the studio entitled “**Contemporary Spatial Concepts, Design and Prototype**”. The main pedagogical objective of this studio was to merge architectural education and practice by external networking of academia with the architectural practice and construction

industry. While working on the design projects of modular, prefabricated buildings through a direct collaboration with professional experts, production companies and industry representatives, students were encouraged to express their creative potentials as well as to develop practical skills that could be applicable in the real world.

The studio “**Problems of Modernity of Single/Family Houses**” formed a methodology towards integration of theory and practice through work at specific locations in the city in cooperation with the Sarajevo Canton Institute of Urban Planning and the Centre for Development and Support in Tuzla. By linking the issues of modernity with sustainable design and materialisation, students had an opportunity to design progressive solutions and promote understanding of architectural design as an open and collaborative process.

The sustainability paradigm in architecture and cultural facilities was approached through integrated design as part of the studio: “**Architecture and Cultural Facilities in the City of Sarajevo**”. Students integrated traditional and contemporary architectural qualities with all technical knowledge and skills in planning, designing and construction, as well as energy efficiency.

Working in the studio **“An Analysis of Traditional Materials and the Study of Energy Efficiency in the Case of Svrzo’s House”** helped students learn how to perform a detailed research of a traditional house and evaluate the results of the energy audit in relation to the sustainability paradigm and the need to protect architectural heritage. In the process, students found out for themselves which of the solid principles behind the traditional architecture can be used as a starting point in future design.

Students’ efforts in the studio **“Protection and Development of Historic Urban Areas; Case Studies: Počitelj and Vranduk”** were aimed at finding new strategies and giving rise to the core imperative of creating the architectural tools that would adequately respond to the complexity of architectural discourse in dealing with the historical context, especially in countries with tradition, both at the level of education and practice.

The selected student projects show assertive evaluation of the pedagogic outcomes of the aforementioned design studios. As for the on-going process of educational metamorphosis, we anticipate an in depth, open discussion on future focal points, aimed at collecting impulses for a future-oriented identity of the architecture programme at the Faculty of Architecture, University of Sarajevo.

In addition to the studio design projects, students from the Faculty of Architecture in Sarajevo, the Norwegian University of Science and Technology in Trondheim and the Architecture and Civil Engineering faculty in Banja Luka (AFS, NTNU and AGFBL) had an opportunity throughout the HERD programme to work together and exchange views and ideas during workshops such as the “Sustainability Week” and “0 Emission Week” that were held in Trondheim. At the live studio workshop held in Sarajevo in 2016, a group of students from the aforementioned faculties further improved their cooperation by building something together. Within the five days, they built three pavilions, which in many ways represent an example of transition from education to practice.

The architecture programme at the Faculty of Architecture, University of Sarajevo, is continuously evolving. Teaching staff has to evaluate and propose curriculum changes, which will emphasise the core competency in the field of architectural design. This process is, however, strongly influenced, not only by the huge imperative of sustainability, but also by the manifold implications for artistic, technical, ecological and social issues of the real-world. The true challenge is to respond to that impetus and here are some of the examples of how it can be done.

Senka Ibrišimbegović

On behalf of the editorial team

METAMORPHOSIS OF
ARCHITECTURAL
EDUCATION
IN
(POST)
TRANSITIONAL
CONTEXT

“HERD” PROGRAMME DESIGN STUDIOS: A SELECTION OF STUDENT PROJECTS

Architectural Studio: Contemporary Spatial Concepts, Design and Prototype

Teaching staff:

Erdin Salihović, PhD, Associate Professor
Amira Salihbegović, PhD, Assistant Professor
Slađana Miljanović, PhD, Assistant Professor
Nermina Zagora, PhD, Senior Teaching Assistant
Amra Salihbegović, M. Arch, Teaching Assistant
Vedad Islambegović, PhD, Senior Teaching Assistant
Dženis Avdić, M. Arch, Teaching Assistant

Guest lecturers and expert practitioners in studio work:

Eldin Čolak, CE., “Promo” company, Donji Vakuf
Ena Hero, M.arch, “Promo” company, Donji Vakuf
Emir Salkić, Arch., Architecture studio “Normal”
Muhamed Serdarević, Arch., Architecture studio “Normal”

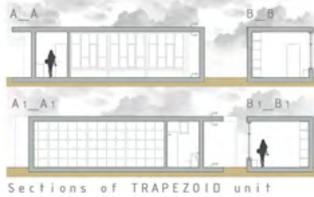
Selected student projects:

Zerina Alić, B. Arch.
Šejla Hasanbegović, B. Arch.
Nikola Ostojić, B. Arch.
Selma Rožajac, B. Arch.
Samira Sukanović, B. Arch.

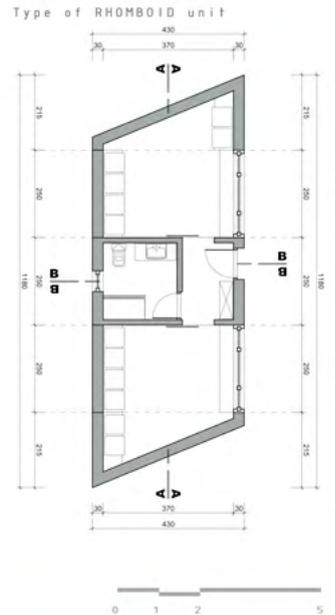
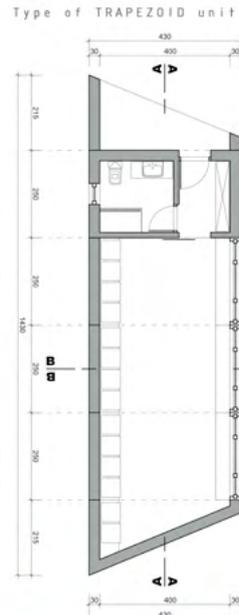
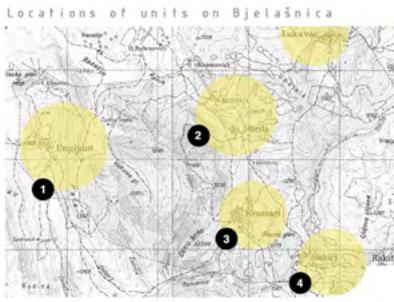


Task of this project was to create a modular unit that could fit in mountainous terrain of Bjelašnica. To make units flow through this kind of terrain, main unit has two variations, RHOMBOID and TRAPEZOID form, which angle was taken from OCTAGON form. Main unit is also constructed of two smaller units, TRIANGLE and RECTANGLE form. Decomposing main unit in these smaller units provides different lengths of the main unit.

FACULTY OF ARCHITECTURE SARAJEVO_project ECO BJELAŠNICA_student OSTOJIĆ NIKOLA



0 1 2 5



0 1 2 5



The basic idea is designed to show easy, simple, polyvalent, prefabricated, modular and environmentally friendly units that is mainly intended for victims of disasters. The concept is composed of free units dissimilar by size and purpose.



FACULTY OF ARCHITECTURE_SARAJEVO_project_EMERGENCY SHELTERS_students_SAMIRA SUKANOVIĆ



The shape of the building alludes to a simplified mineral formation.



The concept behind the forest cabins of the mineral village is to create a place for people to lose oneself and connect with nature. It may serve for a rest after a long walk in the nature, or rather as an inspiring setting for thinking, writing, dreaming. The cabin orients itself to face the views of the surrounding valley through the large picture window that allows for a striking visual continuation of both the surrounding vegetation and, during cold months, snow. Transporting the cabin mitigates the environmental impact on the forest by allowing users to periodically relocate to permit old sites to regenerate. The ability to transport the cabin can also allow construction to occur in a controlled environment, removing the environmentally harsh construction process from the sensitive forest. The angled walls on one side of our cabin offer increased space for sleeping and relaxation. By simplifying the interior space into a highly efficient space that only includes the essentials, the incoming guest will be treated to an escape from the hustle and bustle of everyday life.

FACULTY OF ARCHITECTURE_SARAJEVO_project_MINERAL VILLAGE_STUDENT_HASANBEGOVIĆ ŠEJLA

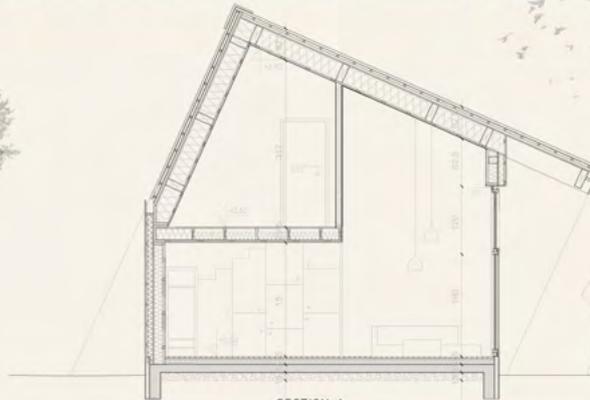


ELEVATION AND SECTIONS

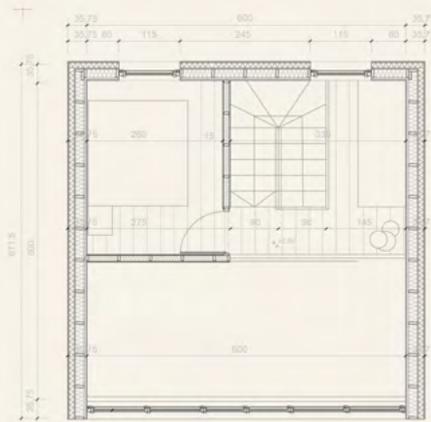
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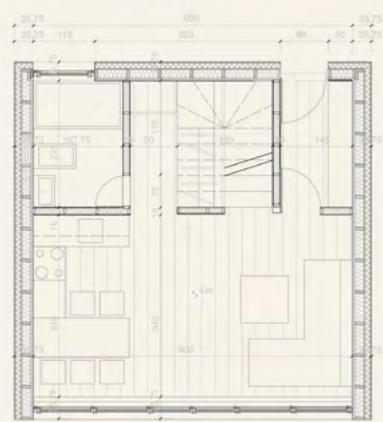
SITEPLAN



SECTION A



GALLERY



GROUND FLOOR

The building consists of a two-story split level structure: the lower level hosts the living room and has a South view to the valley; the upper one is a dedicated sleeping area and is characterized by a more intimate and shady environment.





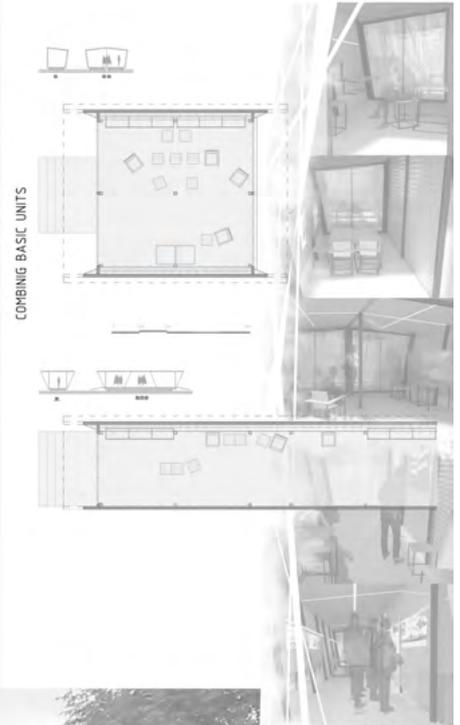
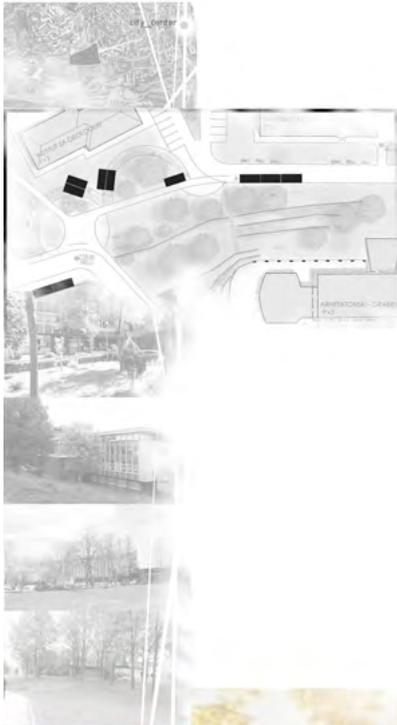
Creating modular units, with the purpose of temporary use in urban outdoor spaces, is based on the idea of using basic geometrical forms. The structure of basic unit is designed in order to multiply in horizontal plane, so it can be used for different purposes and users. It presents place of gathering at public spaces which can easily become part of outdoor social events. Contrast of the inner bright and vivid space are the light coloured panels, placed over a skeletal frame. Triangular panel walls, on one side of the structure, transmit light through perforated elements and alternately can be easily removed.



FACULTY OF ARCHITECTURE _ SARAJEVO

project _ URBAN PASS

student _ ZERINA ALIĆ



“HERD” PROGRAMME
DESIGN STUDIOS:
A SELECTION OF
STUDENT PROJECTS

Architectural Studio: Problems of Modernity of Single/Family Houses

Teaching staff:

Nina Ugljen Ademović, PhD, Associate Professor
Amira Salihbegović PhD, Assistant Professor
Senka Ibrišimbegović PhD, Senior Teaching Assistant
Elša Turkušić-Jurić PhD, Senior Teaching Assistant
Vedad Islambegović PhD, Senior Teaching Assistant
Dženis Avdić, M. Arch, Teaching Assistant

Guest lecturers and expert practitioners in studio work:

Edin Jenčiragić, Arch, Sarajevo Canton Institute of Urban Planning
Mirza Rustempašić, PhD, Sarajevo Canton Institute of Urban Planning
Ismet Salihović, ME., Centre for Development and Support Tuzla

Selected student projects:

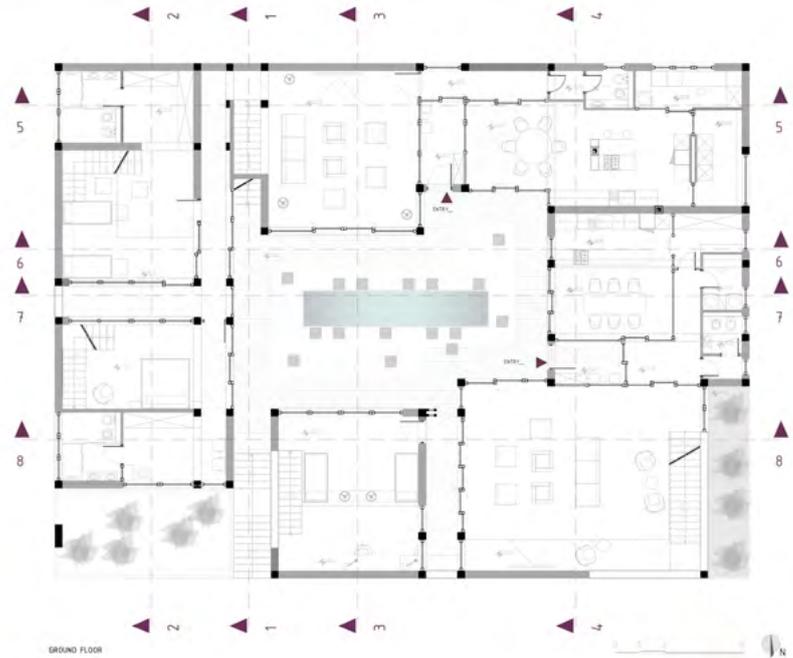
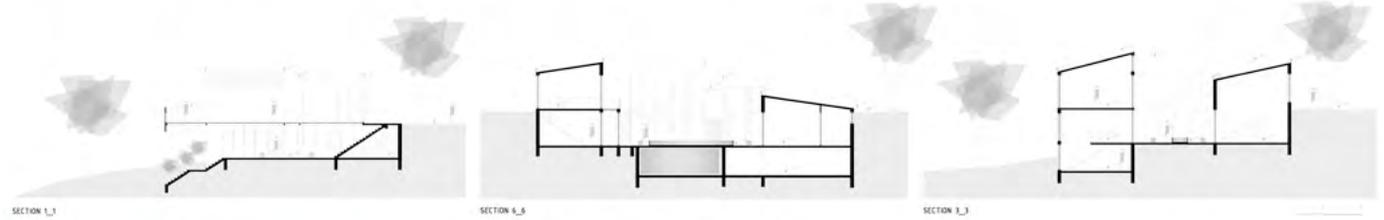
Emina Alić, B. Arch.
Toni Cindrić, B. Arch.
Tea Gaštan, B. Arch.
Maja Glavinić, B. Arch.
Amina Mihmić, B. Arch.
Merima Terović, B. Arch.
Mirza Topalović, B. Arch.
Amar Zuka, B. Arch.

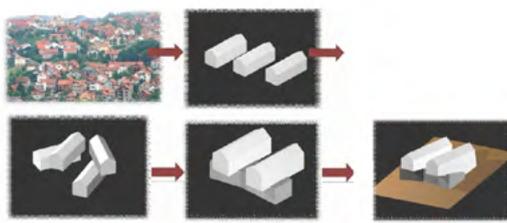


CONCEPT

The main idea of our concept can be described in several stages. In the first phase of design final product is an introverted building, analyzing its psychological background and primary function - developing healthy family, the incidence not compatible with the use of the building. Second phase of design is attempting to return building from introverted character to the public character, and the result is typical *ITALIAN KOMUNE*. Third stage of design representing a sublimation committed summary and good attributes the previous two phases. Hence the final product presents our *HOUSE*.

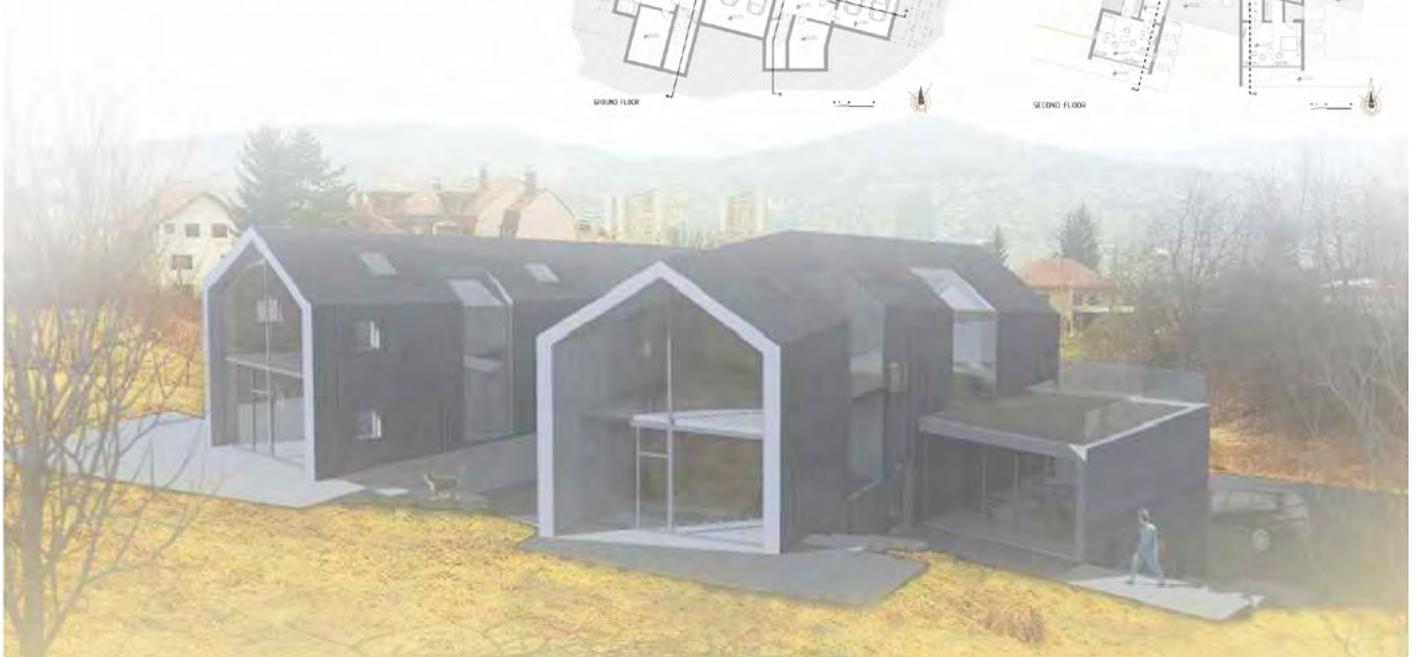
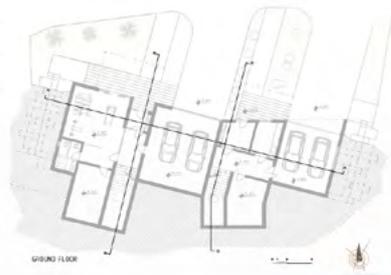
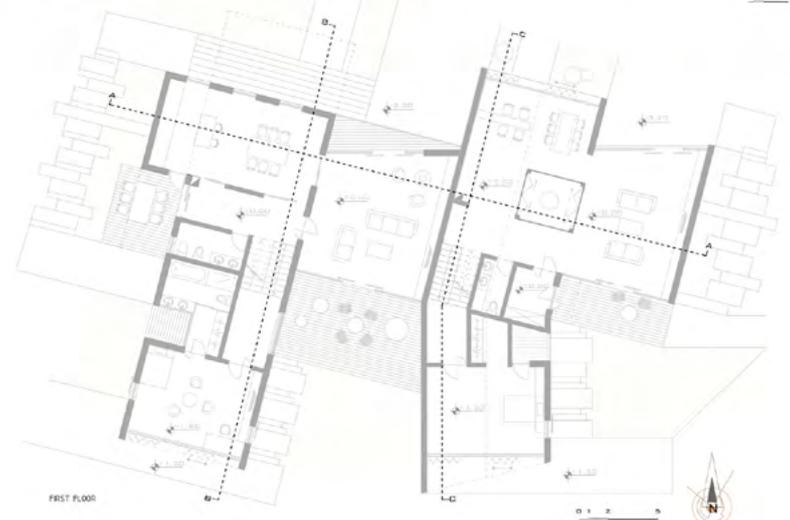
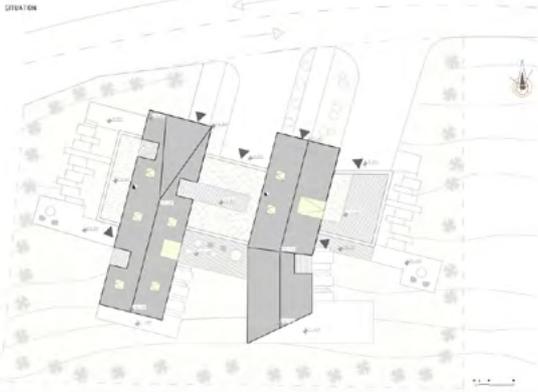
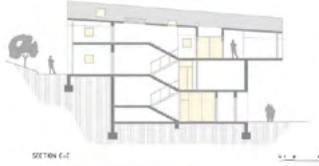
FACULTY OF ARCHITECTURE_SARAJEVO_project_SHADOWCOAST_students_MERIMA TERDVIĆ_AMINA MIHMIĆ

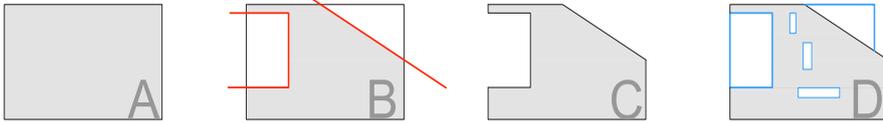




The guiding principle of our concept is the archtype house located on territory of Bosnia and Hercegovina, that appears in post-war period. This type of house is a low budget product, and also a product of illegal construction. Our concept uses the form of these houses as the main shape. By rotating, moving and folding these shapes we constructed the final form of the house. Even though the product reminds us to the environment in which is built, it is compositionally arranged in functional and logical units.

FACULTY OF ARCHITECTURE_SARAJEVO_project_DUPLEX_STUDENTS_MIRZA TOPALOVIĆ _TONI CINDRIĆ



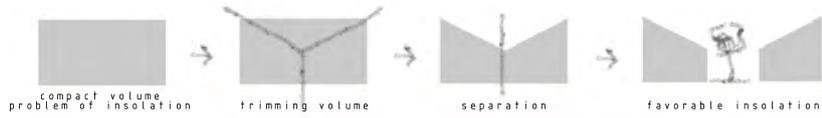


The very idea was to blend in at the location so that the object remains neutral in relation to the surrounding neighborhood. Its height makes it blend in, the form of a gable roof mimics the existing structures. Within the object, space is defined as a compact unit, without excessive surface area of communication, or space that would lead to energy losses. Rooms are airy, the living room has defined the concept of an open plan, get the feeling of the size of the space without barriers.



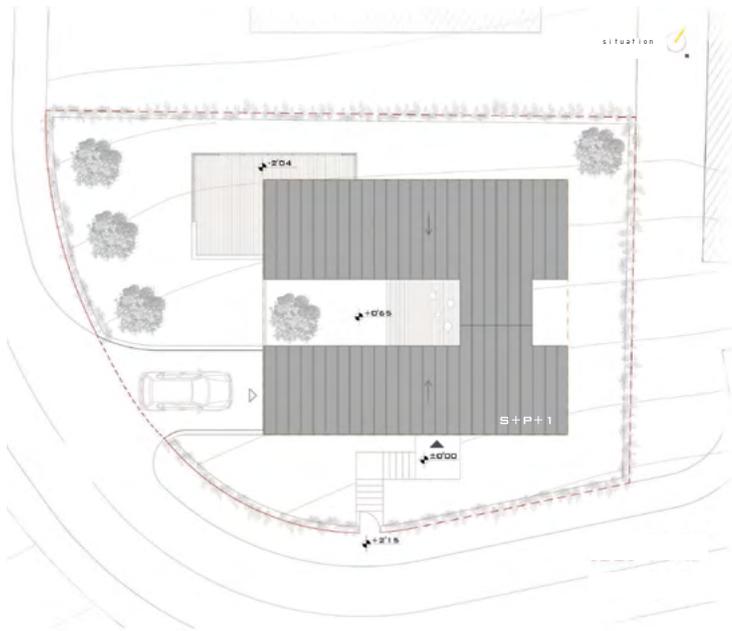
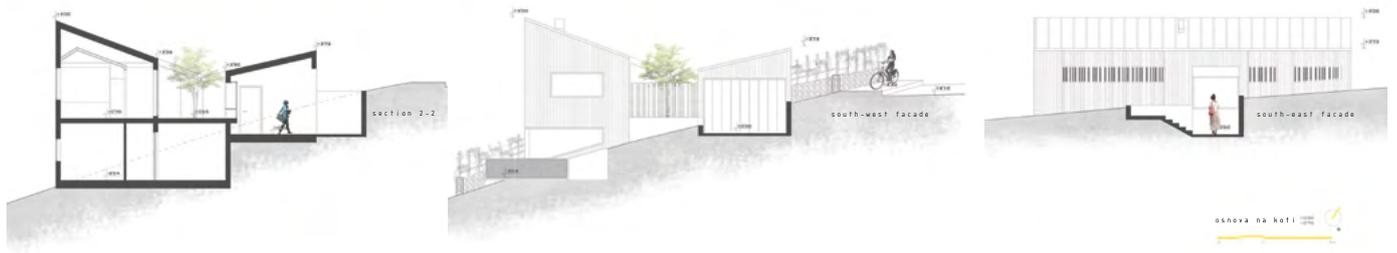
ARCHITECTURE FACULTY_SARAJEVO_project_FAMILY HOUSE AT TREBEVIC MOUNTAIN_student_GAŠTAN TEA





CONCEPT

FACULTY OF ARCHITECTURE_SARAJEVO_project_ATRIUM HOUSE_student_MAJA GLAVINIĆ



“HERD” PROGRAMME
DESIGN STUDIOS:
A SELECTION OF
STUDENT PROJECTS

Architectural Studio: Architecture and Cultural Facilities in the City of Sarajevo

Adnan Pašić, PhD, Associate Professor

Nihad Čengić, PhD, Assistant Professor

Slađana Miljanović, PhD, Assistant Professor

Amira Salihbegović, PhD, Assistant Professor

Senaida Halilović, M. Arch, Senior Teaching Assistant

Armin Hodo, M. Arch, Teaching Assistant

Selected student projects:

Stefani Barišić, B. Arch.

Tea Krmek, B. Arch.

Amina Mihmić, B. Arch.

Merima Terović, B. Arch.

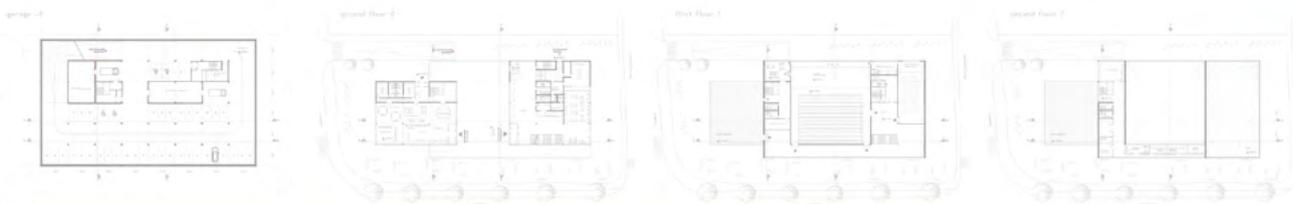
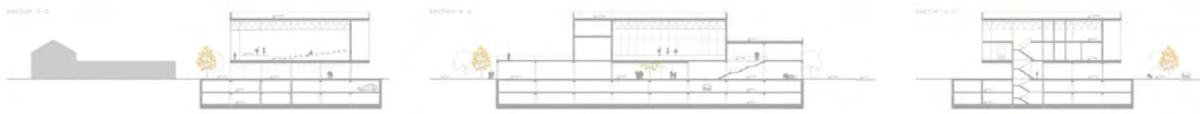


concept



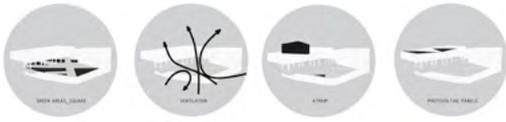
the concept of the planned facility is based on relationship between function and future users, valorization of culture content refers in space-
part of creating the volume, composition of building parts is result of additional facilities, two underground levels represent a stable
foundation and in a functional sense, technical accuracy, the main cube emphasizes the verticality with wooden slats in the service of window
blinds, energy efficiency was also achieved in a transparent plate, symbolism of those glass surfaces of the cube is the boundary of the new
facility, developed and undeveloped, but are also an invitation to passers in the world of art.

FACULTY OF ARCHITECTURE _ SARAJEVO _ project _ HEART OF ART _ students _ STEFANI BARIŠIĆ _ TEA KRMEK



42
R I S K

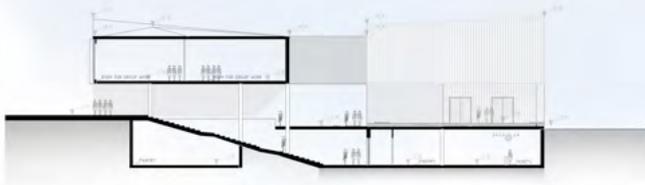




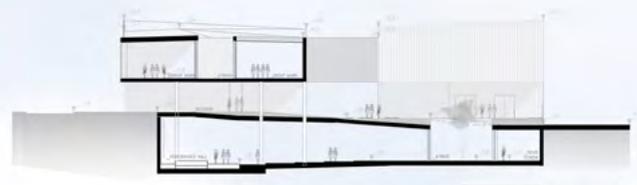
CONCEPT

"OPEN LINES" IS A NEW CULTURAL BUILDING SITUATED IN THE PLACE OF OLD THEATER "ARENA", RETAINING MODERNIZED FUNCTION OF THE EXISTING PLACE WE STARTED TO CREATE A NEW OBJECT WHOSE MOST IMPORTANT GUIDELINE IS "GENIUS LOCUS". NEIGHBORING BUILDINGS ARE HIGH, PARK AREAS AROUND ARE GETTING SMALLER AND GREEN AREAS ARE ALMOST NOT EXISTENT, CONCLUSION FOR THE FIRST GUIDELINES IS THE DESIGN OF THE FACILITY - OPEN SPACE AND CONVERTING IT INTO A PUBLIC GREEN - PARK AREA. TO GIVE A FACILITY AN ADEQUATE FUNCTION WE HAD TO LOOK AT THE PLAN OF THE CITY, IMMEDIATE VICINITY OF THE LOCATION AND LOOK BACK ON THE MEMORY OF THAT LOCATION. IT USED TO CONTAIN A CINEMA AND THAT IDEA IS NOW USED AS AN ESSENTIAL GUIDELINE FOR THE FORMATION OF A NEW FACILITY. DUE TO THE CONFIGURATION OF THE TERRAIN AND LEVEL DIFFERENCES BETWEEN THE TWO PARTS OF THE FIELD OF 160 METERS HEIGHT IN THE NORTH-SOUTH, THE SQUARE AND WALKWAYS ARE ASSEMBLED OF DISCONTINUOUS DIAGONAL RAMP AND A SLIGHT BELLINE OVERCOMES THE HEIGHT DIFFERENCES, AND ACCORDING TO THE ANALYZED FUNCTIONS THE BUILDING WILL BE ADJUSTED TO THE GROUND AND PARTIALLY BURIED OR PARTIALLY RAISED. CINEMA - HALL, A HALL FOR PERFORMANCES AND FACILITIES FOR THE FILM IS LOCATED IN BASEMENT AND DUE TO BUILDING PLACEMENT IN THE SITE AND ATTENDING THAT KIND OF PERFORMANCES DOES NOT REQUIRE NATURAL LIGHTING THAT JUSTIFIES PLACEMENT OF THE PREMISES UNDER THE GROUND.

FACULTY OF ARCHITECTURE_SARAJEVO_project_OPENLINES_students_MERIMA TEROVIĆ_AMINA MIHMIĆ



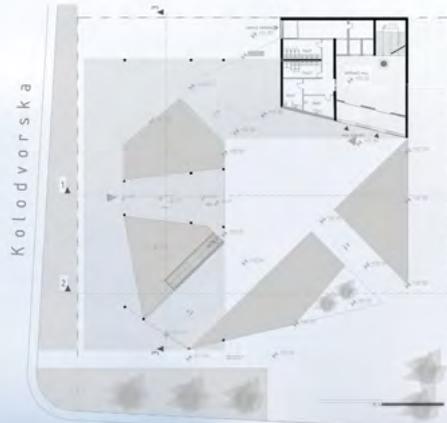
SECTION 1_1



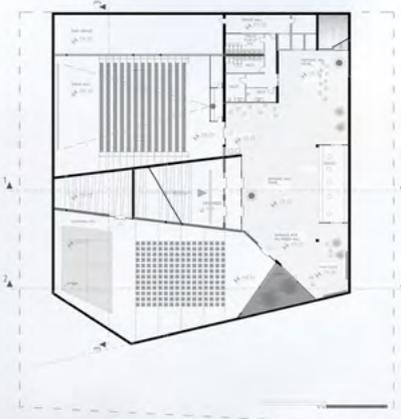
SECTION 2_2



G-1



GROUND FLOOR



G-1



METAMORPHOSIS OF
ARCHITECTURAL
EDUCATION
IN
(POST)
TRANSITIONAL
CONTEXT

“HERD” PROGRAMME
DESIGN STUDIOS:
A SELECTION OF
STUDENT PROJECTS

Architectural Studio: An Analysis of Traditional Materials and the Study of Energy Efficiency in the Case of Svrzo’s House

Teaching staff:

Lemja Chabbouh Akšamija, PhD, Associate Professor

Azrudin Husika, PhD, Assistant Professor

Nihad Harbaš, M. Mech., Senior Teaching Assistant

Lejla Šabić, Arch., Teaching Assistant

Selected student projects:

Emina Alić, B. Arch.

Sabina Bakal, B. Arch.

Irina Bošnjak, B. Arch.

Sanja Bušatlić, B. Arch.

Dženita Džinić, B. Arch.

Vedrana Karabegović, B. Arch.

Blanka Marin, B. Arch.



The goal of this study was to analyse the sustainability of traditional construction methods and materials on the example of Svrzo's house in Sarajevo. It was important to determine whether and how this traditional building could adapt to contemporary requirements in the field of energy efficiency, as well as to identify principles present in the design of the house that could viably be applied to future sustainable designs. By analysing the structural and artistic aspects of the building, having in mind their social, economic and environmental effects, we explored the house's potential and value and assessed its energy efficiency and sustainability in different contexts.

DETAIL "abdeslhana"



EXCERPT FROM THE STUDY

In order for us to provide guidelines for future interventions in Svrzo's house in terms of changing the use of space, it was necessary for us to focus on three main aspects:

ORIGINAL FUNCTION

An architectural heritage (except for archaeological sites) always seeks to restore the original function. The building is thus really revitalized. However, given that the original function of Svrzo's house is primarily residential, with the assumption that the stated function can NOT be restored, we began to conduct various studies in sociology (human factor), economy (sustainability of such function in this particular case), environment but also energy efficiency, (whether the facility meets the current standards of sustainability), education, culture etc in order to determine the possibilities and potential of it is restoration to its original function.

Based on those studies, our conclusion is that Svrzo's house, would not be effective as a residential building now from different points of observation:

- It is a **valuable example of cultural heritage** (housing function would take away the educational character and priceless cultural value this object has)
- **The change in the residential concept** would involve making changes to the object.
- It is an **energy inefficient object**- if you look at it from the aspect of energy efficiency and take into account the efficiency standards for residential architecture.

DETAIL doors for "kahve-odžak"



CURRENT FUNCTION

The valorization process is essential to select new or evaluate the existing function.

Evaluation (determining the value of the architectural - cultural heritage) or valorization is one of the stages in the methodological process of active protection of architectural heritage, which comes just after the extensive research phase, recording and analysis but precedes the determination of the particular creative process in the protection procedure. Analyzing the example of Svrzo's house, we determined that it has:

- The **value of authenticity** (because it contains original elements observable in the social and technical sciences)
- The **value of representativeness** (as a representative of the traditional construction of the Ottoman period in Bosnia and Herzegovina, at the same time expressing the uniqueness and typicality in its appearance).

As a conclusion we can say that the **current purpose - Museum - is positive** for the preservation, presentation of origin, characteristics and beauty of Svrzo's house in urban, architectural, aesthetic, formative and documentary sense.

However, it is necessary to enable further evolution of this architectural piece.

- Therefore, on the basis of valorization and according to all the cognitions about Svrzo's House we made in the making of this feasibility study, we will determine the guidelines and raise certain questions that are of importance for all the possibilities of usage both in the present and the future. The goal is to increase the sustainability of Svrzo's house and implement the concept of active protection of architectural heritage.

DETAIL "Fakme idetat"



OPTIMAL FUNCTION GUIDES FOR FUTURE DEVELOPMENT

- Using only the ground floor of the house in the winter appears as a "problem". Are modern users willing to use just one half of the house in the winter months, only to meet the environmental aspect of traditional construction? So, of course, in contemporary design we make concessions to comfort of living, but how will that affect primarily the environmental aspect?

- There is a possibility and need for activating the close surroundings of Svrzo's house in a way that these new functions / activities are complementary to the function of the museum and are enhancing the overall attendance. This is supported by the results of a survey that showed that 77% of examinees want new activities in Svrzo's house but because of their absence do not visit more often than once.
- Activation of the museum with additional activities that will attract and entertain new but also the old visitors. So, the goal is that the house as a museum serves as a *platform* for organizing various events/activities that won't disrupt its

primary function (*museum*) but will allow the museum to constantly evolve into something new and attract the visitors again.

- Provide accurate demand characteristics in terms of defining potential users but also specify the quality and all of its potentials;
- Improve the conditions of the Svrzo's house museum in terms of *energy efficiency* to the extent that proves necessary;
- Improve the conditions of the Svrzo's house museum in relation to its current state (decreptitude of the furniture, fabric and so on);
- Promote the value of Svrzo's house and traditional building in general, in order to achieve higher attendance;
- The survey showed that most respondents visited Svrzo's house only as a part of organized visit. It is desirable to continue to develop this aspect of attendance. At the same time, take advantage of the fact that the Svrzo's house is a dependence of the Museum of Sarajevo with the aim of self-sustainability of the house.

GROUND FLOOR



FIRST FLOOR



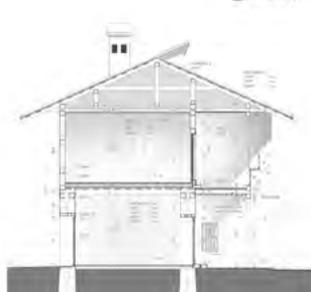
SOUTH ELEVATION



WEST ELEVATION



SECTION A



SECTION B

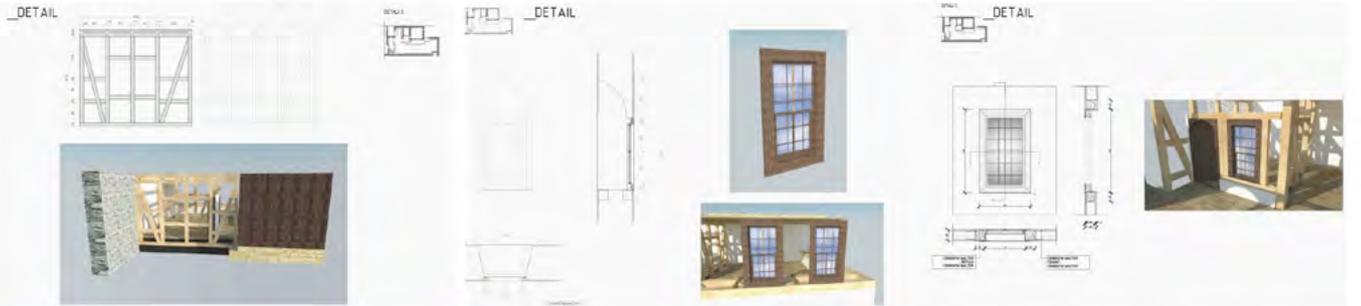




The goal of this study was to analyse the sustainability of traditional construction methods and materials on the example of Srzco's house in Sarajevo. It was important to determine whether and how this traditional building could adapt to contemporary requirements in the field of energy efficiency, as well as to identify principles present in the design of the house that could viably be applied to future sustainable designs. By analysing the structural and artistic aspects of the building, having in mind their social, economic and environmental effects, we explored the house's potential and value and assessed its energy efficiency and sustainability in different contexts.

FACULTY OF ARCHITECTURE_SARAJEVO_SUSTAINABILITY ANALYSIS: SRZCO'S HOUSE_STRUCTURAL ASPECT_KARABEGOVIĆ VEDRANA_HARIN BLANKA

_STRUCTURAL ASPECT



_3D/INTERIOR



_3D/STRUCTURE



_3D/STRUCTURE



...program za jačanje svjetlosti

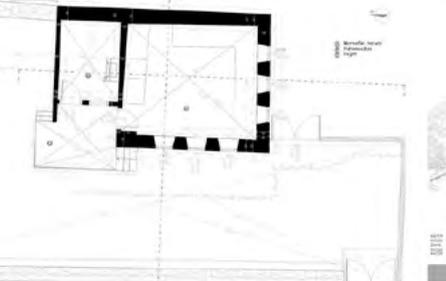
...štetnosti materijala i presjek po zida ije župjaka

...materijali i osnovne karakteristike

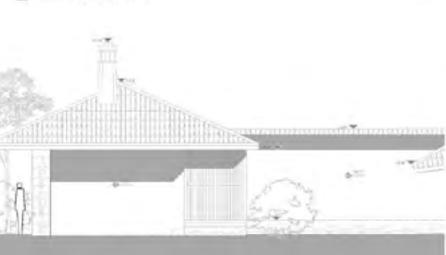
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...sposredna tradicionalnih elemenata gradnje i moderne

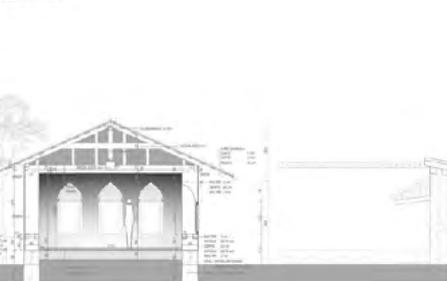
_GROUND FLOOR



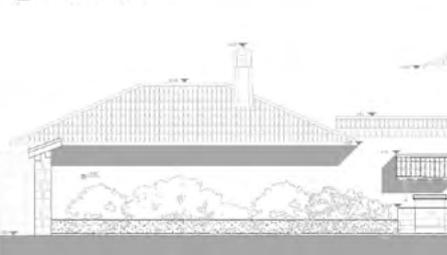
_NORTH ELEVATION



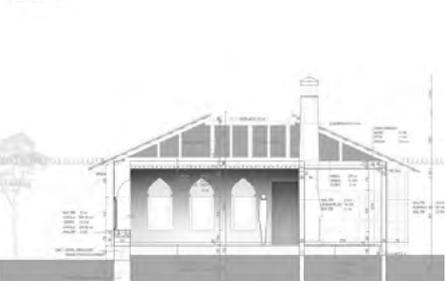
_SECTION



_EAST ELEVATION



_SECTION



_WEST ELEVATION



METAMORPHOSIS OF
ARCHITECTURAL
EDUCATION
IN
(POST)
TRANSITIONAL
CONTEXT

“HERD” PROGRAMME
DESIGN STUDIOS:
A SELECTION OF
STUDENT PROJECTS

Architectural Studio: Protection and Development of Historic Urban Areas;
Case Studies: Počitelj and Vranduk

Teaching staff:

Amir Pašić, PhD, Full Professor

Aida Idrizbegović-Zgonić, PhD, Assistant Professor

Lejla Kahrović, M. Arch., Assistant

Selected student projects:

Emina Alić, B. Arch.

Sabina Bakal, B. Arch.

Stefani Barišić, B. Arch.

Selma Bektaš, B. Arch.

Irina Bošnjak, B. Arch.

Sonja Brković, B. Arch.

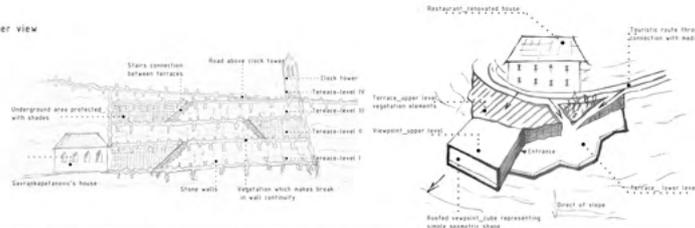
Senida Hadžihalilović, B. Arch.

Irnes Mujagić, B. Arch.

Samed Mujić, B. Arch.

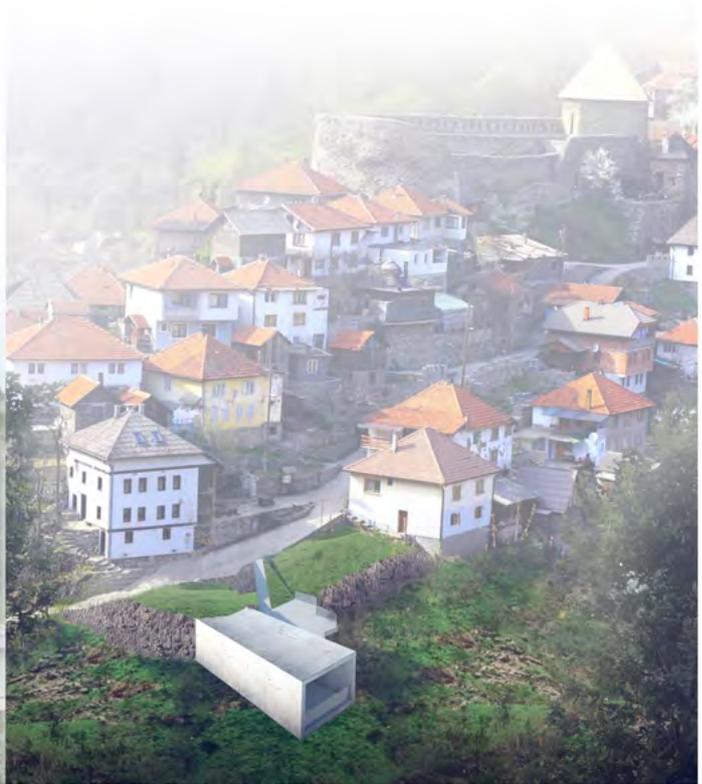
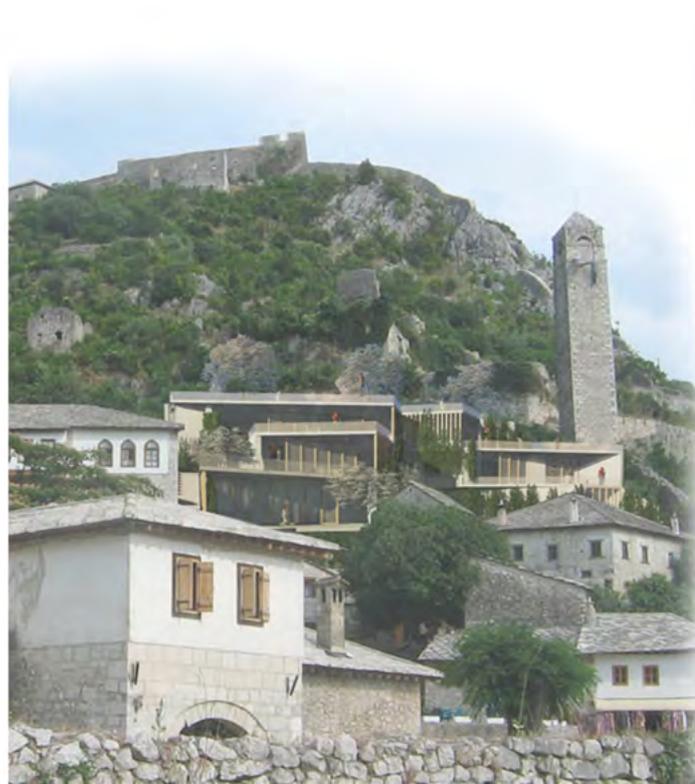
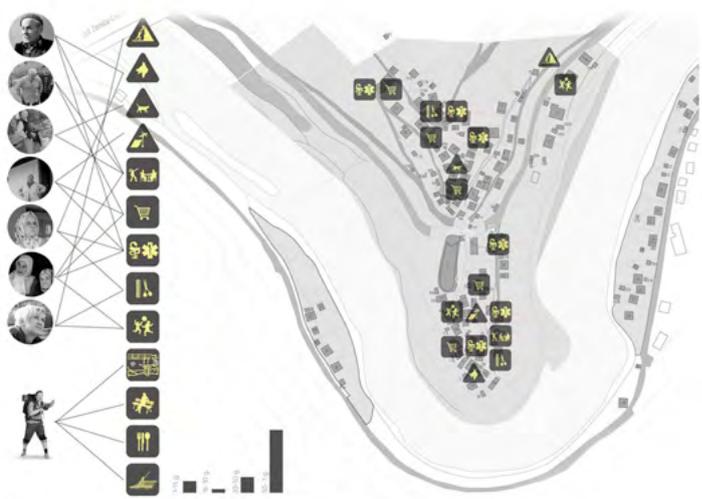
Amar Zuka, B. Arch.

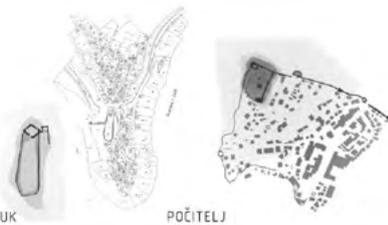
- Concept:
- using potential of the site and existing slope to create better view
 - connect art colony with clock tower
 - form terracing on several levels inspired by vineyards while following tradition of building in these areas
 - form terraces by using walls, use stone in raw construction as traditional material in the area
 - in vertical sense create break of continuity of walls and accent of terracing by using wide range of vegetation elements
 - terraces dominantly green, with smaller pavement areas
 - forming underground levels as closed areas with shades made of Amodern materials and design which will reflect modern intervention inside traditional building



- Concept:
- form space with several levels following natural slope, which is common in tradition of building in Vranduk
 - use combination of free form, natural and simple, clear geometrical shapes to make intervention contemporary
 - materials: mainly stone for raw construction as traditional material, concrete and stone in modern style and glass as modern material, elements of vegetation to revive area and provide warmth, coziness
 - form two levels- two terraces, as well as shaded section to serve as viewpoint formed in shape of cube which emerges from natural slope making this modern interpretation recognizable among old buildings of Vranduk

FACULTY OF ARCHITECTURE SARAJEVO "Multi centar Počitelj" "Viewpoint Vranduk" _students_Mujić, Samed, Mujagić, Innes, Senida Hadžihalilović





VRANDUK

POČITELJ

CONCEPT

Our task in this study was to make a comparison of traditional materials of Vranduk and Počitelj analyzing the volume and scale of the objects, their connection with the ground, the walls, openings, roofing and their respective functions thus translating our conclusions into a new project in that environment.

We noticed that Počitelj has a notable lack of content that would present the cultural and natural wealth of that place in a way that would be interesting for the tourists as well. Therefore, the new facility would follow certain parameters of this space but should, with the modernity of its expression, build its own autonomy and identity. Functionally, its task is to present the resources and uniqueness of Počitelj so the new object would be a small tourist and education center.



CERAMIC ROOF
TILES / SHINGLE

WATTLE AND
DAUB (bondruk
system)

BRICK
(bondruk
system)

STONE

BASE MA-
TERIALS

VRANDUK



STONE SLABS/
CERAMIC ROOF
TILES

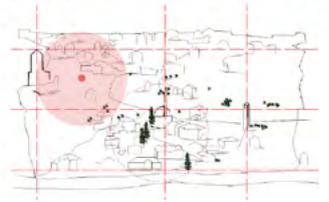
STONE

BASE MA-
TERIALS

POČITELJ

NEW OBJECT - Where? Why? How?

The position of the new structure should be easily observed from different perspectives and equally accessible. The building would thus fulfill its functional role, and would be easily perceived and therefore used. Looking at Počitelj as a whole, it is evident that the central zone is much less active than the rest, and that there are no facilities that could potentially make this zone attractive for visitors. The new structure should be an upgrade of the existing walls of an old and already demolished building in the central zone of Počitelj. Getting to the location requires tourists to explore the configuration, walk lines, paving and therefore the object is not only a generator of changes on the small plot but can generate and changes along the route that leads to it, or even a labyrinth of paths that exist in Počitelj.

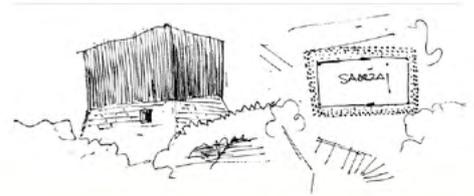
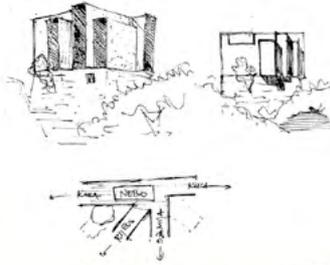
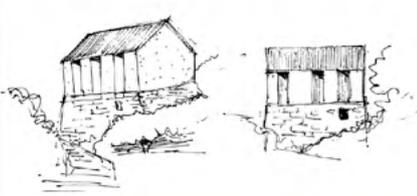


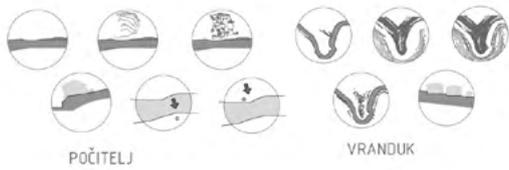
VARIANTS - thinking about the shape of the future structure

1. The final form may result from the archetypal form of a traditional Počitelj house, materialized in white concrete, which would be a self aware addition contrasted enough to the ambience, but that, in some way, derived from it.

2. The form itself is autonomous and its relationship with the environment is achieved more in terms of its functions, from inside to outside, where the shaping of the inside space has a purpose of directing viewers attention to certain values in the ambience of Počitelj. The building derives from the place, not so literally with its appearance, so the deep connection to the site should be read from the inside.

3. A universal form, in which the emphasis is on experimenting with a contrasting material through which we can filter the values of the current environment. The emphasis is on testing the value of the new material, to its metaphysical values, the issues of continuity, variability and and its perceptibility.





POČITELJ

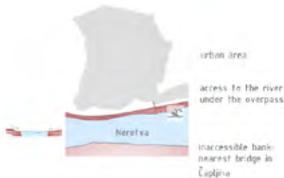
VRANDUK

The idea behind the design proposals for architectural and urban transformation in Počitelj and Vranduk was to encourage residents and visitors to use the river banks for recreation. The designs achieve this by providing easy access and attractive content while following the existing urban matrix and adapting to the natural environment.

VEGETATION AND WIND



RIVER BANKS: ACCESSIBILITY AND CURRENT USE



INSOLATION



13:00



18:00

POČITELJ: ANALYSIS OF EXISTING CONDITIONS

VEGETATION AND WIND



RIVER BANKS: ACCESSIBILITY AND CURRENT USE



INSOLATION



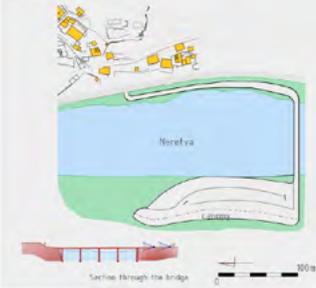
12:30



15:00

VRANDUK: ANALYSIS OF EXISTING CONDITIONS

PROPOSAL 1: BRIDGE



Section through the bridge

PROPOSAL 2: PAVILION



PROPOSAL: PAVILION

PROPOSAL 1: BRIDGE



PROPOSAL 2: PAVILION



ACCESS



ACCESS

PAVILION



fortification fortresses_analyses

VRANDUK

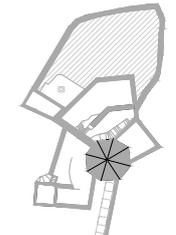
FORTRESS TYPE	_closed fortress (climate conditioned)
FORTRESS SHAPE	_irregular longitudinal form -the unique space inside the walls
FORTRESS POSITION	_housing objects on the east side of the fortress
ACCESS	_walking and driving access
MATERIALIZATION	_stone
ROOF COVERING	_batten
INSULATION	_convenient
SPACE ACTIVATION	_green surface inside the walls exists unused. Including the modern furniture and using the terrace space shall make the comfortable socialization space.



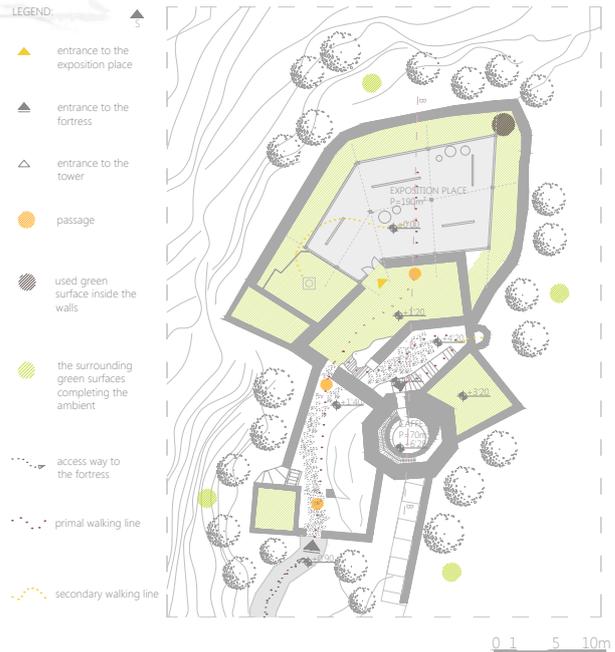
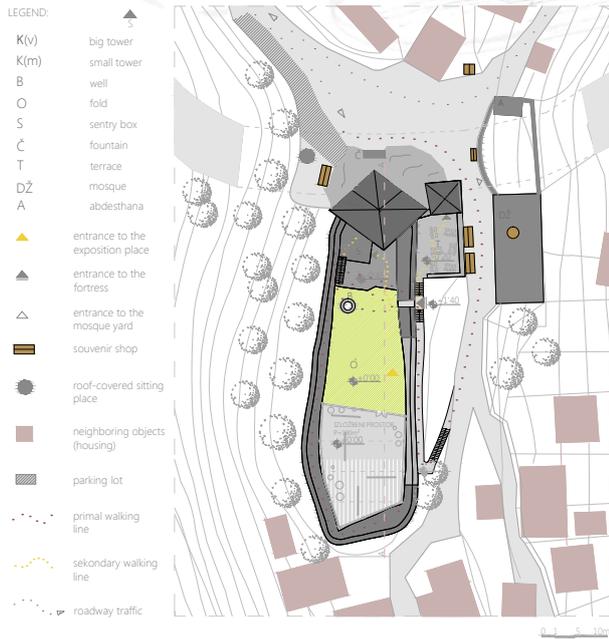
I Vranduk I

POČITELJ

FORTRESS TYPE	_open fortress (conditioned by Mediterranean climate)
FORTRESS SHAPE	_irregular shape composed of three areas inside the walls
FORTRESS POSITION	_untouched nature and neighboring housing objects
ACCESS	_walking access
MATERIALIZATION	_stone
ROOF COVERING	_stone panels
INSULATION	_convenient
SPACE ACTIVATION	_potentially rich area for the space usage, especially because of the beautiful vistas towards the old town as well as because of the convenient orientation. The area can be activated by the interpolation of the new shape inside the fortification remains or by the inclusion of the exposition pavilion with furniture thus making the area more attractive and more interesting.



I Počitelj I



fortification fortresses_interpolation

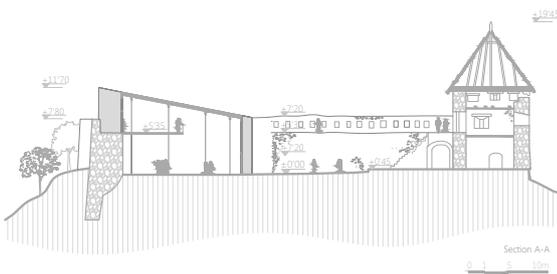
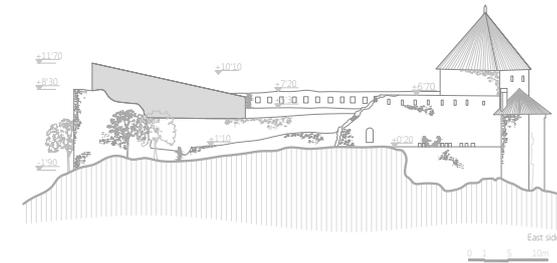
the concept

The idea is to activate the open, unbuilt areas inside the fortresses thus giving a new dimension to the current state by applying new physical structures upon the open areas achieved by closing the stone monumental walls. The initial intervention was giving it a new function—thus making a contribution to the esthetics—that is including a modern component to the old. Having expositions areas included inside the fortress makes a significant contribution to the character of the fortress itself thus achieving the quality of space and giving an opportunity to spend some time there. Similar fortifications, without any changes, have existed in these areas for years, but still with minor interventions which would not lower their value. The question is how to include the new into the old pragmatically, without touching upon the monumental, architectural and environmental value of the fortress. The intensity of the modern materialization dominance of new physical structures should stay consistent in regard to the fortification. The main planning approach difference between the fortresses of Vranduk and Počitelj lies in the completely different climate features of the above-mentioned areas. The fortification form is primarily conditioned by its location and the extroversion of the walls compositions of the Počitelj fortress in contrast to the introversion of the Vranduk fortification, which highly influenced any further activities within the same.



V R A N D U K

Acting inside the monumental walls, placing a new structure thus composing the object within the protected area through the activities of damaging climate impacts. The location of Vranduk, in the zone of continental climate, influences the form of the object as well as the roof incidence to prevent snow accumulation. Shape and form adaptation to the climate features, but in accordance with the overall fortification composition. The unbuilt open space inside the walls should be activated in an urban architectural way. The urban equipment should be used for filling the space thus using the potential of the sunny area. Using the urban equipment will make the terrace applicable for sitting and hanging around, after the working hours, thus making it the space for fun. The design concept was based on the principle of "a house within the house", the interpolation of the new volume into the existing physical structure. The simple form of the new structure fits the existing ambient. The modern materialization aspects should remain respectful towards the architectural heritage. Using the materials in only one color will not disturb the existing harmony of the space. The new units should be included not to dominate the space but to add some modern expression to it.



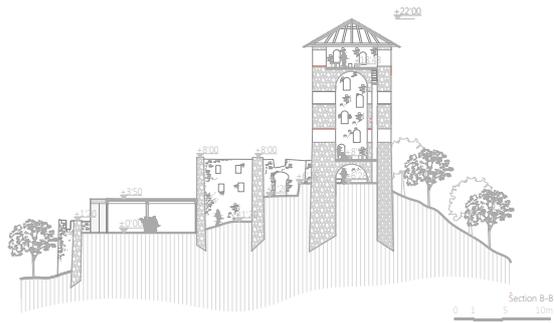
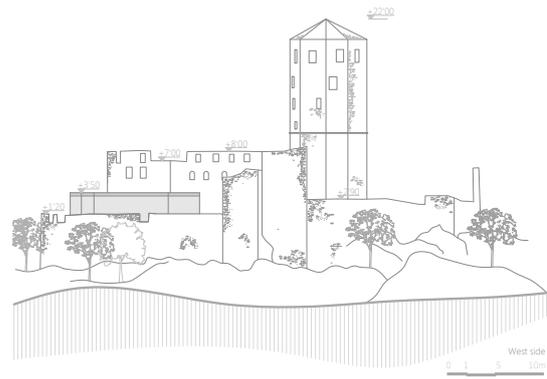
interpolation_metal

The localities exert the dominance which is best recognized in the fortresses which do present the most attractive element of these complexes. If we are talking about the old and historically significant complexes then the main task of implementing new structures is their moderate emphasis within the whole existing complex. New forms shall direct and turn one's attention to the old structures, fortresses, in this case. Therefore, it is essential to implement new forms in a way that their modern materialization aspects will not be aggressive to the environment of the objects and forms existing there for hundred of years. The value of the protected complexes is defined precisely by their function in the ancient history. The analyses and the environmental experts say that both Počitelj and Vranduk used to be important points for the area of Bosnia and Herzegovina from that period.

Today, however, it is very difficult to estimate their value concerning the existing state. It is especially the case with the Vranduk fortress, which is not as visited and attractive as it could be, taking its great value into consideration. Therefore, it is important to enrich both of these complexes in a way that they will be interesting for tourists from the local communities as well as for those all over the world. The comparison of these two fortresses is also one of the things differentiating them. We could say that the fortress of Vranduk is simpler than that of Počitelj, taking both their form and composing unities into consideration. The common feature of both localities is the tower, which is situated inside the Fortress, presenting the dominant in regard to its towering figure.

P O Č I T E L J

Being the oldest building representative, the Mediterranean area where Počitelj is located presents the fortification fortress. The fortress concept absolutely fits the climate of the area and as a response offers the openness of the walls composition. The space, offering the most attractive vistas towards the untouched landscape of the river Neretva, is planned to be the architectural creation of the exposition pavilion. The location of the cubic form inside the walls, the emphasis of the fortress and, at the same time, the exposition of the horizontal structure in relation to its verticality, pays one's attention to the fortress, which dominates the complex. Inclusion of the new unit within the historical ambient helps achieve the attraction which increases the tourist visits to the place. Modern spirit is felt in the area still without damaging the existing structures.



interpolation_glass

IMPRESSUM

METAMORPHOSIS OF ARCHITECTURAL EDUCATION IN (POST) TRANSITIONAL CONTEXT

Sarajevo, 2016.

EDITORS:

Mladen Burazor, PhD, Assistant Professor
Markus Schwai, PhD, Associate Professor
Nermina Zagora, PhD, Senior Teaching Assistant
Senka Ibrišimbegović, PhD, Senior Teaching Assistant

REVIEWERS:

Hans Narve Skotte, PhD, Full Professor
Amir Čaušević, PhD, Associate Professor
Venkatesh Govindarajan, PhD, Senior Lecturer
Dženana Bijedić, PhD, Assistant Professor

CONTRIBUTORS:

Amir Pašić, PhD, Full Professor
Nina Ugljen Ademović, PhD, Associate Professor
Lemja Chabbouh Akšamija, PhD, Associate Professor
Adnan Pašić, PhD, Associate Professor
Erđin Salihović, PhD, Associate Professor
Markus Schwai, PhD, Associate Professor
Aida Idrizbegović-Zgonić, PhD, Associate Professor
Venkatesh Govindarajan, PhD, Senior Lecturer
Mladen Burazor, PhD, Assistant Professor
Nihad Čengić, PhD, Assistant Professor
Sladana Miljanović, PhD, Assistant Professor
Amira Salihbegović, PhD, Assistant Professor
Senka Ibrišimbegović, PhD, Senior Teaching Assistant
Vedad Islambegović, PhD, Senior Teaching Assistant
Elša Turkušić-Jurić, PhD, Senior Teaching Assistant
Nermina Zagora, PhD, Senior Teaching Assistant
Dženis Avdić, MArch, Teaching Assistant
Amra Salihbegović, MArch, Teaching Assistant
Lejla Šabić, Grad. Arch, Teaching Assistant

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Faculty of Architecture, University of Sarajevo
Patriotske lige 30
71 000 Sarajevo
Bosnia and Herzegovina

NTNU –
Norwegian University of Science and Technology
Faculty of Architecture and Fine Art
NTNU
NO-7491 Trondheim
Norway

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HERD A 2016 CONFERENCE COORDINATORS:

Dženis Avdić, MArch, Teaching Assistant
Amra Salihbegović, MArch, Teaching Assistant

CONTRIBUTORS:

DŽENIS AVDIĆ

MLADEN BURAZOR

LEMJA CHABBOUH AKŠAMIJA

VENKATESH GOVINDARAJAN

NIHAD H. ČENGIĆ

SENKA IBRIŠIMBEGOVIĆ

AIDA IDRIZBEGOVIĆ ZGONIĆ

VEDAD ISLAMBEGOVIĆ

SLAĐANA MILJANOVIĆ

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AMIRA SALIHBEGOVIĆ

ERDIN SALIHOVIĆ

MARKUS SCHWAI

LEJLA ŠABIĆ

ELŠA TURKUŠIĆ JURIĆ

NINA UGLJEN-ADEMOVIĆ

NERMINA ZAGORA

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