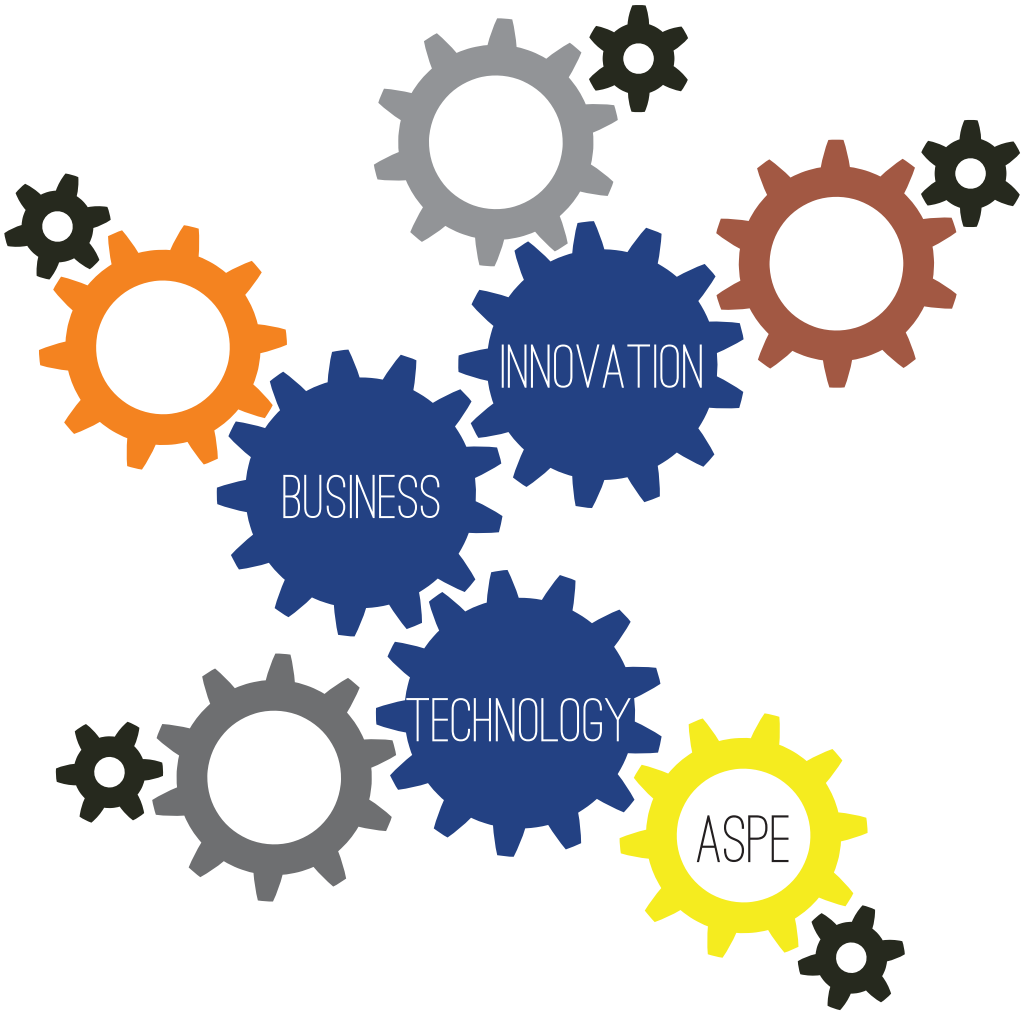


INTERNATIONAL CONFERENCE IN BUSINESS, INNOVATION AND TECHNOLOGY

Chapter: Architecture, Spatial Planning and Civil Engineering

ORGANIZED BY: UBT

IN PARTNERSHIP WITH:

IFAC KA-SIM

EUROPEAN ORGANIZATION FOR QUALITY

KOSOVO ASSOCIATION FOR MANAGEMENT

AEP KA-CASE

UBT PUBLICATIONS, NOV 2013

Proceedings of the 2nd Annual International Conference on Business, Technology and Innovation

Chapter: Architecture, Spatial Planning and Civil Engineering

Edited by
Edmond Hajrizi

November, 2013

ISBN: 978-9951-437-23-3

International Conference on Business, Technology and Innovation
Durres, Albania 1-2 November 2013

Editor: Edmond Hajrizi

Contributing editors: Albert Qarri, Ibrahim Krasniqi, Krenare Pireva, Evelina Bazini, Nita Abrashi

Co-organizes: Ardian Emini, Vlora Aliu, Betim Gashi,Murat Retkoceri, Xhemajl Mehmeti, Kushtrim Dragusha, Kaltrina Bunjaku, Leonita Braha

Publisher, UBT

Preface

International Conference on Business, technology and Innovation is an international interdisciplinary peer reviewed conference which publishes works of the scientists as well as practitioners in the area of business, law, technology, architecture, etc.

The main perspective of the conference is to connect the scientists and practitioners from different disciplines in the same place and make them be aware of the recent advancements in different research fields, and provide them with a unique forum to share their experiences.

It is also the place to support the new academic staff for doing research and publish their work in international standard level.

This conference consists of 5 sub conferences in different fields:

- Management, Business and Economics
- Law
- Computer Science and Information Systems
- Mechatronics, Robotics and Systems Engineering
- Architecture, Spatial Planning and Civil Engineering

This conference is the major scientific event of the University for Business and Technology. It is organizing annually and always in cooperation with the partner universities from the region and Europe.

In this case our partner universities are the University of Vlora "Ismail Qemaili" and University of Tirana – Faculty of Economics.

Other professional partners in this conference are: Kosova Association for Control, Automation and Systems Engineering (KA – CASE), Kosova Association for Modeling and Simulation (KA – SIM), Quality Kosova, Kosova Association for management

This conference is sponsored by Ministry of Education, Science and Technology of Republic of Kosova, AEP Project and EUROSIM - The European Association of Simulation.

This Chapter presents the contributions of researchers for the Architecture, Spatial Planning and Civil Engineering.

We have to thank all Authors, partners, sponsors and also the conference organizing team making this event a real international scientific event.
This year we have more participants and publication than last year.

Congratulation!

November 2013

Prof Edmond Hajrizi

Chairman of ICBTI 2013, UBT

Contents

Architecture, Spatial Planning and Civil Engineering

Symbolism and Poetics of Autogenic Space and Structures – The New Design Approach on Mosque as Representative Building (Design Proposal for the Central Mosque of Prishtina as Case Study)..... 8

Banush Shyqeriu, Kushtrim Hajdari

Quality Of Wood Drying Which İs Using İn Residential Buildings Depending On İts Thickness (Case study timber of beech, with different thickness that is drying in conventional kiln in the territory of Kosovo).....26

Rrahim Sejdiu, Kushtrim Cuka , Selam Ceka , Muharrem Sejdiu

Santiago Calatrava, City of Arts and Science: The Similarity of the Elements.....32

Ani Tola, Armand Vokshi

Replacement Of A Monolith Reinforced Concrete Slab With A Lightweight Cobiax System Construction.....43

Mimoza Sylejmani ; Blerta Emini

Structure as Architecture, Architects as Engineers 58

Altin Bidaj , Irakli Premti , Hektor Cullufi

The Natural Light In Alvar Aalto's Buildings.....63

Parashqevi Tashi , Ani Tola(Panariti)

The Impact of Socialist Realism Ideology in the Albanian Architecture from 1945-1990.....76

Olisa Ndreçka, Florian Nepravishta

Pervious Concrete-New Solution for Sustainable Urban Street Construction Case: Prishtina and Tirana.....85

Driton R. Kryeziu, Mevlan Qafleshi, Fisnik Kadiu

The Influence Of Digital Culture In Tectonics And The Language Of Form In Architecture TOYO ITO, GREG LYNN, PATRICK SCHOUMAKER.....98

Denada Veizaj, Gjergji Islami

Strategic Management Of Secondary Raw Materials In Kosovo As Economical Potencial And Environmental Protection For The Country.....107

Ibrahim Krasniqi

The Analysis of Interface of Social-Technical Aspects within Transport Planning and Urban Design.....114

Ylber Limani , Binak Beqaj, Vlora Aliu

Urbanization and Socio-Urban Developments in Prishtina in Post-Conflict period.....127

Besim Gollopeni

Urban Land Management Policy For The Central And Localgovernment In Albania 134

Gjergj Thomai , Daniel Guralumi , Iva Mezezi

Interpretation of 3D city models for Sustainable Urban Development 148
Hebib Alili, Fadil Shehu
Fausto Di Florestano - The Genesis Of New Architectural Forms In Albania 158
Armand Vokshi ,Florian Nepravishta
Development Of Cost Model For Construction Projects In Albania 168
Valdete Ballhysa
Tirana, Between East And The West In The Focus Of The Urban Texture 181
Armand Vokshi, Ani Tola (Panariti)
Improving Energy Efficiency in Buildings in Republic of Kosovo 192
Ferhat Bejtullahu
Flexible Use And Aplication Of Energy Efficiency Measures In Existing Multi -Residential Buildings 201
SadijeKelmendi , Vlora Aliu
Effects of Buildings and Environment in Our Everyday Life 210
Arlinda Sheqiri
Planning for the Development of Tourism in the Natural and Archeological Park of Orikum 215
Florian Nepravishta, Armand Vokshi
Tuned Mass Damper: An Intelligent Device As A Protection System Instructural Engineering 226
Feti Selmani, Musa Stavileci
Analogy in elements: breaking the national identity 239
Kujtim Elezi, Nuran Saliu
Modified Sma Design Mix For Motorway Wearing Course – Case Study Kosovo Motorway 250
Esat Gashi , Hajdar Sadiku
Analysis On Energy Consumption In The Health Sector And Energy Saving Measures 256
Kadrush Latifi , Nafije Gashi ,Luljeta Hoxha ,Mehmet Qelaj , Driton Ademi
Standard Energy Audit In The Residential Buildings - A Case Study In A Residential Apartment In Street ,,New Kalabria'' In Pristina 261
Mehmet Qelaj; Flamur Bidaj; Nafije Gashi; Ali Muriqi; Driton Ademi; Violeta Nushi
Building Typology In Kosovo Based On It's Thermal Characteristics 269
Luljeta Hoxha, Kadrush Latifi, Nafije Gashi,Lutfije Dervishi

Architecture, Spatial Planning and Civil Engineering

International Program Committee:

- Aray aci O. (TR)
- Beqaj B. (RKS)
- Dangschat J. (A)
- Dilinger T h. (A)
- Elezi K. (MK)
- Galluzzi M. (I)
- Guralumi D. (AL)
- Hajrizi E. (RK S) Chair
- Heiduk E. (A)
- Jagxhiu F. (RKS)
- Kadiu F. (AL)
- Andrew s, K. (SLO)
- Klein J. (A)
- Marzolf K. (USA)
- Ramsak M. (S LO)
- S tirmer N. (HR)

Organizing Committee:

- Ahmeti M .(RKS)
- Beqaj B. (RKS)
- Beqiri L. (RKS)
- Gashi B. (RKS)
- Hajrizi E. (RKS) C hair
- Kosumi S. (A)
- Mahmuti L. (RKS)
- Retkoceri M. (RKS)
- Sheqiri A. (RKS)
- Aliu V . (RKS)
- Sylejmani M.(RKS)
- Krasniqi I. (RKS)
- Kryeziu.D (RKS

Symbolism and Poetics of Autogenic Space and Structures – The New Design Approach on Mosque as Representative Building (Design Proposal for the Central Mosque of Prishtina as Case Study)

Banush Shyqeriu[1], Kushtrim Hajdari[2]
[1] Lecturer at Faculty of Architecture, University for Business and Technology in Prishtina;
Researcher at Institute for Cultural Sciences, Humboldt University in Berlin
banush.shyqeriu@ubt-uni.net
[2] Architect at Hoppe Architekten, Vienna; PhD Candidate at Vienna University of Technology
arch.kushtrimhajdari@hotmail.com

Abstract. The congregation Mosque, *Masjid* (from Arabic, *sujúd* = prostration to God) is one of the most important institutions of Muslim world, also the predominant built form of Muslim architecture. Having a basic spatial configuration to create "shelter" for prayer, it is evoking how the simple space bears meaning that generates symbolism. This paper tries to de-construct and re-construct the Mosque as a representative built form. By using our *Design Proposal for the Central Mosque of Prishtina as Case Study*, we emphasize an "organic" approach towards Mosque design through a methodology of integral contextualization and conception as the new "typology", by re-interpreting the traditional symbolic repertoire of structural and spatial elements / grammar of Mosque, towards novel spatial scenarios and narratives in the realm of phenomenology of architecture. Generating meaning which connects the tradition and contemporary perception is the ultimate goal of this approach, aside a higher spatial, structural and energetic performance of the Mosque as built form.

Keywords: Mosque; "shelter"; meaning; symbolism; design; "organic"

1 Introduction

Human beings are bound, attracted and "rooted" to certain places and spaces not for their mere formal expression or aesthetics, but for their meanings they hold, elicit and convey to them, which meanings provide a comprehensive mutual communication between the user and natural environment as well as with built forms and build environments.
Buildings do elicit meanings, and at this point architecture reconciles itself with the user it "shelters". Yet, modern built forms and environments have frequently lost the phenomena of meaning, as they do not belong to us to any deep extent (Alexander; 2004). Modernism has been called into question as the "soulless container architecture" (Leach; 1997) so, the disappointment with functionalism at the end of the twentieth century turned the form-function relation to the relation between form and meaning, furthermore, meaning is not something apart from function, but is itself a most important aspect of function. The return of meaning presents a *topophilic* (Bachelard; 1994) and *biophilic* (Almusaed; 2011) reconciliation of people with the built and natural environment, a re-discovery of latent meanings in the *genius loci* (Norberg-Schulz; 1979). Architecture means to visualize the genius loci, and the task of architect is to create meaningful places, whereby he helps man to dwell. The rapid spread of the amenities and conveniences of modem life created a uniform but a less personally and socially meaningful built environment. In turn, architectural symbolism can act as an ontological context and a field for exploring the dialectics of relationship between people and built environment (Akkach; 2005). If architecture goes beyond utilitarian needs, as Le Corbusier asserts, then religious architecture certainly applies. Here the ordinary place and space is presented and represented into "extraordinary" meaningful poetry of relationship between people and built form as well as its surrounding environment. Symbolism and/as meaning is the departure point for a phenomenological approach of Mosque Design as the scrutinized subject and object of this paper. "Reading" the poetics of architecture – form, space and structure - as well as "writing" architecture is the methodological framework for catalyzing a

theoretical approach on Mosque – Urban Mosque - as a representative built form through the lenses of implicated disciplines; religion / Islamic studies, philosophy/epistemology, psychology/Gestalt psychology, cultural studies, linguistics/semiotics as well as poetry. Furthermore, Mosque is the appropriate and ultimate focal point to look at architectural issues from the perspective of faith and vice versa.
Taking a theoretical approach towards Mosque as a built form is as challenging as taking a design approach, yet this paper takes both challenges as well as opportunities within the context of current societal and technological developments.

1.1 A short etymological, ontological and historical account of Mosque as institution and built form

The root of Arabic word for sanctuary, *Masjid* is *sejede*, which means *to prostrate*, in fact prostration is the highest act of ritual prayer in Islam, *salāt*. Hence, prayer (*salāt*) is the *raison d'être* of ontological Mosque.

The place and space which gathers the Muslims for congregational prayer traditionally is referred as *jāmi*, from Arabic, *jámī; jamā, jammeā* = congregation, gathering, union.

Before being a *space*, a Mosque is a *place*, and this place according to Islamic teachings is the earth itself, the whole earth as the Mosque. This can be clearly asserted from the Prophetic sayings, "*Wherever you pray, that place is a mosque*" and, "*I have been given the whole earth as a mosque (place for prayer)*" or "*the whole earth has been made a mosque for us*". Yet, these Prophetic sayings raise questions about how and why an identifiable Mosque architecture emerged and developed. In its formal and compositional characteristics, the typical Mosque remains an intriguing phenomenon that is at once simple and complex. It is simple in that a number of recurrent elements can be traced in various compositions throughout the premodern and modern periods, revealing a consistent identity. Yet it is complex in that the model perpetuated in many elaborate forms has little to do with the function it serves. Hence, the relation of form and function of the Mosque remains a perplexing and challenging task in architectural design. Moreover, the Prophet's Mosque in Medina as the generic and precedent of all Mosques is so "simple" and "profaned" that seemed hard for the historiography, especially western historians and theoreticians to grasp it as a sacred building from the viewpoint of western epistemology that has clearly polarized the "sacred" and the "profane".

Fig. 1. *The whole earth as prayer place – Mosque*. The designation of a sacred zone by setting out demarcating boundaries can be traced in some premodern Islamic references. Many early places for prayer were said to have merely lines drawn in the sand. (Akkach; 2005).

Source and Photo Credit ©: Corbis.

1.2 The Prophet's Mosque in Medina as the Eternal and Generic Mosque

The very first piece of Muslim Architecture was the Mosque that the Prophet Muhammad (p.b.u.h) built himself at Medina in 622 AD. It was a square enclosure surrounded by walls of brick and stone. This simple structure had the portion of the roof under which the Prophet led the prayer made of palm sticks and mud, and it was supported on columns made from palm trunks. Furthermore, this simple structure served as a religious, social, political and educative center.

In this line, the function of the Mosque as an institution is well set from the two main Islamic sources; the *Holy Quran* and the prophetic sayings, the *Hadith* which constitutes the Prophetic tradition, the *Sunnah*. Yet, the question how the Mosque as institution – function it serves – is related to the

representation of this function – the form – remains quite ambiguous and frequently in the domain of conjecture. Taking this point as challenge and opportunity, this paper presents a methodological framework through theorization of our design proposal for the Central Mosque of Prishtina as case study, even though, the paper is not exclusively framed into this case study, as it takes also an inclusive and holistic view of the issue.

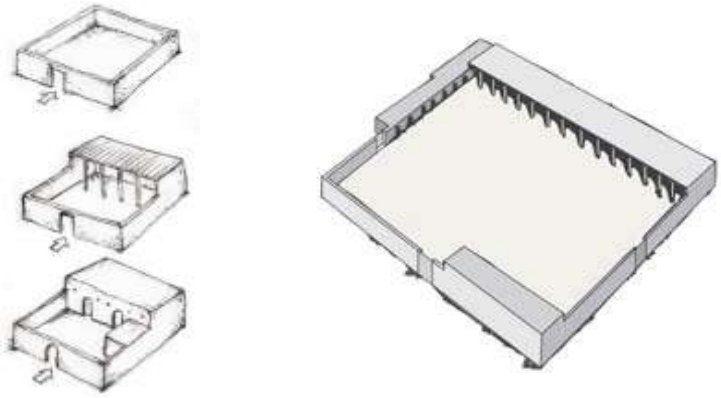


Fig. 2. (Right) the House and Mosque of the Prophet Muhammad p.b.u.h. at Medina: The Islamic prototype of both religious and residential architecture. (Left) regional architecture of House types of Arabic Peninsula, specifically from city of Medina.

Source: Author's drawings after Prochazka; 1986

2 Phenomenology Of Architecture As An Ontological Context For Approaching Mosque Design

Phenomenology implemented in architectural design relies in the manipulation of structures, elements and sequences of space, materials, light and shadow to create memorable encounter through an impact on the human senses. Phenomenological approach to architecture proclaims that the senses be stimulated by the design not merely the visual stimulus but also tactile and feelings. This is clearly asserted by Peter Zumthor; *materials in architecture can be made to shine and vibrate*. In the phenomenology of architecture, the Euclidian geometric space is transcended into a space of meanings as "forces" to be felt. In this sense geometry has the power to articulate spatial relations and materiality which in turn can reflect how buildings embody and encode social, cultural and material knowledge and information, which embodiments can be then decoded by the particular society/user (Rapoport; 1990).

Fig. 3. The atmosphere of space, sequences and material tactility in vernacular architecture in Kosovo

Source: Author's photo courtesy

Religious buildings traditionally represent a "container" of encoded multivocal meanings, which meanings are mostly embedded into symbolic forms of architecture itself. Mosque architecture in this sense is a phenomenological container of meanings embedded, represented and decoded by the

particular users, and at this point this provides an interesting ontological context to approach the contemporary Mosque design.
Being itself prescriptive and normative in behavior not in form, Islam provides no ready-made recipes to establish design standards for Mosque as a built form, in this line Islamic architecture, traditionally derives its meaning from the usage rather than the from imposing a meaning. Here the question that rises is how then distinctive features and typologies on Mosque design appeared and crystallized? Does Mosque represent an *autopoietic* system (Schumacher; 2011) "appeared" out of a *solipsistic epistemology*? A practical answer would be that the Mosque architecture draws upon sources of inspiration from the legacies of the past, the promise of the present, and the inspired visions of the talented individuals – architects, artists and artisans. Yet the question of phenomenology is not fully constrained within material boundaries. Symbolic meanings have played a deep role in shaping the visual language of Mosque as a representative, legible built form. In one hand they have maintained the legacy with the past but in the other hand have "limited" the design creativity through a stress of Muslims to become more "normative" which led to the so-called "pan-Islamic" style.

2.1 Symbolism of architecture as a mean of articulating meaning

Symbolism is a current topic in many disciplines; its discourse is multifaceted. Psychologists, anthropologists, cultural theorists, social scientists, historians of religion, historians of art and architecture, philosophers and architectural theorists, have all developed viable dimensions of the discourse. The wide interest in the topic in the humanities and social science disciplines points to its significance in understanding humankind and its situations in the world. Man cannot gain a foothold through scientific understanding alone. He needs symbols, that is, works of art which "represent life-situations".
One has also to distinguish between signs and symbols. Historically there have been different theorizations and implications in defining symbols.
Signs are supposed to be univocal, that is, to have a one-to-one correspondence to what they stand for because they are related to those things fairly directly. Symbols, on the other hand, are supposed to be multivocal, that is, they have a one-to-many correspondence and are hence susceptible to many meanings. Hence, symbolization manifests itself through experienced meanings "translated" into another medium, while that medium continues to remain itself (Eliade; 1968). Symbols and signs are commonly understood and used as means of communication; in architecture they represent the nonverbal communication between the built form and the user.
In Islamic architecture, symbolism mediated historically and theoretically between the polarity and dichotomy of meaning-oriented and beauty/pleasure-oriented, especially in the case of ornament. Moreover there is an inconsistency how the terms symbol and sign were used in the pre-modern Arabic literature and how it is used in the contemporary Islamic architectural discourse.
The Arabic terms *āya, ramz, ishāra, 'ibara, mithāl*, and *dalīl* are all used to denote various shades of both 'sign' and 'symbol.' All are used in the Quran; however, the term *āya* is the most nuanced and frequently used. *Āya* literally means "mark" or "sign" but is most commonly used to refer to a Quranic "verse." The most potent meaning of the term, however, is "symbol" as in the widely quoted verse: "*We shall show them our symbols (āyāt) on the horizons and within themselves until it will be manifest unto them that it is the Truth*" (Quran 41:53).
Āya also means warning, example, lesson, indication, miracle, wonder, marvel or prodigy. All these meanings are contextualized in the Quran:
"If all trees in the earth were pens, and if the sea eked out by seven seas more were ink, the words of God could not be written out to the end." (Quran 31:27)
"Do you not see how God cites a symbol: a good word as a good tree, its root set firm and its branches in heaven." (Quran 14:24)
"And of his symbols is this: he created you of dust, and behold you human beings, ranging widely!" (Quran 30:20)
From the perspective of *philosophia perennis*, forming an integral part of the sensible world, architectural forms are considered as eminently appropriate to act as symbols. In the pre-modern Islam, cosmological meaning and interpretation of architectural components and forms was stressed especially from the Sufism, yet, Sufism traditionally had tenuous relationship with mainstream Islam, which makes

it hard and ambiguous to interpret or implement those ideas in the contemporary context of architectural discourse.
Taking symbolism as a means to articulate meaning into architectural form and space, we will elaborate this approach in our proposal for the Design of Central Mosque of Prishtina.

2.2 Poetic meaning of architecture

Holl et al (2006) asserts that *if architecture can be said to have a poetic meaning we must recognize that what it says is not independent of what it is*. Perhaps the most comprehensive work concerning the poetics of space applying the method of phenomenology to architecture is from French philosopher Gaston Bachelard, *The Poetics of Space*. A highly philosophical approach but tangible on lived experience of architecture.

The relation of architecture with poetics is also asserted by Le Corbusier: *Architecture only exists when there is a poetic emotion*. In this sense poetics, symbolism and meaning represent the tangible and transcendent features of the phenomenology of architecture.

Representation of "sacred" as light and space and light in space was the core theme in Gothic architecture. Also space as an immaterial idea and its atmospheric qualities were the poetic articulation in the Gothic "drama". In this sense Le Corbusier asserted that: *the cathedral is not a plastic work/ it is a drama / a fight against the force of gravity, which is a sensation of a sentimental nature.* Hence, symbolism and poetics are part of the phenomenological language through which architecture speaks, and as such are the main themes in elaboration of this paper.

3 Urban And Architectural Conception – Harmonizing And Reconciling The "Tension" Between Two Fabrics

Buildings are more than morphological entities as they produce interventions and situations. Urban Mosque is a building that operates under unique existing site constraints (Kahera et. al, 2009); as such it creates a "tension" in the urban fabric.

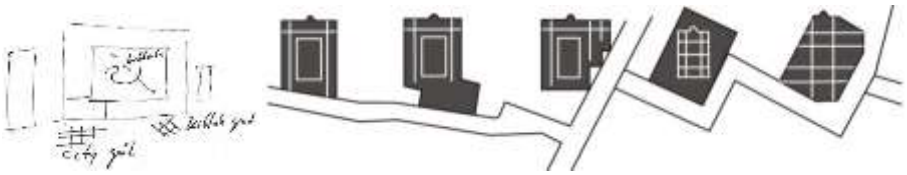


Fig. 4. (Left) sketch depicting city grid and Mosque grid in the proposed site. (Right) architectural solutions for "reconciling" the city grid with kiblah grid

Source: Author's drawings after Prochazka; 1986

Islamic prayer requires no tangible object to be performed. As prescribed by the Prophet p.b.u.h. prayer in Islam is an act of worship performed toward the liturgical center, the Ka'ba, which - except the Holy Mosque in Mecca – lies beyond boundaries of all Mosques. In this sense Islamic prayer does not represent any pictorial act. It is the directionality which orients and unifies the believers in the ritual prayer, which conditions the orientation of the prayer space towards Ka'ba, in the same time revealing an architectural condition. The orientation as a preset makes the Urban Mosque a unique building within the urban fabric, with its autonomous grid imposed to the city fabric.

Fig. 5. Mosque ground floor showing urban integration and contextualization through communication theme.

Source: Author's drawing

For our proposal of Central Mosque in Prishtina the directionality is taken as a theme and regenerative urban concept. In one hand it clearly depicts the Mosque as an "autonomous" and distinctive built form, in the other hand integrates it within urban fabric through two passage-ways, one running in the kiblah axis and the other transversally crossing it. The main entry situated in the kiblah axis as well as side entries de-constructs the normal entry situation, placed in the kiblah direction but leading opposite to it (see Fig. 5 and 9). This provides an "organic" approach of contextualization which re-defines traditional spatial schemata.

The layout of contextualization is further emphasized with spatial/ volumetric configuration of the Mosque as a corpus that tends for harmony in the urban context.

3.1. Spatial tendencies of the Islamic prayer as symbolic embodiments in Mosque spatial /volumetric configuration

Islamic ritual prayer consists of prescribed set of gestures / actions and recitations, performed the same way, whether in individual prayer or in congregation, while standing at a fixed point in space. It involves a series of bodily postures rhythmically repeated in one place with no processional ritual. The spatial tendencies of Islamic prayer go from vertical to stationary to horizontal, and at this point they reveal an interesting symbolic action to be embodied in our generative idea for conceptualizing spatially our proposal for the Design of Central Mosque of Prishtina.

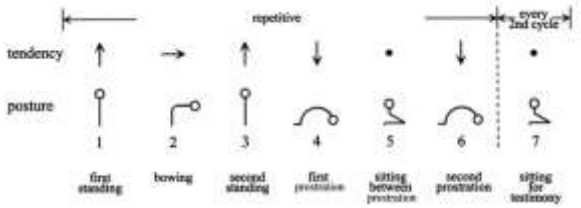


Fig. 6. The bodily postures and associated spatial tendencies of the Islamic prayer.

Source: Akkach; 2005

There are four principal postures: standing *(qiyām)*, bowing *(rukū)*, sitting or resting *(julūs)*, and prostrating *(sujūd)*. The movements associated with these bodily postures reveal four tendencies: upward, associated with the standing posture; horizontal, associated with the bowing posture; downward, associated with the prostrating posture; and stillness, associated with the resting posture.

The four characteristic postures in ritual prayer were taken as numbers and tendencies for articulating the volume of the Mosque in four cascaded coherent volumes, symbolizing the four bodily postures in ritual prayer. As the Mosque is a place and space that hosts both genders equally into ritual prayer, the four cascaded volumes are mirrored from the symmetry ax which represents the *axis mundi* of liturgical center, the Ka'ba.

The cascading down of the volumes in two sides of the kiblah axis is a gesture of prostration, humility and submission as an essential element of belief, as well as an "organic" contextualization and harmonization into urban fabric.

3.2. *Divine Proportions* – Golden ratio and Root rectangles as embodied containers of bodily postures of Islamic prayer

From Vitruvius, da Vinci's *Vitruvian Man*, to Le Corbusier's *Le Modulor*, the concern with anthropometric scale of human proportions was evident. Moreover proportions were used as canonic rules of cosmic order in western and Islamic pre-modern architecture, sacred and profane.
Determining the four interconnected volumes, symbolizing the four characteristic bodily postures and their tendencies in ritual prayer, we have strengthen the theme further by using "Divine" Proportions – Golden ratio and Root rectangles – to proportion these volumes in both sides of symmetry axis. The central volume is proportioned with golden ratio, while the side volumes with root-two and root-four rectangle, reflected in bilateral symmetry.

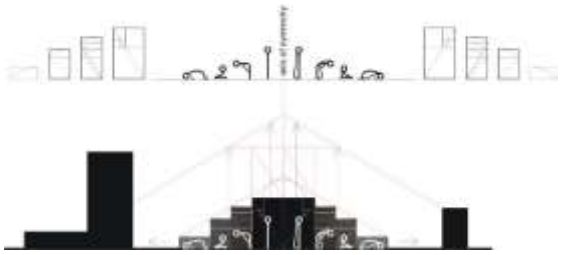


Fig. 7. Conceptualizing and symbolically embedding bodily postures of the Islamic prayer in the corpus of the Mosque as a representative built form, symbolizing submission through prostration.

Source: Author's schemes

Geometry here is used as the medium and representation of a generative concept. Moreover, geometry captures not just abstract patterns but also the visual framework of these patterns, turning abstract rules into representations. Crossing the divide between the abstract and the visible, geometrical systems represent our knowledge as visual entities and as abstract conceptual structures.

3.3 Curvature of Mosque volumes as store of information

Inward curved walls of Mosque exteriorities are conceived to promote the centripetal character of the Mosque in one hand and in the other hand to symbolize a melting down of the Mosque into the courtyard. According to Layton (2006) shape is the means of reconstructing history and a means by which past actions are stored, in this line a building should be a maximum memory store. Large amount of memory can be stored in a particular type of asymmetry: the *curvature extrema* of a shape. Moreover, Layton asserts that memory is erased by symmetries and stored in asymmetries, which theory puts into doubt and redefinition the whole Euclidian geometry. Further, memory and meaning are interconnected and built form is their container. Retrieving and decoding information/ memory has a particular importance in phenomenology of architecture, which sees aging of a building and its pathos as information and memory stored into the material and form. Peter Zumthor asserts this clearly: *I am convinced that a good building must be capable of absorbing the traces of human life and thus of taking on a specific richness. Naturally, in this context I think of the patina of age on materials, of innumerable small scratches on surfaces, of varnish that has grown dull and brittle, and of edges polished by use.*

The inward curvature of Mosque creates a profile and contour that store information and elicit meaning to the user of a known metal image that is a Mosque encoded by their intuition.

3.4. Profile and contour – *mnemonic* features of Mosque as a legible built form

The Kiblah wall with its cascaded volumes ending with topological domes constructs a legible mental image of the Mosque captured as a silhouette of traditional Mosque. Profile and contour of the articulated volumes act as *mnemonic* features of Mosque as a legible built form. Le Corbusier asserts that *profile and contour are the touchstone of the Architect.*

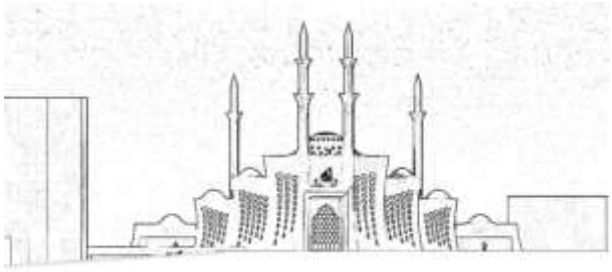


Fig. 8. Profile and contour of the Mosque depicted through a legible silhouette of re-constructed traditional grammar of classical Mosque architecture.

Source: Author's rendering

Eliciting associations, encoding information and known images of traditional Mosques, the kiblah wall acts as a container where the user would "unconsciously" and intuitively decode the cues of a built form that is known to him. Moreover, these cues are constructed in many layers in the exteriorities of the Mosque in order to provide redundancy in orientation, and identifiable schemata of reading spatial elements and features.

3.5. Articulation of exteriorities as redundant cues

In an unfamiliar environment nothing is more meaningful than a familiar image, cues that orient you in perceiving, conceiving and using the space. These familiar images communicate nonverbally with the particular user through, what Lynch (1960) has called as "imageability". In reality "imageability" is the environment quality which protects man against getting lost, which means that shape, color or arrangement facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment (Norberg-Schulz; 1979).

Emphasizing the kiblah axis as well as giving a clear indication and a gestural sign of main entry, the Gate in our proposal represents a mediator between the inner and outer space. It is a cue of orientation which sequences the elements of inner space. The Gate is also the starting point of the water theme and the unifying frame for the "sacred and the "profane" as it leads you to the prayer space and it's adjacent amenities as well as a number of other functions (library, recreation room, child daycare center, etc).

In traditional Mosque architecture, the schemata of orientation and legibility are no doubt articulated almost worldwide with the vertical structure, the minaret. Etymologically, the word minaret derives from Arabic, *manáre,* originally meaning a lighthouse or signaling tower. The first Mosques, including the very first Mosque the Prophet p.b.u.h. built, did not have a minaret. The call for prayer – Azan – initially was performed from rooftops of the Mosques. With the spread of cities, the Azan could not be hared from those living in the distant periphery, in this sense the minaret appeared as a tall architectural structure where Azan could be called and hared in greater distance. The first documented minaret was built abound 665-666 AD in Basra of Iraq (Prochazka; 1986), 44 years after the first Mosque in Medina was built.

Fig. 9. Night rendering of the Mosque showing the articulation of external themes as redundant cues.

Source: Author's photo /rendering courtesy

In our proposal, minarets represent symbolic and structural tectonics in articulation of the architectural body. They determine and emphasize the regulation lines of symmetry axis, the entry gate, balance the kiblah wall and create coherent volumes. Moreover minarets fulfill the "imageability" of the Urban Mosque within the urban scheme as elements of orientation and identification.

To complete the schemata of "imageability" of an Urban Mosque which supposed to take the role of the Central Mosque, we have proposed another vertical structure, reminiscence to the traditional city core, a tower clock, which is symbolic as it represents time connected with temporality of prayer and in the same time it is a landmark identifying and distinguishing the new Central Mosque. Moreover, its position and form, reconciles the two grids, the urban grid and the kiblah grid, as it twist up from one to the other.

Continuing the theme of the schemata of orientation, Mosque courtyard is conceived as a pattern of directional filed. The motif of openings in the walls of the Mosque is continued down in the courtyard as pattern of ground lighting leading and orienting people to access points, hence, creating a directional field.

3.6 Articulation as ornament – openings as motif

The meeting of interior and exterior "forces" and "energies" in a built form is expressed in the wall, and in particular in the openings which connect the two "domains". As a process of making, architecture is articulated in its whole domain.

Articulation determines how a building stands and rises, and how it receives light. The word "stand" denotes its relationship to earth, and "rise" its relationship to the sky. Verticalism and religious aspiration have in fact always gone together. In general, openings serve to concretize different inside-outside relationships. "Holes" in a massive wall give emphasis to enclosure and interiority. Openings also receive and transmit light, and are therefore main determinants of architectural character. Openings can become motifs.

Architects look to their past not as much for models of form - though they do so - as for validation of their current ideas. It is not that new ideas cannot be developed through the thought of design but that such values must be able to be reconciled with those that have emerged from the great buildings of the past. Redefining the openings of the traditional Mosque is in the same time a validation of our idea as well as reconciliation with the strong character of the traditional Mosques in Kosovo and in the region around.

Inspired by traditional wooden lattice work of windows, as well as the elegance of Islamic calligraphy, we have re-interpreted and composed the openings for the Central Mosque as motifs which are to be read as autogenic structural ornamentation (Douglis; 2009). Here ornament is embedded into structure not as an appliqué mere decoration, it flows naturally as a motif of light ascending down. Moreover it

defines the unique character of the Central Mosque within the urban context as an autonomous, *autopoietic*, yet legible structure.

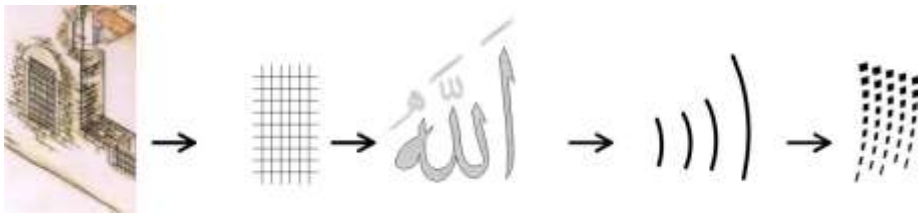


Fig. 10. Reinterpretation of openings in the Mosque inspired from tradition and Arabic calligraphy.

Source: Author's scheme

The articulation of openings as motifs goes hand in hand with the preservation and imposition of the "mass" as visual weight, reminiscence to the traditional houses in Western Kosovo, the *Kulla* (Tower House), which structures originally are characterized with small openings (*fringji*) pierced into the massive stone walls.

Fig. 11. Night rendering of the Mosque, showing the kiblah wall with the openings articulated as motif of spaces and light.

Source: Author's photo /rendering courtesy

The openings represent a progressive sequence from small to large, from bottom-up, having the potential to signify or imply movement. This movements which creates the dynamics of architectural form and mass, creates vertical tendencies of ascending and descending, in the same time creating mass at the bottom of the building and "lightness" at the upper portion. The dynamics of architectural form are further intensified by tilting the openings into an angel, which creates tension and in the same time achieving a compositional harmony where parts are perceived in the whole.

3.7 99 openings symbolizing 99 Names of Allah (*Asmā-ul Husnā*)

The abstraction of calligraphy into openings is further embedded into symbolic interpretation of 99 Names of Allah (*Asmā-ul Husnā*) through 99 openings in each side of the symmetry axis of the Kiblah façade. Here the number 99 is a mnemonic feature that bears the meaning symbolically while the explicit engraving of the unique name of God – All-llah - decodes this information to the user.

4 Light Theme – From Metaphysics To Atmospheric Qualities

All things are given their name and place, including buildings, by sunlight. Light "shapes" and "tames" forms, masses, surfaces and reveals their sensual and tactile expressions. For Le Corbusier:

The elements of architecture are light and shade, walls and space. Light *ensouls* buildings (Day; 2004).
Light and shadow *animate* the natural and built forms. The phenomenon of shadow has always intrigued the human mind. The shadow's curious relationship to the object it maps has often formed the object of philosophical reflections (Akkach; 2005).
"*Have you not seen how your Lord has spread the shadow (zill)? And had he willed, he could have made it still*" (Quran 25:45).
Light is not only the most general natural phenomenon, but also the less constant. Light conditions change from morning to evening, and during the night darkness fills the world, as light does during the day. Light, thus, is intimately connected with the temporal rhythms of nature which form a fifth dimension of understanding.

4.1 From light to delight – the theatrical effects of architecture

Light as presence, darkness as absence have been used constantly in religious architecture to evoke the "sacred", by creating metaphysical theatrical effects. As the visible most "intangible" domain, light is the source of truth ascended in earth to reveal the real human drama. The spatio-temporal effects of natural light have been used in many levels in our proposal for the Design of Central Mosque of Prishtina. First, the deep openings, piercing the two shells of the wall, create spaces filled with light, which articulate the interior with different levels of shades and brakes the sequences of space into patterns of visual perception. Second, light is taken as a floating theme from many directions, including the upper boundary of the space, entering from the *oculi* of domes and flowing down by creating a theatrical effect in a drama of light and shades in a multi-dimensional animated space. Furthermore, the light theme is emphasized with visual connectivity in-between floors by using "floating" floors, where slabs touch the lateral walls only through "bridges" which we have called the "Quran bridges" as they are articulated as spaces where bookshelves and sitting places for reading are carved into the rammed-earth massive wall. Here light is the mediator of different vertical levels by creating the unity of prayer spaces, physically and visually connected. Yet, the light theme is articulated in hierarchies and sequences in order to break up the large space. By preserving the traditional central space under the dome, the main dome is the highest point with largest number of openings/ *oculi* bringing the highest amount of light, cascading down with volumes the light theme gets to the very human scale of spatial proportion.

Fig. 12. Interior rendering showing the whole domain of interior themes articulated and narrated in light, rammed earth and kiblah axis / wall. *Source: Author's photo /rendering courtesy*

Light theme here represents the phenomenological perspective view of performance as well as a theoretical, aesthetic and communicative perspective on performance.

5 Interiorities As Narrative Themes

Elaborating themes that do elicit meanings to the user, interiorities of our proposal were taken as narrative themes of orientation and symbolic interpretation of Mosque fixed and semi fixed-features.

The *Mihrab* (niche) and *Minbar* (pulpit) as "furniture" of the Mosque, in our case are composed as a multifaceted narrative theme. First of all they represent the act of orientation, emphasizing the kiblah wall and kiblah axis; positioned in the axis of symmetry they represent the climax of sequences in interior spaces. With two giant columns wrapped on rammed earth to create visual mass, the kiblah axes is further emphasized with the huge glazed opening / window, which provides the highest concentration of light in the Mosque, in front of it, the semi-perforated and semi-translucent foil-like *Mihrab*, is situated.

The geometry is again the regulator, where *Mihrab* proportioned through golden ratio is scaled up, offset into the glazed opening and ending up with a structure bridging the two columns, a structure planted with flowers and greeneries, which we have called the *Garden of Aden*, symbolizing the garden of paradise where you climb through the *Minbar* which is interpreted as a double spiral staircase around the columns of kiblah axis. Here the theme is interconnected into a narration, as the *Mihrab* is conceived as a "leaf" fallen from the Garden of Aden which leaf is gold-colored to represent the shiny autumn leafs and to create the dazzling atmosphere of the light penetrating it from the glazing.

llen from the *Garden of Aden*

Source: Author's photo /rendering courtesy

The glazed surface behind *Mihrab* is conceived as a river cascading down, where water flows down the lattices, creating the cascade-like effect and the sunlight reflect the moving water into the interior space, animating it an narrating the theme of water, light, earth and greenery, where air is the mediator filling the atmosphere and holding the phenomenology.

Fig. 14. Transversal section showing the articulation of Kiblah wall as a narrative theme

Source: Author's drawing

The highest point of kiblah wall in the kiblah axis ends with an engraved calligraphy of the unique name of God in Islam – Allah - which marks and decodes the 99 openings in each side of the kiblah wall, standing for 99 names of God. Surrounded by two crescent moons, they symbolize the light into darkness, a clear sign of the true path.

The interiorities of the Mosque represent a drama, where poetry is narrated as a set of themes embedded into autogenic space and structures.

6 Water Theme In-Between *Hierophany* And Sensual Performance

The phenomenon of water has universal and particular meaning to all heavenly religions. For Elaide (1968), *in whatever religious complex we find them, the waters invariably retain their function; they disintegrate, abolish forms, "wash away sins"; they are at once purifying and regenerating.* Water as life-giving and regenerating is clearly depicted in the Holy Quran:

"*And of his symbols (āyāt) is this: he shows you the lightning for a fear and for a hope, and sends down water from the sky, and thereby quickens the earth after her death. Herein indeed are symbols (āyāt) for folk who understand.*" (Quran 30:24)

Waterscape is a very important theme in the Islamic architecture in general and in Mosque architecture in particular. Water is very important to the Mosque due to the ritual wash – ablution - that Muslims must perform before prayer. So, it is a direct implication to the concept of purity in Islamic teachings. In Islam, water is seen as primordial, life-giving, sustaining, and purifying.

"*...We made every living thing of water.*" (Quran 21:30)

"*… For Allah loves those who turn to Him constantly and He loves those who keep themselves pure and clean*."

(Quran 2:222)

Fig. 15. Level -1 of Mosque complex, showing water theme as a narrative and directional "field" of orientation.

Source: Author's drawing

Water is used in Islamic architecture for several basic reasons. First, it is used practically to provide cooling in hot, dry climates. Second, it is used aesthetically to emphasize visual axes, reflect the surrounding environment, and visually multiply the adjacent architecture and its decorative detailing. Third, it is used symbolically to represent the life-giving, sustaining, and purifying aspects of water mentioned in the Quran, like the ablution fountains found traditionally in the central courts of Mosques, where the believers would perform the ritual wash five times a day.

The symbolic manifestation of the "sacred" is termed by Eliade (1968) as *hierophany*. In this line water used in Mosque architecture is a multivocal manifestation of Islamic teachings for purity and also a symbolic representation of the *gardens of paradise under which rivers flow*. In reality it is almost impossible to make a clear distinction of water theme used as symbolic *hierophany* or as performative

theme (i.e for cooling effects). As LaVine (2001, p.6) asserts; *there are no entities in this world that can simply be split into issues of measurable performance and those of interpreted symbolic meaning because our own experience of the world from which our buildings arise cannot be divided in this way.*

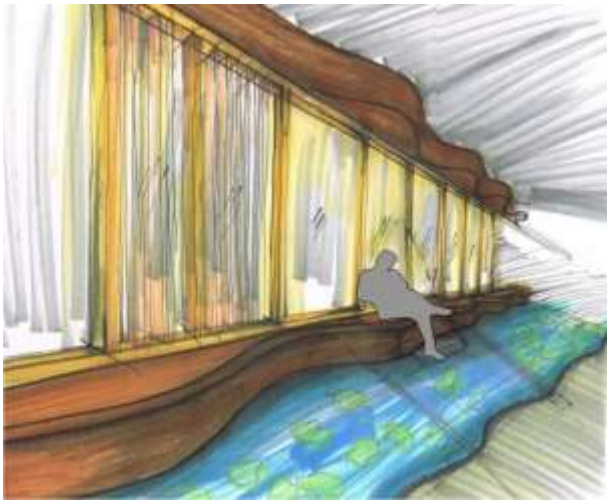


Fig. 16. Hand-rendering depicting water channel passing aside rammed-earth wall of the Library.

Source: Author's drawing

Taking into account the above elaboration of water theme we have used it in a multivocal way in our proposal for the design of Central Mosque of Prishtina. First of all, water here is taken as a theme of orientation, in one hand emphasizing the kiblah axis and in the other hand leading you the way to ablution zone as a magnetism of the target (Arnheim; 1977). This is the way toward a double purity, the physical purity of water in the ritual wash and then the spiritual purity in the ritual prayer. "*Where is the ablution zone*?" it's an odd question. "*Follow the water stream*" is the answer. Symbolically the starting points of the water theme are the two massive, white marble blocks in each side of the main entrance to the Mosque complex. Their white color symbolizes the purity and their hardness is a parable of what God Almighty has revealed in the Holy Quran:

"*Then your hearts became hardened after that, being like stones or even harder. For indeed, there are stones from which rivers burst forth, and there are some of them that split open and water comes out, and there are some of them that fall down for fear of Allah. And Allah is not unaware of what you do*". (Quran 2:74)

From the two marble blocks, water flows down in two sides of the passageway as two channels, the left one leading to the male ablution zone and the right one leading to female ablution zone. Here water creates a gender dichotomy within the spatial unity by providing cues for spatial orientation in the sequencing of space. The walls aside the water channels are elaborated as "living" walls, revealing the materiality of the interiorities of the Mosque – rammed earth – which provide a livable place and space, a place where you can sit in the niches of massive rammed earth wall accessed through the glass bridges. Here the phenomenology of architecture reveals itself in its full range, from *hierophany* to tactility and sensual performance, as water, earth and cooled air provides the atmosphere of a *sociopetal* space (Lawson; 2001), a place that generates social encounters. The energies of encounter are stressed as well in the creation of a "node" where two passageways intersect. This node is both communication and a symbolic act of purity, as it represents the act of ablution washing out the sins. In this way, the node is an elliptic ramp connecting two levels, while the void is a sculptural elliptic cone which we have named the "Pillar of Prayer" standing for one of the five mandatory conditions/pillars of Islam. This cone is materialized in two shades, the white marble which covers most of it and the black marble melted at the bottom of it. Water gushes from the top of it symbolizing ablution, while the white marble symbolizes the wash away of sins – black marble – from ablution waters. Water theme is both a spatial narrative and a system of communicating meaning, where symbolism interacts with the performative values.

7 Sensual Tactility – Earth As A Phenomenological And Performative Material

Earth represents a primordial "ordinary" material with extraordinary features in all ancient cultures, and it was used not only for building homes, but also for religious buildings. As a traditional material it contains the social, cultural and material traces of life. It is a material which provokes humility and elicits tactile experience, creating memorable encounters.
An Italian proverb asserts that *"There is nothing in life so ordinary that it cannot be made extraordinary."* The first step in designing something extraordinary is to define the elements that make it ordinary. Thoughtful manipulation of the ordinary state of form is a contributing factor in bringing forth new images. Earth construction techniques have been known for over 9000 years, and even today, one third of the human population resides in earthen houses. Earth when used as a building material is often given different names. Referred to in scientific terms as loam, it is a mixture of clay, slit, sand, and occasionally stones. When compacted within a framework, it is called "*rammed earth*". Loam is able to absorb and desorbs humidity faster and to a greater extend than any other building material, enabling it to balance indoor climate. Like all heavy materials, loam stores heat. The preparation, transport and handling of loam on site requires only ca. 1% of the energy needed for the production, transport and handling of baked bricks or reinforced concrete. Loam, then, produces virtually no environmental pollution. It is often maintained that earth walls help to clean polluted indoor air. Provided the building process is supervised by an experienced individual, earth construction techniques can usually be executed by non-professionals. As asserted by the mystic poet Rumi: "*Earth turns to gold in the hands of the wise.*"

Fig. 17. (Left) earth and wooden lattices used as finishing material in vernacular architecture in Kosovo. (Right) study model of rammed earth wall and window as an atmospheric space. *Source: Author's photo courtesy*

Yet, nowadays, living in the "whitewash" environment people have often prejudices against earth as a building material. And again Rumi wrote: "*We live on earth yet so ignorant of earth and all the treasures it holds.*"

7.1. Rammed earth as tactile autogenic ornamentation

In contrast to exteriorities with white insulated concrete as the ultimate material and expression, the interiorities of the Mosque are constructed as inner shell in rammed earth technique. Considering the above mentioned extraordinary features of the earth as a natural and ecological material, we will further explore more attributes.
Besides its outstanding thermal, ecological and other physical properties, earth has a strong meaning in Islam, as the "raw" material in the creation of first human being, Prophet Adam p.b.u.h. Much more, earth is the abode in the graves, while from it is the resurrection, God Almighty asserts this clearly in the following verse:
"From the earth We have created you, and to it We shall return you, and from it We shall raise you again" (Quran 20:55).

Further more (clean) earth is used as material to perform ablution – *tayammum* - when one can find no water, by placing his hands in the (wall) surface or the ground and then rubbing his face and his hands. It is transmitted that the Prophet p.b.u.h. said:
"*The earth has been made for me (and for my followers) a place for praying and a thing to perform tayammum, therefore anyone of my followers can pray wherever the time of a prayer is due.*"
Taking also into account that the very first Mosque that the Prophet p.b.u.h built in Medina was of earth, the arguments to use this material for the articulation of interiorities of the Mosque would be strengthened also for the fact that rammed earth technique applied in layer creates distinctive patterns as autogenic ornamentation. In this line the ornamentation is integrated with the making process of rammed earth (see Fig. 12).
For Christopher Alexander, *ornament arises, naturally, when a person is making something and seeks to embellish this "something" while making it. The embellishing is spontaneous. It comes from the continued unfolding of the whole, going naturally from the broad wholeness of the thing to the microstructure where the chisel, hand, brush, and trowel make patterns in the thing, in order to continue and extend its wholeness.*
For the ornament to be profound, the motifs and disposition of the ornament must arise, naturally, from latent centers which are felt within the uncompleted thing.
Our approach seems to be a "flight" against ornament as superfluous and appliqué. Yet, our intention was to create a unique character and atmosphere of the Mosque interior space as u humble space. Moreover, the texture of rammed earth elicits tactile experience.
With the light theme, cool air, reflected water and the *Garden of Aden*, the phenomenology of architecture is revealed in its whole domain, where phenomenology is performed in the spatial sensuality and tactility of Mosque.
It is the symbolic meaning of earth and light which animates this space and creates the ultimate atmosphere for a livable space where the enactment of prayer takes place.

7.2. A white Mosque is not a "*white elephant*"

Considering the Islamic principles of simplicity, humbleness, humility and devotion, our approach was not to create a Mosque resembling an arrogant sculpture and a "*white elephant*" to be feed and praised but never used effectively. In reality the beginning of Islamic Architecture has been always connected with the time Muslims began to build monumental architecture (Rasdi; 2010), including Mosques as representative buildings. Yet, Prophet p.b.u.h. said: *"I was not commanded to build high mosques"*

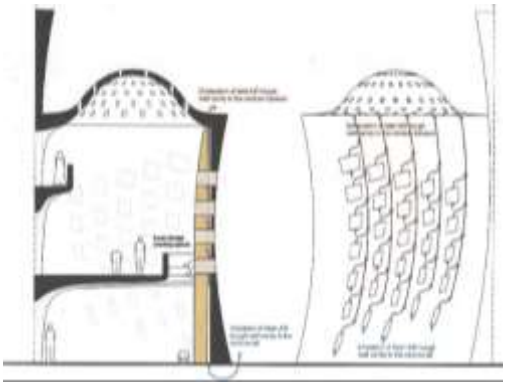


Fig. 18. Section and elevation showing natural ventilation scheme.

Source: Author's drawings

Earth as a building material, used in our proposal goes hand in hand with the Islamic principles of simplicity, and creating extraordinary performances out of ordinary materials and techniques. Living in an era where the "cheapest survives" (Vincent; 2002) our approach was to use natural materials and principles to construct and run the building. Adopting a structural system of double-shell and cavity for constructing the Mosque, this allowed us to use the cavity in-between two shells – inner and outer – as

a natural ventilation duct, where fresh air is inhaled form basement through window's sills and the stall air is exhausted through window transoms up into the roof-top. Wall acts as a multi-performative component, from aesthetic performances to structural and technical.

8 Conclusions

Being at the same time simple and complex, the Mosque represents one of the most challenging tasks in architectural design for the fact that ontologically it is a "shelter" that bears enormous meanings for the particular user, and as such it is a "container", a medium and a media, where people encode and decode complex social, cultural and material information in order to create a comprehensive system of communication with a sense of belonging to the place and space. When we love a place, we belong to that place and the ordinary becomes extraordinary. Symbolism adds poetic meaning to architecture, moreover this paper has strived to "write" a tangible and tactile poetry through narrative themes in the phenomenology of Mosque architecture.

As a conclusion, this paper bridges the gab between theory and practice in Mosque design, brings other disciplines in an interdisciplinary discourse and constructs new bridges between traditional past and the novel future, hence, sets a framework for new design approach on Mosque as a representative building.

References

1. Akkach, S. (2005) *"Cosmology and Architecture in Premodern Islam: an architectural reading of mystical ideas"* State University of New York Press, Albany
2. Alexander, Ch. (2004) *"The Nature of Order: An Essay on the Art of Building and the Nature of the Universe"* Book Three*, "A Vision of a Living World"* Center for Environmental Structure, Berkeley
3. Al-Hilali, Muhammad Taqi-ud-Din., (trans.) (1999) "*Interpretations of the Meanings of The Noble Quran"* Darussalam Publications, Riyadh
4. Al-Mundhiri, Al-Hafiz Zakiuddin Abdul-Azim (ed.) (2007) *"Sahih Muslim"* Darussalam Publications, Riyadh
5. Almusaed, A. (2011) *"Biophilic and Bioclimatic Architecture: Analytical Therapy for the Next Generation of Passive Sustainable Architecture"* Springer-Verlag, London
6. Arnheim, R. (1977) *"The Dynamics of Architectural Form"* University of California Press, Los Angeles
7. Bachelard, G. (1994) *"The Poetics of Space – the classic look at how we experience intimate places"* translated from the French by Maria Jolas, Beacon Press, Boston
8. Day, Ch. (2004) *"Places of the Soul: architecture and environment design as healing art"* 2nd Ed., Architectural Press, Oxford
9. Douglis, E. (2009) *"Autogenic Structures"* Taylor & Francis, Oxon
10. Eliade, M. (1968) *"The Sacred and the Profane: The Nature of Religion"* A Harvest Book, Harcaurt, Brace & World, Inc., New York
11. Hasan, A. (trans.) (2008) *"Sunan Abu Dawud"* Darussalam Publications, Riyadh
12. Holl, S., Pallasmaa, J., Pérez-Gómez, A. (2006) *"Questions of Perception: Phenomenology of Architecture"* A+U William Stout Publishers, San Francisco
13. Kahera, A., Abdulmalik, L., and Anz, C. (2009) *"Design Criteria for Mosques and Islamic Centers: Art, Architecture and Worship"* Architectural Press, Oxford
14. Khan, Muhammad Muhsin (trans.) (1997) *"Sahih al-Bukhari"* Darussalam Publications, Riyadh
15. LaVine, L. (2001*) "Mechanics and meaning in architecture"* University of Minnesota Press, Minnesota
16. Lawson, B. (2001) *"The language of space"* Architectural Press, Oxford
17. Layton, M. (2006) *"Shape as Memory: A Geometric Theory Of Architecture"* Birkhäuser, Basel
18. Le Corbusier (1986) *"Toward a New Architecture"* Dover Publications, Inc., New York
19. Leach, N. (ed.) (1997) *"Rethinking Architecture: A reader in Cultural Theory"* Routledge, London
20. Lynch, K. (1960) *"The Image of the City"* MIT Press, Massachusetts

21. Minke, G. (2006) *"Building with Earth: Design and Technology of a Sustainable Architecture"* Birkhäuser, Basel
22. Norberg-Schulz, Ch. (1979) *"Genius Loci: Towards a Phenomenology of Architecture"* Rizzoli, New York
23. Özkan, S. (ed.) (1996) *"Faith and the Built Environment: Architecture and Behaviour in Islamic Cultures"* Comportements, Lausanne
24. Prochazka, A. B. (1986) *"Architecture of the Islamic Cultural Sphere: MOSQUES"* Muslim Architecture Research Program, Zürich
25. Psarra, S. (2009) *"Architecture and narrative: The formation of space and cultural meaning"* Taylor & Francis e-Library, New York
26. Puhalla, D. (2011) *"Design Elements: Form and Space"* Rockport Publishers, Massachusetts
27. Rapoport, A. (1990) *"The Meaning of the Built Environment: A Nonverbal Communication Approach*" University of Arizona Press, Tuscon
28. Rasdi, M. T. H. M. (2010) *"The Design of Mosques as Community Development Centers from the Perspective of the Sunna and Wright's Organic Architecture"* Journal of Islamic Architecture, Vol 1, No 1, p. 1-7
29. Schumacher, P. (2011) *"The Autopoiesis of Architecture: A New Framework for Architecture"* John Wiley & Sons Ltd.
30. Sheikh, A. (1941) *"Muslim Architecture: From the Advent of Islam to the Fall of Mamluk Empire in Egypt"* The Academy of Oriental Arts, Lahore
31. Vincent, J. F. (2002) *"Survival of the cheapest"* materials today, December 2002, p. 28-41
32. Zumthor, P. (1998) *"Thinking Architecture"* Birkhäuser, Basel

Quality of Wood Drying Which is Using in Residential Buildings Depending on its Thickness (Case study timber of beech, with different thickness that is drying in conventional kiln in the territory of Kosovo)

Rrahim Sejdiu[1], Kushtrim Cuka [2], Selam Ceka [2], Muharrem Sejdiu [2]
[1] University of Prishtina "Hasan Prishtina"
Faculty of Applied Science - Ferizaj
Department of Design and Wood Technology
Str. " Besim Rexhepi", w.n. Ferizaj , REPUBLIC OF KOSOVO
rrahim.sejdiu@uni-pr.edu

Abstract. Wood processing industry is one of the most developed industries in Kosovo.In the framework of this industry, special importance should be given to the wood drying process, as a necessary process for further processing of wood.Therefore, a proper study of the drying quality of sawn boards which is using in residential buildings would be necessary.For the study were taken 13 subjects which are stretch throughout the territory of Kosovo.The study shows that the sawn timber in thickness 25-37mm, is drying well, but lacks air conditioning and equalization of moisture content throughout its thickness.While timber thickness 38-49mm and 50-70mm, did not dry enough, lack of moisture equalization throughout the thickness and conditioning is not done at all. The following results provide data for three thicknesses obtained in the study.Thickness (mm).

Thickness (mm)	*Number of samples*	*Average moisture content in shell (%)*	*Aver. moisture content in core (%)*	*Aver. moisture content in shell (%)*	*Aver. for all thicknesses (%)*
25-37	*52*	*7,16*	*8,86*	*7,17*	*7,73*
38-49	*44*	*12,61*	*14,65*	*12,71*	*13,12*
50-70	*33*	*13,1*	*16,74*	*12,88*	*14,24*

In conclusion we can say that the sawn timber over 37mm thickness, is not eligible for further processing products used in residential and domestic objects is in contradiction with EU norms.

Keywords: equilibrum, moisture, prong tests, shell, core.

1 Introduction

Water in wood normally moves from higher to lower zones of moisture content. This fact supports the common statement that "wood dries from the outside in," which means that the surface of the wood must be drier than the interior if moisture is to be removed. Drying can be broken down into two phases: movement of water from the interior to the surface of wood, and removal of water from the surface. Moisture moves to the surface more slowly in heartwood than in sapwood, primarily because extractives plug the pits of heartwood. In drying, the surface fibers of heartwood of most species reach moisture equilibrium with the surrounding air soon after drying begins. This is the beginning of the development of a typical moisture gradient (fig. 1), that is, the difference in moisture content between the inner and

outer portions of a board. If the air circulation is too slow, a longer time is required for the surfaces of sapwood to reach moisture equilibrium. This is one reason why air circulation is so important in kiln drying. If it is too slow, drying is also slower than necessary and mold might even develop on the surface of lumber. Water moves through wood as liquid or vapor through several kinds of passageways. These are the cavities of fibers and vessels, ray cells, pit chambers and their pit membrane openings, resin ducts of certain softwoods, other intercellular spaces, and transitory cell wall passageways (Panshin and de Zeeuw 1980).
Lighter species in general dry faster than heavier species because their structure contains more openings per unit volume.

Sometimes the boards are not drying in a uniform way. This can be caused of various reasons but the most important things are:

- The difference of moisture content in the boards,
- Non-conditioning of boards and
- Uneven drying of boards.

As a result, wood elements may suffer the different tensions and then they can be distorted and destroyed a whole product. Even worse would be the case if the wood elements sawn in two or more parts, and those two or m re parts of woods are used for parquet, because, one side of these elements will have low moisture, while, the other side will have high moisture and as a result, the prisms of parquet will be distorted. This is the reason why this problem has taken a special importance and many tests are done to obtain correct results. As we know from European Union norms, the average moisture content of wood for residential houses must be between 8 or 10%, in all thickness.

2 Goals of the Research

The goal of this research is:

- To determine the quality of dried boards after drying, depending on the distribution of moisture content across the different thickness (25-37mm, 38-50mm and 50-70mm).

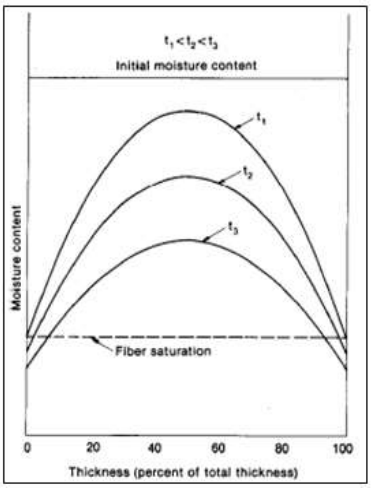


Fig 1. Typical moisture gradient in lumber during drying at times

Fig.2. Red circles shows places where samples are taken for the study

3.

Materials And Methods

During the preparation of this research are used different materials that were needed to complete the study. Materials (samples) that are used here mainly are taken from the kiln operators distributed in the

territory of Kosovo. In figure 2. are marked the places where samples were taken for study (13 operators stretch throughout the territory of Kosovo).

For study was chosen beech timber, it is because all of our researches that we done reported that, in Kosovo the majority of wood processing are using this kind of wood. Areas where this species of wood are taken are: Kamenice, Jezerc, Globoqice, Kacanik, and Decan.

Works in terrain

During the work in terrain are making several visits to enterprises for listed, followed and taking samples for further working. First visits are done during filling the kiln chamber, and then they are visited during drying to determine the condition of the boards. The same enterprises also are visited after drying. This is done to obtain necessary samples to determinate the distribution of moisture content in the thickness of boards.

Fig 3. Stocking boards and marked samples

To prove the non-uniformity of moisture during timber drying are made "prog" tests which shows the quality of drying depending on moisture content in core and shell of boards.

Material preparation

Materials for the study are improves from enterprises immediately after kiln drying is done figure 5. Boards just after drying are sawn according to standard recommendations (5586 ML88, for thicknesses 25-37 and 38-49 figure 4a, while for thickness 50-70mm samples are taken with recommendation that shown in figure 4b). To test core and shell of sawn material are weighed the outer (surfaces) and the inner (core) parts (figures 5a and b). Immediately after initial weighing, samples are brought to the laboratory of FAS in Ferizaj and are oven dried in the thermostat to 0% of moisture content (drying temperature 102 ± 30C), samples are weighed several times until it reached the same weight after three measurements (weighted).

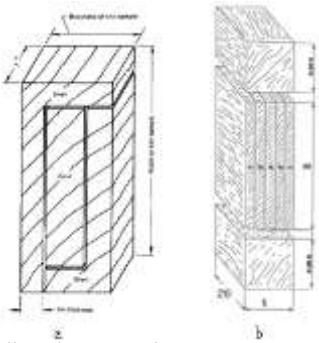


Fig 4. Method of cutting section for measuring shell and core moisture content. (ML88 5586). a. for thickness 25-37 and 38 to 49 and b. for thickness 50 to 70

Also to establish no-uniformity of moisture content on boards we have made "prongs" probes (Figure 6a and b) which show the performance of major tensions with bending toward the center of the boards (Figures 6).

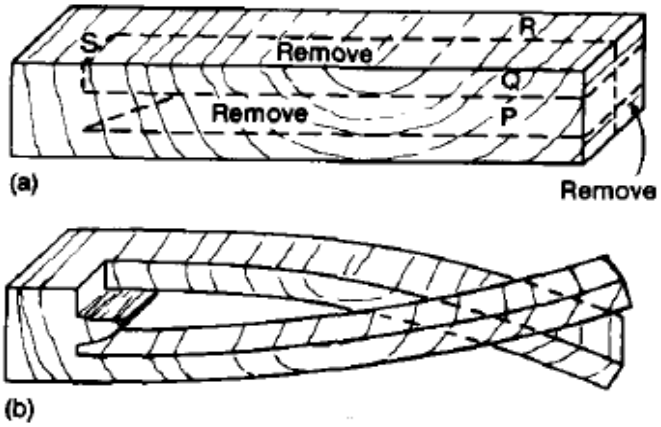


Fig 6 (a) Method of cutting stress sections for severe casehardening tests. (b) Prongs are offset so that they can cross and indicate severity of casehardening. (ML88 5584)

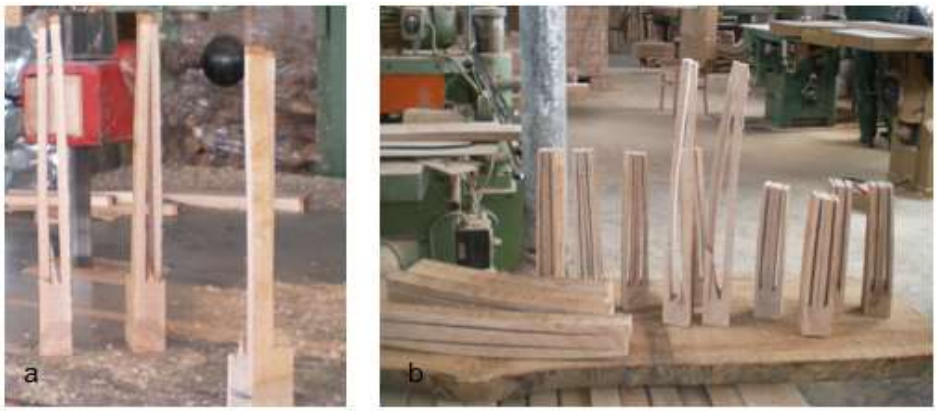


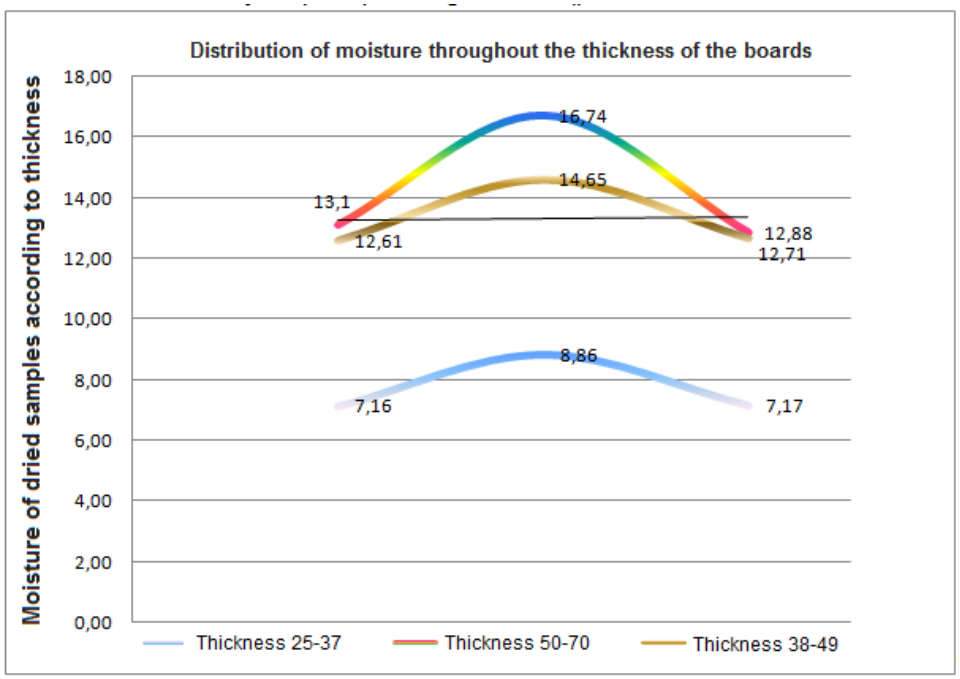
Fig 7. Samples for prongs probes with different thicknes

4 Results

Table 1. Show the number of samples and moisture content for three different thicknesses.

Thickness (mm)	Number of samples	Average moisture content in shell	Average moisture content in core	Average moisture content in shell	Average for thicknesses
25-37	52	7,16	8,86	7,17	7,73
38-49	44	12,61	14,65	12,71	13,12
50-70	33	13,1	16,74	12,88	14,24

Data from the Table 1. Are shown in figure number 10.



5 Conclusions

Based on the results we can conclude that the quality of wood drying in Kosovo is not satisfactory. Good results of the wood drying are founded in thickness 25-37mm, but the average of moisture content and conditioning are not done. Poor results were found in two other thicknesses (38-49 and 50-70mm), expect high moisture content that we have seen on boards, also are found non-uniformly dried lumber (different distribution in core and shell). The same results are shown from the "prongs" samples which obviously have significant tension and both sides are curved toward the center which means that the moisture in the core is higher than in the shell, as a such wood products that are drying in convectional kiln in Kosovo does not fulfill European Union conditions for residential houses 6-10%.

References

1. Dry Kiln Operator's Manual, William T. Sipmson, Madison, Wisconsin 1991,
2. Susenje i Parenje Drva, Juran Kërpan, Sumarski Fakultet-Zagrab 1965,
3. Tharja e Drurit, Arben Bejtja, Universiteti Bujqësor i Tiranës 1985,
4. Teknologjia e Finalizimit të Drurit, Osman Osmani, Shkolla e Lartë Teknike-Ferizaj 2001,
5. Tharja dhe Përpunimi Hidrotermik i Drurit, Sulejman Meta, Lectures for students in the Faculty of Technical Applied Sciences in Ferizaj,
6. Changes of Equilibrium Moisture during the Natyral Drying of Wood in the Territory of Kosova (for years 1960-2008), Rrahim Sejdiu et al International Journal of Current Engineering and Technology, Vol.3, No.2 (June 2013), page 653-654.
7. Shrinkage of Beech Wood Depending on the Geographical Location of the samples in the Tree, Rrahim Sejdiu et al International Journal of Current Engineering and Technology, Vol.3, No.5 (December 2013), page 1664-1666.

Santiago Calatrava, City of Arts and Science: The Similarity of the Elements

Ani Tola[1], Armand Vokshi[1]
apanariti@hotmail.com; armandvokshi@gmail.com
[1] Polytechnic University of Tirana
Faculty of Architecture and Urbanism
Tirana, Albania

Abstract. This paper presents a description of the buildings of the City of Arts and Science and defines the key elements that Calatrava uses in the designing of this complex. In the beginning is presented a general description of the City of Arts and Science. A further analysis is been done for each building, which is based in the context of the concept that Calatrava uses. Also is done an analysis in the context of shape, structure and materials, which are very connected with the concept of the architect. In the end, are analyzed also the elements that are similar with his prior projects and how they have been developed. These elements also have been served for his recent work.
The paper concludes that the key elements that Calatrava uses in this complex are almost the key element that Calatrava has been used in the other prior projects. These key elements which are also present in its recent works, creates the design vocabulary that Calatrava uses in his projects.

Keywords: Calatrava's geometric shapes, design's elements, structure.

1 Introduction

This paper introduces a description of the buildings of the City of Arts and Science and defines the key elements that Calatrava uses in the designing of this complex.
The opening provides a general description of the City of Arts and Science. The city of Arts and Sciences is an urban recreation center of culture and science that was completely developed by Santiago Calatrava. It also incorporates L'Oceanogràfic, an underwater city designed by the late Felix Candela. This complex is made up by seven building such as, L'Hemisfèric, The Science Museum Principe Felipe, L'Umbracle, El Palau de les Arts Reina, L'Oceanogràfic, the bridge El Pont de l'Assut de l'Or and the last but not least, L'Àgora.
After that, it describes each of the composing buildings. It contains general information for each building and describes the architectural and engineering concepts and elements.
A further analysis has been done for each of the composed buildings. This analysis is based in the context of the concept that Calatrava uses, such as the human being and nature. It also gives an analysis in the context of shape, structure and materials, which are connected to each other and the concept of the architect.
In the end, it also analyses the elements that are similar to each other and his prior projects and how they have been developed. These elements have also been compared to his recent work.

2 City of Arts and Science

"*As the site is close to the sea, and Valencia is so dry, I decided to make water a major element for the whole site using it as a mirror for the architecture.*"

In 1991 Calatrava won a competition for a telecommunication tower to be built on a 35 hectares site located in the old dried-up river bed of the Turia, midway between the old city of Valencia and the coastal district of Nazaret. In 1957, there was a disastrous flood, so the river was diverted along a canal to the south of the city, and the dried-out riverbed planted as a 7 kilometer long promenade through the center of the city. The promenade is crossed by two streamlined new bridges designed by Santiago Calatrava. Calatrava subsequently received the commission to develop the whole complex, which was to be called The City of Arts and Science and would include a planetarium and a science museum. After a change of government in 1996, the planned telecommunication tower was replaced by an opera house. The city of Arts and Sciences is an urban recreation center for culture and science, which was completely developed by Santiago Calatrava. It also incorporates L'Oceanogràfic, an underwater city designed by the late Felix Candela with an area of 350,000 square meters. The client of the project was the government of Valenzia and the project underwent the first.
Calatrava's work appears to have been strongly influenced by the work of Gaudí. His highly organic, almost anthropomorphic forms are all based on his structural studies. The skeletal concrete forms are in many ways similar to Gaudí's stone and masonry constructions, but there is a difference. While Gaudí's work was always charged with a highly developed sense of materiality, Calatrava abstracts his materials, preferring a white finish that homogenizes the elements of the construction.

3 Architect's Biography

"Santiago Calatrava Valls was born on the 28th of July 1951 in Benimàmet, an old municipality now integrated as an urban part of Valencia, Spain. He is a Spanish architect, sculptor and structural engineer whose principal office is in Zürich, Switzerland.

In Valenzia, he pursued his undergraduate architecture degree at the Polytechnic University of Valencia along with a post-graduate course in urbanism. During his schooldays, he also undertook independent projects with a group of fellow students, bringing out two books on the vernacular architecture of Valencia and Ibiza. Following graduation in 1975, he enrolled in the Swiss Federal Institute of Technology in Zürich, Switzerland, for graduate work in civil engineering. In 1981, after completing his doctoral thesis on "The Foldability of Space Frames", he started his architecture and engineering practice.

Calatrava's early career was mainly dedicated to bridges and train stations, with designs that elevated the status of civil engineering projects to new heights. His Montjuic Communications Tower in Barcelona, Spain (1991) in the heart of the 1992 Olympics site, as well as the Allen Lambert Galleria in Toronto, Canada (1992), were important works and turning points in his career, leading to a wide range of commissions. The Quadracci Pavilion (2001) of the Milwaukee Art Museum was his first building in the United States. Calatrava's entry into high-rise design began with an innovative 54-story-high twisting tower called Turning Torso (2005), located in Malmö, Sweden. Calatrava has also designed a futuristic train station, the World Trade Center Transportation Hub, at the rebuilt World Trade Center in New York City.

His style has been heralded as bridging the division between structural engineering and architecture. In his projects, he continues a tradition of Spanish modernist engineering that included Félix Candela, Antonio Gaudí, and Rafael Guastavino. Nonetheless, his style is also very personal and derives from numerous studies of the human body and the natural world.

4 The Key Elements of the City of Arts and Sciences

4.1 L'Hemisfèric (Planetarium)

Completely designed by Santiago Calatrava, this building was the first one that was opened to the public in April 1998. L'Hemisferic is the centerpiece of this complex, with a surface of 13,000 m2. Its position

in the site is very well thought by the architect, as it is set in a slightly below grade to avoid the conflict of the view with the two others buildings, "Science Museum" and "Palacio de las Artes".

The building is meant to resemble a giant eye, is also known as the "Eye of knowledge". Taking a look to Calatrava's sketches, we can easily read that his inspiration for the concept of this building was the eye.

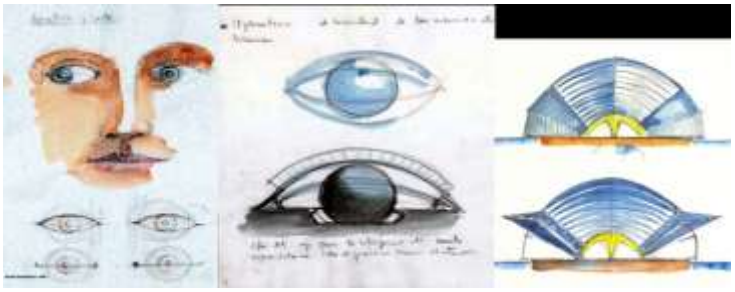


Fig. 1. Calatrava's Sketches

The whole shape of the eye will be drawn by a mirror plan, which will be the surface of the water. The building is surrounded in all of its parts by a water pool, and the bottom of the pool is made of glass. The accessibility from the building to the pool is made up of two sides that are the curved axes of the "eye". These two sides are designed as the eyelid, which opens and closes to create this access with the water pool and they also serve as a shade-shutter. The structure of the "eyelid", the shutter, is built by aluminum awnings alongside the perimeter that fold upward collectively or as individual units. This structure of the shutter forms the brise-soleil roof that opens alongside the elliptical axis of the eye. The brise-soleil is moved hydraulically up the outside of the structure by telescoping cylinders. When this brise-soleil is opened, we can see the dome that is conceived as the pupil of the eye.
In "The Dome" part of the Hemisferic are designed the IMAX Cinema, Planetarium and a Laserium. This planetarium is a half-sphere composed of concrete 110 meters long and 55.5 meters wide. The IMAX Theater's spherical exterior is vestured in fragments of shattered tiles. The structural concrete and steel shell creates a vault above the planetarium. The concrete encasement is extended upwards to the other parts of the "eye", in which are the entrances for the building. In those parts, the brise-soleils of the "eyelid" shutter are narrowed and replaced by a slat structure in the both sides of pivoting point of the concrete shell. They imitate the structure of a feather.

Fig. 2 L'Hemisfèric – Brise Soleil

Which are the Key Elements that Calatrava uses in the design of the L'Hemispheric?

There are three main elements which Calatrava used in the L'Hemispheric; the Eye, the Brise-Soleil and the Swooping Anchor.
Through the metaphor of an eye, the architect's eye is frequently present in the work of Calatrava. The planetarium is the most explicit reference to the human eye, and his sketches for the project make this

link clear. He always expresses the relation between human body and architecture. The eye shape element was present in the other prior projects that Calatravas uses before designing the L'Hemisferic. The half sphere necessary for the projection of IMAX movies is the kind of geometric form that stimulates the imagination of Calatrava. It also represents the human eye, and also the sphere of the cosmos.

The movement of the structural elements that Calatrava uses is present in this project in the Brise Soleil, which serves as a sunshade for the building. Also this element further heightens the expression of his fascination with vision.

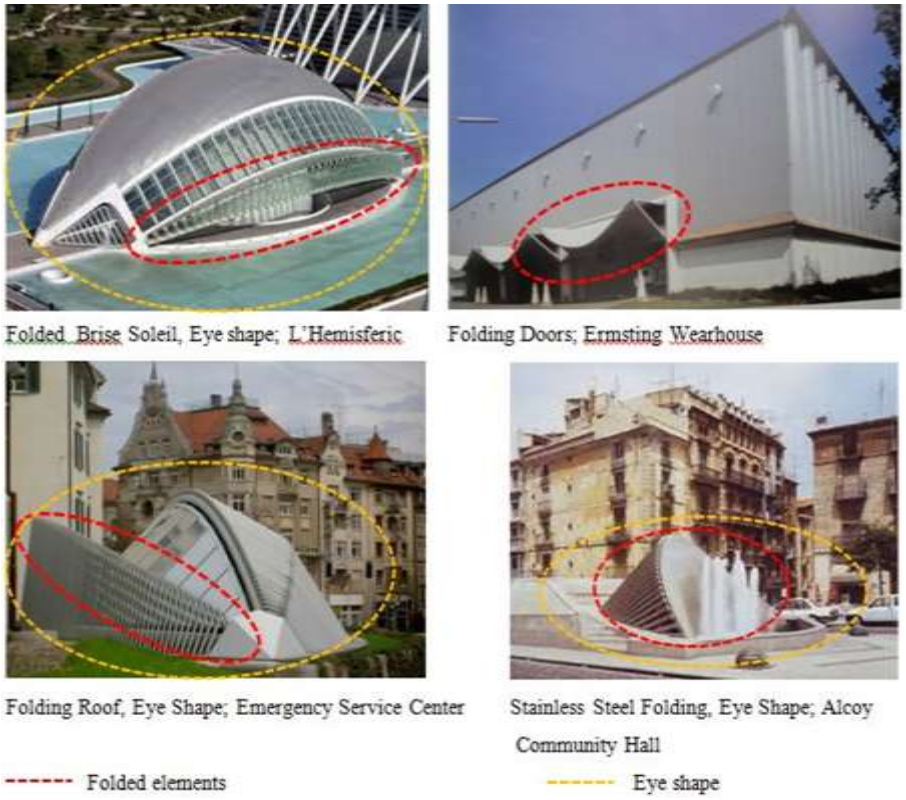


Fig. 3 Folded elements, Eye shape

The movement of Brise Soleil structure has similarity with other projects that Calatrava uses in his prior designs. The mechanic movement that Calatrava uses in these folded elements is an essential tool for L'Hemisferic also. The folding elements Calatrava uses in other projects, such as Ermsting Wearhouse, Emergency Service Center , Kuwait Pavilion. He developed this mechanism, not only to move in one direction, but each element moves independently from each other. It means that they move in a different direction of the vertical plan. The elements that Calatrava uses to design his projects have been a basement and also a design for the next project of Alcoy Community Hall. He uses the folding elements which are the Stainless steel folding of the fountain, and also he designs his fundamental shape as it is the eye.

The swooping anchor of the structure may bring to mind the one of the Lyon-Saint Exupery Airport Station but the French design is not included here. At this point he shows his strong engineering skills. Inspired from the physical concept of anchoring, he uses the swooping anchor as a key tool of his structures.

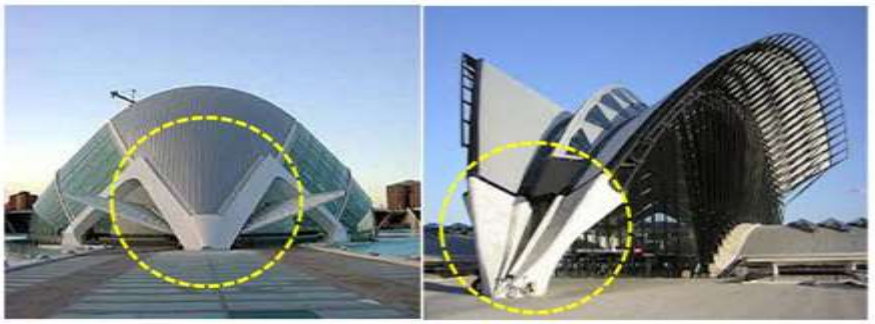


Fig. 4. Swooping anchor

Fig. 5. City of arts and science, Seven Buildings

4.2 The Science Museum Principe Felipe

The second principal building is The Science Museum Principe Felipe, which is also completely designed by Santiago Calatrava. It is designed in 1991-1995 and constructed 1996-2001. Its surface occupies around 40,000 m² on three floors. The building is made up of three floors of which 26,000 square meters are used for exhibitions, which is currently the largest in Spain. The first floor has a beautiful view of the Turia Garden that surrounds it; which is over 13,500 square meters of water. In the second floor is "The Legacy of Science", an exhibition by the researchers; Santiago Ramón y Cajal, Severo Ochoa y Jean Dausset. The third floor is known as the "Chromosome Forest", which shows the sequencing of human DNA.

Also on this floor are the "Zero Gravity," the "Space Academy," and "Marvel Superheroes" exhibitions. This magnificent building stands 220 meters long, 80 meters wide and 55 meters high. It looks just like a brilliant idea, from a very innovative mind of Calatrava. The sunken garden extends beneath the walkway to optically connect the museum to the administrative buildings. The shape of the building resembles the skeleton of a whale. The structure of the building demonstrates the skeleton and is the only architectural element. This prehistoric skeleton is designed by the repetition of the one element, which is like the bone of the skeleton. This element serves as a modular that is repeated in constant distance from each other in the direction of the longitude of the building. They are the primitives of the shape for this building. The symmetrical ends of the building are braced firmly by triangulated structures which also mark the entrances.

Calatrava uses only three materials: white concrete that is the skeleton, the glass that gives transparence all the building, and the steel, which is the structure of the glass. The building's architecture is known for its geometry, structure, use of materials, and its design around nature. The white supporting concrete framework of the south-facing facade is filled with glass. The north facade is a glass and steel screen that forms a continuous curtain along the full length of the building. This is a modular development of 104 meters width and 241 meters in length.

Fig. 6. The repetitive element, constant distance

Which are the Key Elements that Calatrava uses in the design of the Science Museum Principe Felipe?

There are three main elements which Calatrava used in Museum Principe Felipe; the Eye, the Tree structure and the Bones and Skeleton.
The eye shape always remains a key element in Santiago Calatrava's work. He also uses the shape of the eye, in a smaller scale in the Science Museum Principe Felipe than the base shape of L'Hemisferic. This building is just like a miniature of the Hemisferic. Also in the center of it are designed even the brise-soleil, which are the eyelid of Hemisferic, as the pupil of the eye in this building.

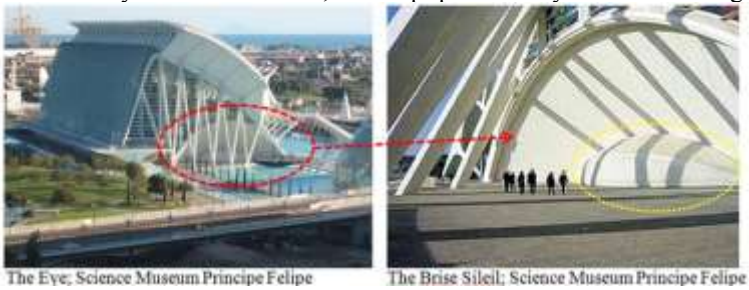


Fig. 7. The Eye shape

The building is based on an asymmetrical repetition of tree and rib like forms filled with glass to admit ample daylight. The North hall which is 40 meters has the proportions of a soaring Gothic cathedral nave. It has flying ribs and a waving glass wall running the full length of the building. The concrete 'trees" are organized by five linearly concrete elements as the branches of the "tree", which supports the connection line between roof and facade on a scale that permits the integration of service cores and lifts.

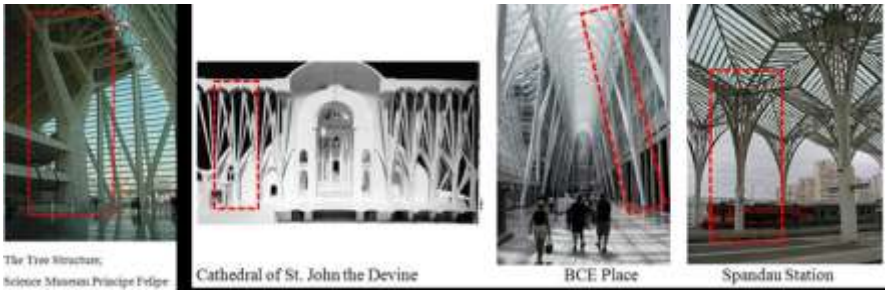


Fig. 8. The Tree Structure

The tree element that he uses in this building is also used and in other projects such as Cathedral of St. John the Devine, BCE Place, and Spandau Station. Also the tree structure has been a base element in the latest projects of Calatrava, such as Oriente Station.

Another characteristic that defines the elements of Santiago Calatrava are the bones and skeleton. The architect is not only inspired by the human skeleton, but also by the animals' one, such as the whale skeleton in this project. Other projects in which Calatrava resembles the concept of the bones are the Kuwait Pavilion and the Shadow Machine, in which he worked in 1991-1992. The difference between those two projects and the Science Museum Principe Felipe is that in them Calatrava is using and the concept of movement. But in the Science Museum Principe Felipe, Calatrava constructed the skeleton just statically, there is no movement. Also another difference is that in the two other projects he is using a part of the human skeleton, such is the hand's bones. There he expresses the movement of the fingers.

Kuwait Pavilion York Shadow Machine

Fig. 9. The bones and skeleton

4.3 L'Umbracle (Parking Structure)

L'Umbracle (Promenade and Car Park), which is located on the Southern facade of the complex, is the latest contribution of Santiago Calatrava's to the unique and comprehensive complex of the City of Arts and Sciences. The L'Umbracle was designed during 1995-1997 and constructed from 1997 until 2001, when it was opened to the public. The 320 meter long and 60 meter wide structure houses parking spaces for 900 cars and 20 busses. The promenade that is in the upper level has a surface of 50,860 m2. The Umbracle is a space that is a home to numerous sculptures surrounded by nature. It harbors in its interior The Walk of the Sculptures, an outdoor art gallery with sculptures from contemporary artists. It was designed as an entrance to the City of Arts and Sciences.

The upper part comprises a long panoramic promenade, with a tree-lined garden, from where there is a superb view of the Complex as a whole. Its 55 fixed arches and 54 floating arches that stand 18 meters high make the "umbrella" of the garden. The plants in the garden were carefully picked to change color with the seasons. L'Umbracle is intended as "a contemporary reinvention of the winter garden". The arches structure is made by steel construction, and they are identical from the beginning to the end. Also in this building we have an element that repeats in the longitude direction, with a constant distance. The material that Calatrava uses in this project is the steel structure and it is white colored. This is a very transparent structure because it lacks solid surfaces as well as the use of glass.

Fig. 10. L'Umbracle

Which are the Key Elements that Calatrava uses in the design of The L'umbracle?
The tree elements that he uses in this building are; the steel arches, the tree pillars, the mosaic tiles.

The concept of the Tree Pillars that Calatrava had been designed in the BCE Place and the Steel Arch which joints the pillars, have been used and in the construction of the L'Umbracle's Promenade. With the same logic Calatrava has designed his next project which is Olympic Game's Promenade.

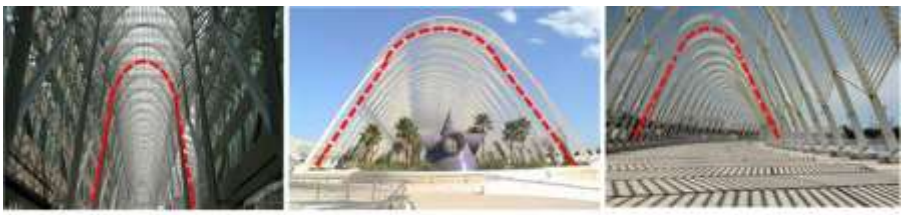


Fig. 11. The steel arches

In the parking level, Calatrava is using his tree pillars and they seem that they are not only as o constructive solution, but they also stand in harmony with the function of the upper level. The way how they are positioned in the tree pillars, is based on the earlier studies that Calatrava has done for the Oriente Station in which the architect sketches the trees of a dense forest.

Fig. 12. Tree pillars

For the aspiration of the parking level and for daylight Calatrava is using the conic volumes, which are intersected by spherical volumes. In the circular open surface of the conic surface, the architect uses blue mosaic tiles. We can see the influence of the Gaudi's style.

The Mosaic Tiles

Antonio Gaudi's Mosaic, Barcelona

Fig. 13. Mosaic tiles

4.4 Palacio De Las Artes Reine Sofia

The Palacio de las Artes Reine Sofia is an opera house and performing arts center. Its surface is around 44,000 m2, and is 75 meter tall. The building is designed completely by Santiago Calatrava during 1995-1997, and is constructed during 1997-2005. In April of 2005 it was opened to the public. It contains four large rooms: a Main Room, Magisterial Classroom, Amphitheater and Theater of Camera. It is dedicated to music and the scenic arts. The Palau de Les Arts has four sections; the main hall, the master hall, the auditorium, and the Martin y Soler theatre. It holds many events such as opera, theatre and music in its auditoriums. The building has a metallic feather outer roof that rests on two supports and is 230 meters long and 70 meters high. One of the supports allows for part of the building to overhang. The building is supported by white concrete. Two laminated steel shells cover the building weighing over 3,000 tons. These shells are 163 meters wide and 163 meters long.

The Palacio de las Artes Reine Sofia was conceived as a series of casual volumes which have been unified through their enclosure within two symmetrical shells. The shells are made by concrete and are cut-away, to be crowned by a sweeping steel sheath that project axially from the entrance concourse out over the uppermost contours of the curvilinear envelope. This genius structure defines the identity of the Palacio de las Artes Reine Sofia. The symbolic of the seashell that Calatrava resembles, presents a dynamic effect as a signal in the landscape. While walking in the promenade by outside, the different volumes looks like they are stacked between the horizontal decks off the side of the structure. The nucleus part of the building is occupied by the technical facilities, such as the scenery module and lifting mechanisms for the stage and orchestra's pit of the opera house, and its fully air-conditioned auditorium, which seats 1300, is set within an acoustically shaped shell embedded within the cluster. In these different services, there is also a smaller auditorium, which is conceived mainly for chamber music concerts, seats 400, and a large auditorium to the east, which is partially protected beneath the open shell and can seat around 2000 people.

Fig. 14. Palacio de las Artes Reine Sofia

Which are the Key Elements that Calatrava uses in the design of The Palacio De Las Artes Reine Sofia?

Though in some views of this project may bring to mind Calatrava's Tenerife Concert Hall, he ventures here into different territory, approaching an almost Surrealist range of shapes. The similar element might be the helmet that looks like a head's snake. Also the types of the materials that are used in those two buildings are the same, as always white concrete, steel and glass. Both of the buildings are seen as a "monumental sculpture".

Fig. 15. Shell and Shape

Calatrava also uses a broken tile surface, which also shows the influence of Antonio Gaudi, a figure Calatrava clearly admires. Also the Blue Mosaic Tiles are used in the interior and the exterior of the Opera House.

4.5 El Pont De L'assut De L'or

El Pont de l'Assut de l'Or is a suspension bridge that connects the south side with Minorca Street, whose 125 meters high pillar is the highest point in the city. It crosses the Turia Gardes, the former riverbed of Turia River. The design of the bridge is made by Santiago Calatrava, as a common design with the other bridges that has been done before. The total length of the bridge is 180 meters, and the height is 125 meters, which makes it the highest point of the city. The bridge was opened to the public in 2008. Calatrava has used the white concrete and the steel for the construction. In this structure there are 19 spans that are connected in two points, by the diagonal position between the vertical wing and the horizontal path of the bridge.

Fig. 16. El Pont de l'Assut de l'Or bridge

Which are the key elements that Calatrava uses in the design of the El Pont De L'assut De L'or?

This bridge brings in mind his famous bridge Alamillo Bridge , which is one of his earliest works. The El Pont de l'Assut de l'Or bridge, comes as a miniature of the Alamillo Bridge. Almost every element is the same. The only differences between them are the dimension and the proportion between the two edges of the triangle shape of the bridge.

The structure of El Pont de l'Assut de l'Or bridge is based in the same concepts that was designed the Alamillo Bridge. The Steel Cables are connected with the concrete construction in the same method. They are lying in diagonal position, or better to say as the hypotenuse of the triangle. Is very understandable the engineering skills that Calatrava owns.Also the horizontal plan of the bridge serves as a path for vehicles and pedestrians.

Fig. 17. Structure and shape

5 Conclusions

Analyzing the above buildings of the City of Arts and Science, I can conclude that the key elements that Calatrava uses in this complex are almost the key elements that Calatrava has been using in the other prior projects. These elements that are present in its recent works are the key elements that create the Calatrava's vocabulary design. Calatrava in the complex presents some similarities in: The concept that Calatrava uses in this Complex is always based in the human being. The most common element is the shape of the eye, as the architect always says that is the "eye of knowledge". In addition to the human being, is presented and the symbol of the nature forms such as the tree, the seashells, and the whale skeleton. In his projects in the center of his concept is the relation of the forms in the nature and in the human being. Studying the structure of this relation is the basement and for his structural designs. The shape, is not casual in Calatrava's designs, and also isn't as a resultant of the site limits. Calatrava's shapes are drawn as an analysis of the rapports between elements of a conceptual natural and human being. The architect brings in sketches, not a copied shape but he carefully studies not only the geometrical element but also the function that will be happening there and the sustainability in every aspect. Studying in engineering school, Calatrava is not only an architect, but he is also an engineer. His works are not only based in the principles of architecture but also they are well thought in the principles from the mind of an engineer. Calatrava skills are not only in imagination, but also he has strength skills in realizing his works. He uses concrete and steel, as the important element. The structure elements, such as the pillars, arches are based in the concept of nature, such as tree, human body, the skeleton, etc. Calatrava always uses three main materials such as, the white concrete, steel structures, and glass. He is able to bring monumental volumes even with these materials. Calatrava mostly presents vernacular architecture, and is influenced by the Spanish architects. He develops the structural concept and he uses the characteristic of the materials.

While some contemporary architects, who shall remain unnamed, seek innovation in extravagant but often unusable forms, the vocabulary of Calatrava is rooted in a sense of design and engineering which precedes more from within than from an imposed and dysfunctional artistic ambition.

References

1. Jodido, Philip (1951); Santiago Calatrava: Architetto, Ingegnere, Artista
2. Tzonis, Alexander; Lefrave, Laine (1995); Movement, Structure and the Work of Santiago Calatrava
3. Tzonis, Alexander (2007); Santiago Calatrava - The Complete Works
4. The Architect's Studio, Santiago Clatrava

Replacement Of A Monolith Reinforced Concrete Slab With A Lightweight Cobiax System Construction

Mimoza Sylejmani [1]; Blerta Emini [2]
[1]University for Business and Technology Architecture, Kosova
e-mail: mimoza.sylejmani@ubt-uni.net;
e-mail: blerta.emini@ubt-uni.net

Abstract. The purpose of this system is the application of lightweight slabs in mid-floor construction. In the case of a conceptual hotel design, which currently is predicted to be built in a classical mid floor reinforced construction, the practice of COBIAX lightweight construction without beams will highlight the advantages of this system. The system uses circular or oval hollow spheres, which are placed in the slab. This results in the creation of a lightweight slab, due to the reduction of mass, also a considerable reduction of columns, avoiding beams, reduction of the foundation plate thickness, decrease in floor height, etc. In this case, the architects will have the opportunity to design large and spatial structures, where the distance between the columns can reach up to 20 m. Reducing the amount of concrete of lightweight slabs in the COBIAX system, affects directly the reduction of CO2(carbon dioxide) emission. Based on studies made by a German research organization ,each m3 of concrete replaced with COBIAX, reduces approximately 210 kg of CO2 emission, which makes COBIAX method an ideal system for eco designers. 1.Hollow spheres are placed in neutral axis where concrete has less shear or compression forces, reducing the volume of concrete. 2. Reducing of the concrete mass that is under tension force up to 35 %, has a positive impact in the whole structure which enables saving building material. The Slab thickness varies from 240 mm to 600 mm. While most standard slabs, transmit stress forces in two or one direction, lightweight COBIAX slab system distributes the stress forces in several direction. COBIAX slab needs up to 40% less load bearing columns, which offers architects better flexible opportunities in design.

Key words: stability, flexibility, economic cost, ecology, feasibility.

1 Introduction

Cobiax system has been applied in numerous structures in Europe , validating the acceptance of this system in Europe. This system of construction in our country (Kosovo) for the first time began to be applied in 2011/2012 in to a building called ”World Trade Center “ WTC-Pristina. It was used in a specific building: in the Commercial Center, while the rest of surrounding buildings such as: housing and administration are being built in classical system (slabs of reinforced concrete). To elaborate the advantages of this system we took a case study-a conceptual design of a hotel which is supposed to be built in the center of Pristina. This project was intended to be built in a classical system and the classical construction was replaced with Cobiax system. Various attempts were made in the past in order to reduce the weight of concrete slabs without reducing the flexural strength of the slab. Reducing the own weight in this way would reduce deflections and make larger span lengths achievable. Idea- *The essence of structural design is the appropriate usage of material. Unnecessary weight is created by materials that are not significantly contributing to a structure’s stability.*A bird can fly because its bones are made of a hard shell with struts placed inside. The bone’s weight is optimized and at dhe same time the bone is stable.Cobiax slabs differ in three ways from traditional solid flat plate slabs ;
*Reduce dead load due to the concrete displacement of the void formers. The bending moments and column reactions are reduced consequently
*Reduced stiffness of the slab due to the presence of the void formers. The deflection of the slab is influenced consequently.

*Reduced shear capacity of the slab due to the presence of the void formers. This requires the identification of the slab areas with too high shear in which the void formers mustn't be placed.

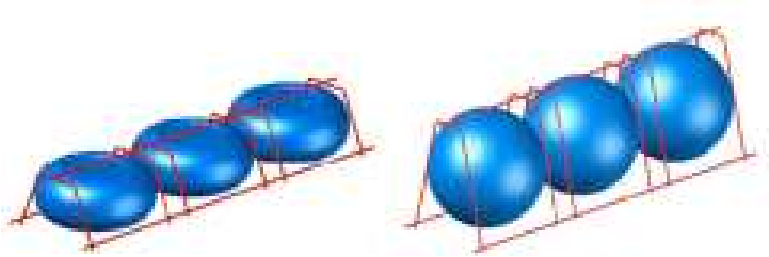
The Cobiax slab is dimensioned with the methods used for traditional flat slabs and compatible with any concrete design code.

Fig 1 The appearance of cobiax slab surface and the solid area.

Source:Personal photo courtesy

1.1. Typology of Products

There are two types of Cobiax cage modules, the "Slim- Line" and "Echo- line";



Slim Line

* Void former height 100 to 220 mm

*Slab depths 20 to 35 (+) cm

Echo- Line

*Void former height 225 to 450 mm

*Slab depths 35 to 60 (+) cm

Void formers, positioned between the bottom and top reinforcement layers - displaced concrete. They are used when the distance between the columns is large ie., when we have strain in which case concrete works more in pressure (98%) and less in traction. (cobiac Engineering; 2010).

It should be mentioned some points regarding this system;

a) Bending – The bending strength of Cobiax slabs was investigated in laboratory tests using various slab depths and void former sizes. The bending behaviour has been proved to be comparable with the one of solid slabs.

b) Stiffness – The void formers in Cobiax slab reduce its stiffness compared with solid flat slabs.

c) Shear – According to current standards, calculation of the shear strength for traditional one – way spanning hollow core slabs is based on the smallest available web width of a hollow cross section. With such criteria used for two-way spanning voided slabs, the resulting shear strength for Cobiax flat slab would only be about 10 % of the shear strength of a solid flat slab with same thickness.

d) Punching – Due to shear force limitations areas with high shear force concentration such as around columns heads are to be executed without Cobiax cage modules. The critical perimeters that are relevant for the punching shear design are located within these solid areas. The punching shear considerations in these areas are therefore as for solid flat slabs.It is recommended to explicitly verify that the determining perimeter for punching is located inside the solid zone as shown on below drawing. Should this not be the case, the solid zone has to be incrased accordingly. The reduced dead weight of the Cobiax flat slab decreases the column reactions and allows optimizing the necessary amount of punching reinforcement.

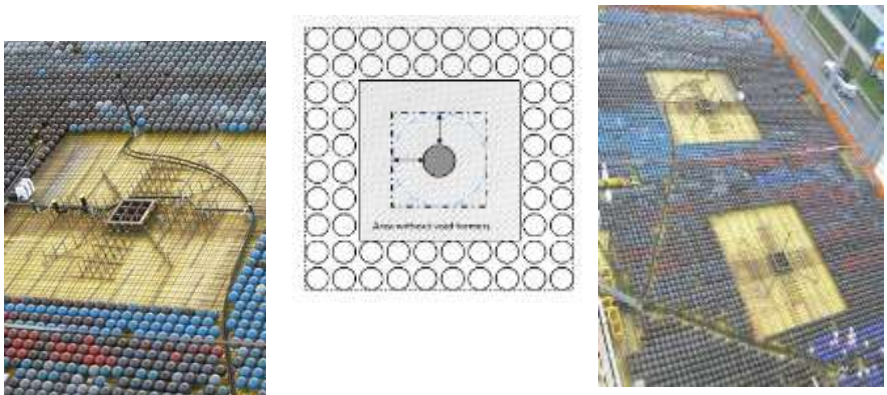


Fig 2 The realization of cobiax slab with sections

Source: Engineering Manual - Cobiax

e) Fire protection – Fire tests in specialized laboratories with Cobiax slab specimens have shown that above parameter and criteria can be applied with no limitation to Cobiax flat slabs and that they can withstand fire in the same way as solid flat slabs. The current fire rating of Cobiax slabs stands for 180 minutes issued by the German Authorities (report P-SAC 02/III – 187 done by MFPA)

f) Acoustic Insulation–Acoustic Insulation tests were conducted on Cobiax slabs with specimens in specialized laboratories as well as in completed buildings. The aim was to evaluate the acoustic insulation capacities of Cobiax slabs compared to solid flat slabs and to define an appropriate acoustic insulation rating method. Interpretation of these acoustic insulation measurements show that for a Cobiax slab the same acoustic insulation evaluation methods can be used as per solid flat slab.

g) Various technical issues – Compared to a solid slab of same thickness, Cobiax slab has an improved vibration performance. Cobiax flat slabs have higher natural frequencies for common practice live loads compared to solid slabs due to their reduced dead load.

1.2. Execution

Cobiax slab can be executed in traditional in-situ concrete or in combination with semi-precast elements.

In-situ concrete

Application of concrete slabs in site, is done through placements of void forms in between lower and upper steel reinforcement. First are placed 1.frames, 2. distance holders 3. reinforcement nets, 4.void formers, 5.concreting

Fig 3 Realization of the slab in workplace 1.frames, 2. distance holders,
Source: Personal photo courtesy 3.reinforcment , 4.void forms,
1.cables for strain 5.reinforcment

Combination with semi-precasted elements

In this case void forms are placed in factory in a prefabricated slab and together are brought instantly into a construction site. In both cases void forms are placed in between lower and upper steel reinforcement.

Fig 4 Application of prefabricated slabs in site

Source: Cobiax Technologies

The advantage of this system is noted on the possibility of establishing installations on mid-floor slab construction, in which case we can remove any sphere without causing any constructive problem.

It is notably a suitable system for seismic countries. Concentrated masses are reduced without losing construction stiffness, and loads in foundations are reduced significantly by 15 %

Fig 5 Installation within a slab construction

Source: Personal photo courtesy

2 Methodology

2.1. Case Studies

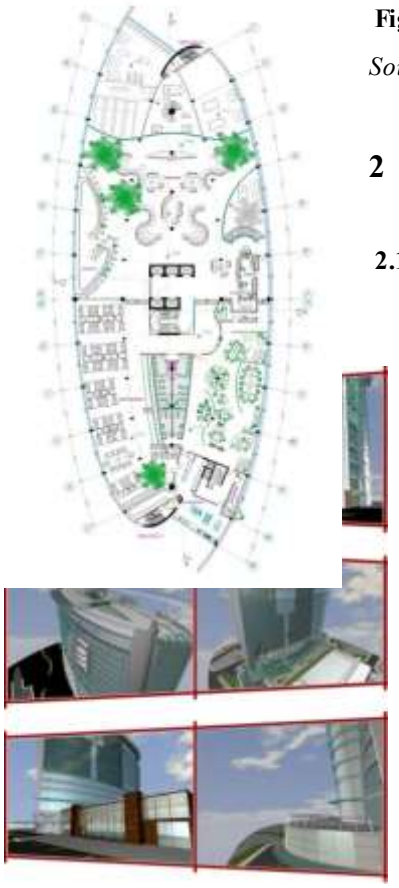


Fig 6 Several views of the building **Fig 7** Location of the building in site

Source: *©Ertan Sylejmani*

As a case study a conceptual hotel design was chosen. This buildings has 3 floors underground, a ground floor and 16 floors with a total height varying from 46,5 to 50,2 meters. This building is designed in a location chosen at the very center of the city of Prishtina known as Center 1. The reason why we have chosen this building as a case study is because during the design phase,the interior columns could create functional problems. These types of columns were not possible to be eliminated since the building was indented to be built by using a classical construction system.However, the application of void forms has enabled us to eliminate a considerable number of columns, the elimination of launching beams all in all, as well as reducing the floor-floor height.

Fig 8 Typical floor layout

Fig 9 A view of building construction

Source: ©Ertan Sylejmani

2.2. Comparisons

Knowing that with the application of void forms, the distance between the columns can go up to 20 m, we have decided to eliminate the selected columns highlighted in colour red, to achieve higher commodity and functionality.

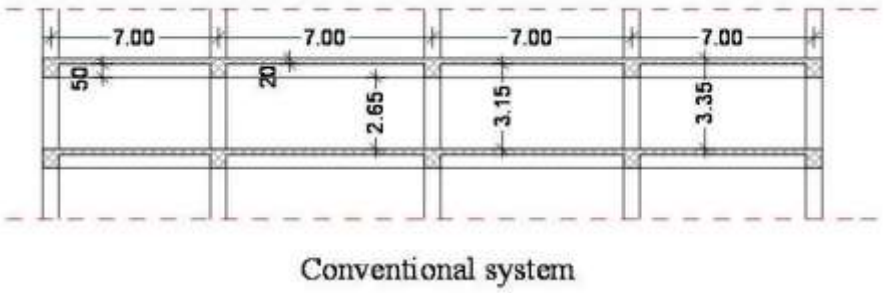


Fig 10 Plan-comparison before and after

Source: ©Ertan Sylejmani

a) Existing layout- where the distance between the columns was 7m

b) Layout with columns that will be eliminated, where the distance between the columns will be 14m

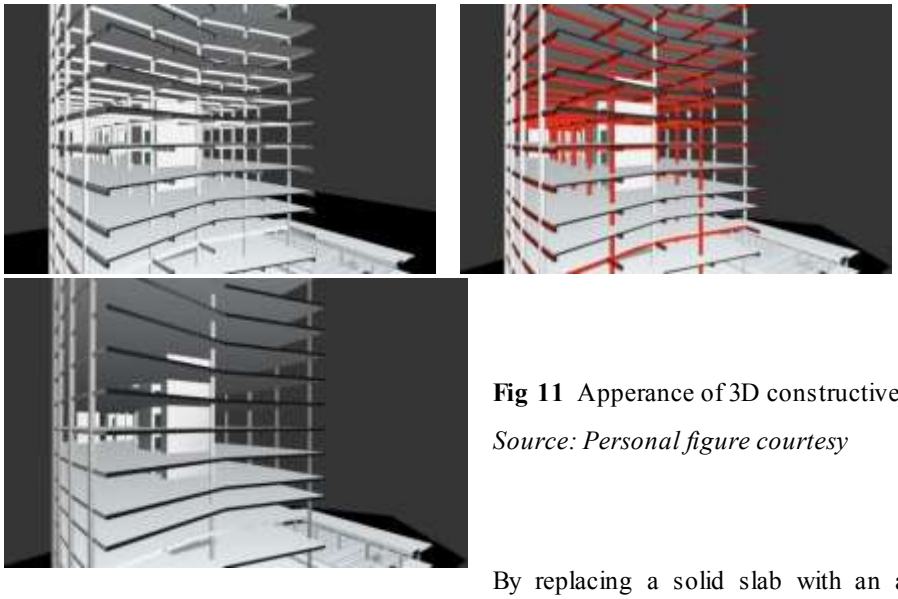


Fig 11 Apperance of 3D constructive system

Source: Personal figure courtesy

By replacing a solid slab with an agile type of slab (cobiax) as shown in the Figure nr. 12 results: in the elimination of the columns by producing new neat spaces and by eliminating launching beams floor-floor height is reduced. In an architectural aspect , it facilitates architects with great opportunities in floor flexibility and the execution of the building is easier.

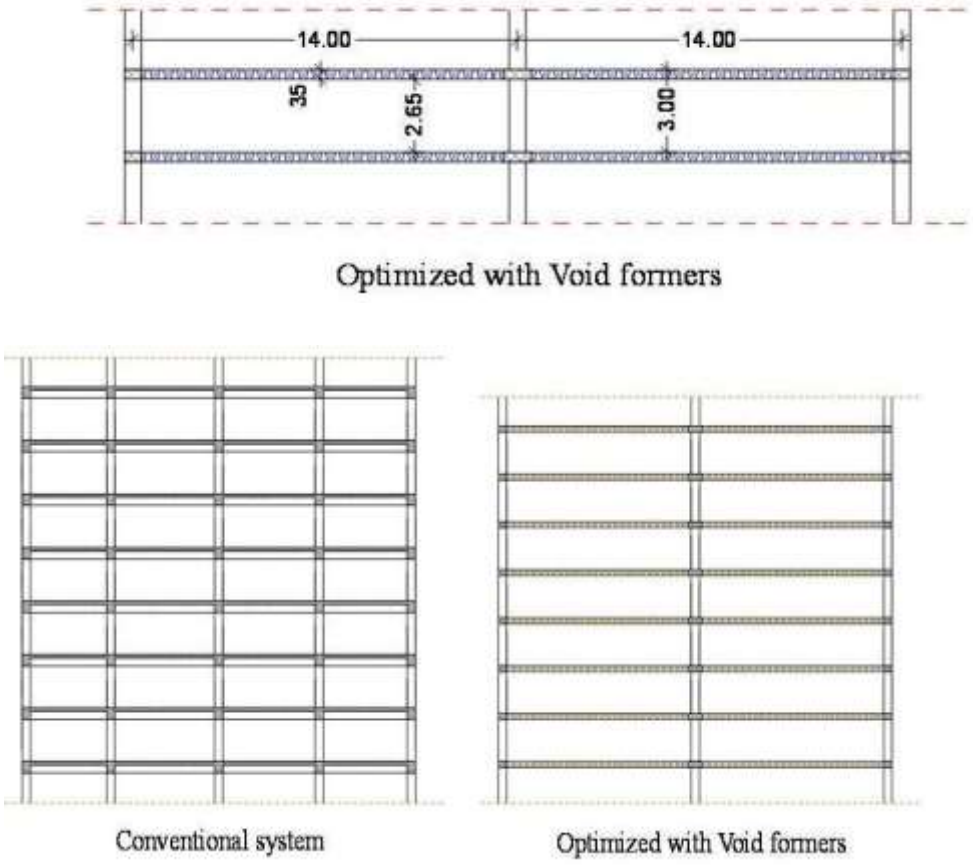


Fig 12 Apperance in section of the object

Source: Personal figure courtesy

2.3. Calculations

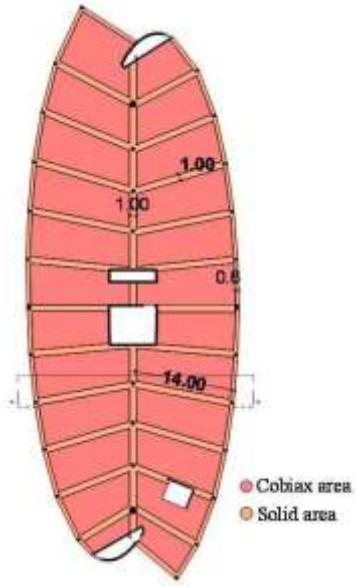


Fig 13 Layout where the surface from reinforced concrete is seen and the extension of void formers

Source: Personal photo courtesy

In the conceptual design the entire surface of slabs is with reinforced concrete with a 20cm height.

S = a x b . . . (m^2)
V slab = Ss x hs . . . (m^3)
V columns = Sc x hc . . . (m^3)
V issued beams=Sib x hib . . . (m^3)
Vfoundation = Sf x hf = . . . (m^3)
V total = Vs + Vc +Vib + Vf = . . . (m^3)

For our project we have chosen the following; Void former height – 220 mm
Void former horizontal diameter – 315 mm, and slab thickness from 350 mm, when dead load reduction per m^2 is 2.80 kN/m^2, concrete displacement per m^2 is 0.112 m^3
Number of void formers per m^2 is 8.16
Width of the hidden beams is acquired 100 cm, the inner and the perimetric 60 cm (according to calculations), there are times when it is realized with sector as shown in Figure 2
V slab(cobiax) =Ss x hs x 0.888 . . .(m^3)
V hidden beams = Shb x hhb . . . (m^3)
V columns = Sc + hc . . . (m^3)
Vfoundation = Sf x hf = . . . (m^3)
V total = Vs + Vhb +Vc + Vf = . . . (m^3)

0.888 – amount of concrete slab of mid-floor
0.112 – amount of cobiax spheres
Table 1 - Main parameter of Cobiax cage modules

Slab depth	[mm]	200	225	250	275	300	325	350	400	450	500	550	600
		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Recommended Cobiax cage module type	[-]	CBCM-S-100	CBCM-S-120	CBCM-S-140	CBCM-S-160	CBCM-S-180	CBCM-S-200	CBCM-S-220	CBCM-E-270	CBCM-E-315	CBCM-E-360	CBCM-E-405	CBCM-E-450
Dead load reduction* per m²	[kN/m²]	-1.40	-1.64	-1.88	-2.10	-2.32	-2.56	-2.80	-2.86	-3.34	-3.82	-4.29	-4.77
Stiffness correction factor	[-]	0.92	0.92	0.92	0.92	0.91	0.91	0.91	0.92	0.91	0.90	0.90	0.89
Shear reduction factor	[-]	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.55	0.55	0.55	0.55	0.55
Cage module support height	[mm]	110	130	150	170	190	210	230	275	320	366	411	457
Void former height	[mm]	100	120	140	160	180	200	220	270	315	360	405	450
Void former horizontal diameter	[mm]	315	315	315	315	315	315	315	270	315	360	405	450
Spacing between void formers	[mm]	35	35	35	35	35	35	35	30	35	40	45	50
Void former centre line spacing	[mm]	350	350	350	350	350	350	350	300	350	400	450	500
Number of void formers per m²	[-]	8.16	8.16	8.16	8.16	8.16	8.16	8.16	11.11	8.16	6.25	4.94	4.00
Concrete displacement per m²	[m³/m²]	0.056	0.066	0.075	0.084	0.093	0.102	0.112	0.114	0.134	0.153	0.172	0.191
Void formers per cage module**	[-]	7	7	7	7	7	7	7	8	7	6	5	5
Equivalent area per cage module	[m²]	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.72	0.86	0.96	1.01	1.25

Source: (Engineering Manual Issue 2010)

3 Results and Discussion

Slab surface is; S=2 073.13 m^2

hs =20 cm

V slab. = 2 073.13 x 0.2 = 414.62 m^3

V columns = 41.11 m^3

V issude beams = 84 m^3

Vfoundation = 3 768.83 m^3 hf = 1.6 m

V p,sh,t =539.62 m^3 x18 floors= 9 713.16 m^3

V total = 13 481.99 m^3 concrete

Concrete is selected with C25/30 class

Solid area; S = 424.94 m^2 Cobiax area; S=1648.19 m^2

hp =35 cm

V slab =1648.19 x 0.35 = 576.86 x 0.888(void formers) = 512.25 m^3

V hidden beams = 424.94 x 0.35 = 148.72 m^3

V columns = 21.79 m^3

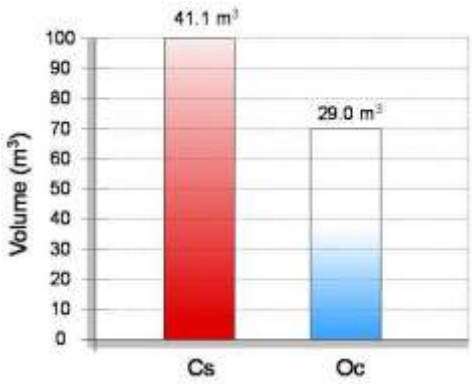
V foundation = 2 753.4 m^3 hf = 1.2 m

V s,c,b = 689.72 m^3 x 18 floors = 12 289.68 m^3

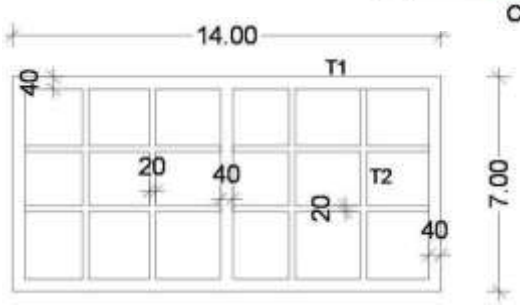
V total = 15 043.08 m^3 concrete

Concrete is selected with C40/50 class, which affects the reduction of cross-cutting elements and contributes to a greater construction life length.

Static spaces lx.14 and ly.7 formers could be realized but this is more difficult to height would go to 1.4 and this floor-floor height impose us suspended column dimensions from slab height will be 10 cm, height would rise to hf. 160 hf. 120 cm.



m beside by using void also with ribbed system, be realized. The beam 1.0 m and as a result of would rise and would ceiling, it would increase 30 x 60, to 40 x 80 cm, while the foundation cm, while previously was



Beam 1- 40 – 140 cm

Beam 2 - 20 – 100 cm

2073.13 : 98 = 21.15

V issued beam =35.27 X 21.15

Vslab = 207.313 m^3

V columns = 36.64 m^3

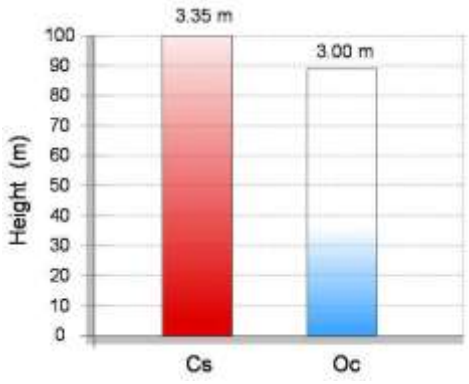
V issued beams = 745.96 m^3

Fig 14 The amount of concrete in slabs

Source: Personal figure courtesy

Cs - conventional system

Oc - optimized with Cobiax



In the conceptual design the number of the columns was initially 52, in which case the use of void forms has reduced it to 32, that means that the number of columns is reduced by 40%

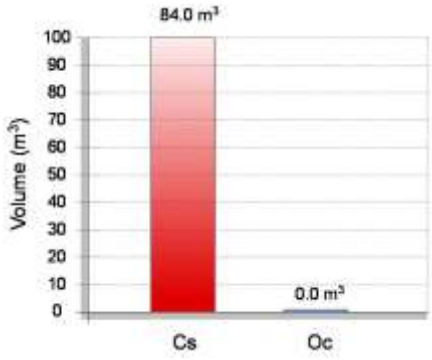


Fig 15 The amount of concrete in launching beams

Source: Personal figure courtesy

Cs - conventional system

Oc - optimized with Cobiax

By the diagram we notice that we don't have beams

Fig 16 Comparison of floor height with two chosen construction system

Source: Personal figure courtesy

Cs - conventional system

Oc - optimized with Cobiax

The height of the building will be reduce by 11%

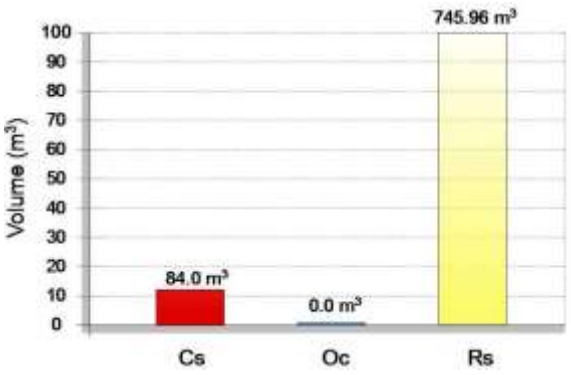
Fig 17 Concrete volume amount in three construction systems

Source: Personal figure courtesy

Cs - conventional system

Oc - optimized with Cobiax

Rs- ribbed system



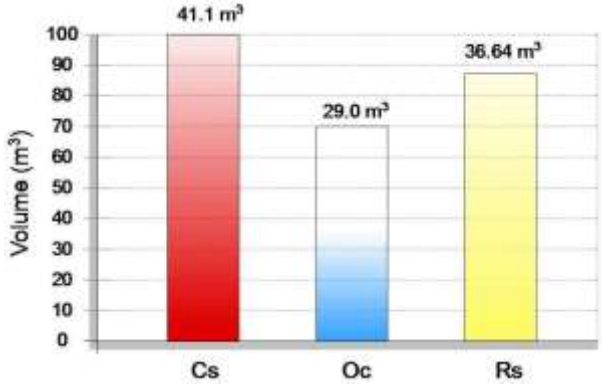


Fig 18 Diagram of issued beams-concrete amount

Source: Personal figure courtesy

Cs - conventional system

Oc - optimized with Cobiax

Rs- ribbed system

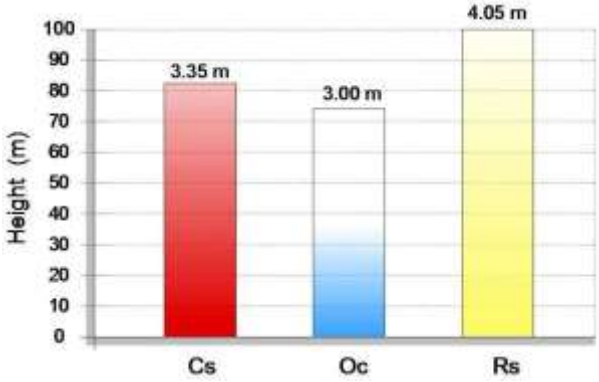


Fig 19 Overview of floor height in three construction systems

Source: Personal figure courtesy

Cs - conventional system

Oc - optimized with Cobiax

Rs- ribbed system

4 Conclusions

From these tests we can conclude that the application of void forms enables distances between columns up to 20 meters and by this we achieve 40% reduction of original planned columns with classical system of construction. It should be noted that these void spheres are manufactured using recycled materials. It contributes also in a shorter period of implementation, reduces cross-cuttings of vertical elements, achieving lower floor heights. By achieving lower floor heights, suspended ceilings are not required

resulting in lower foundation height as well. It contributes also in achieving a more affordable building costs, by reducing cubic meter volume of concrete from the local price of 200 euros to 130 euros.

In designing inner spaces, gypsum card boards could be applied, and they play a feasible role.

References

1. Bennet, W. "Voided Flat Plate Slabs Reduce Cost and Speed-up Construction" Concrete International, May 1983
2. Cobiax Engineering Manual 2010- version 10-2010
3. Cobiax Technology Handbook of 2006
4. Fraunhof- Institut für Arbeitswirtschaft und Organization IAO – Nobelstraβe 12, D-70569 Stutgart in 2007
5. Hanson (Heidelberg) - Hanson Building Products (Omnia and Cobiax - flooring systems)
6. Mota, M. "Voided Two- Way Flat Plate Slabs" Structure Magazine, April 2009
7. Universiteit Van Pretoria

Structure as Architecture, Architects as Engineers

Altin Bidaj[1] , Irakli Premti[1] , Hektor Cullufi[1]
[1]Polytechnic University, Faculty of Civil Engineering Department of Mechanics of Structures, Tirana, Albania

Abstract: The construction challenges and opportunities demand a new kind of professional, with expertise in structural analysis, architectural design, systems engineering, information technology, and management. A decision has to be made regarding the extent to which structure should be exposed in an architectural design. For doing the right choice the architects should have a very good knowledge of structural engineering concepts and materials applications. Structural exposure should be limited to buildings where structure integrates with and clearly strengthens the expression of architectural ideas. Having a huge number of structural possibilities, designers and architects have considerable freedom of choice. In this article we try to make a short description of the potential of structure that is beams, columns, frames, struts and other structural members, to enrich architecture. We try to raise architects' perception of structure and materials as integral elements of architecture rather than applied technologies.

Keywords: engineering, architectural, materials, design, structure, technology.

1 Introduction

Building design is as old as the history of civilization, yet today the evolving challenges and opportunities in building design and construction are real, diverse, and exciting.

- New building materials, including composites, super-high-strength concrete, adaptive, self-monitoring and self-healing systems.
- Total integration of information technology in building life cycles, using building information models to support design, construction, operation, and rehabilitation.
- Evolving requirements for safety and security, including damage-resistant and resilient materials and designs.
- Life cycle designs that support adaptive reuse of structures as needs change.
- Demands for energy efficiency and sustainability, including use of recycled materials and zero-energy building concepts.

These challenges and opportunities demand a new kind of professional, with expertise in structural analysis, architectural design, systems engineering, information technology, and management.

2 Materiality and Construction

Some architecture is characterized by a strong expression of structural materiality and construction. Each structural material possesses features particular to its own materiality. For example, thinness of section, flanged cross-sectional shapes, potential for extreme slenderness in both compression and tension, and the ability to accommodate significant penetrations in members are characteristics unique to steel construction.

Concrete, in a plastic or even completely fluid state while still fresh, can harden in moulds of almost any shape and display many different surface textures. Other signatures of concrete include negative details at construction joints and form-tie recesses. Timber materiality on the other hand is best

expressed by its natural grain and color, typical rectilinear cross-section shapes and connection details that respond to its relative softness and anisotropy. Certain structural configurations such as vertical and hierarchical layering of horizontal joists and beams, and relatively closely spaced beams and posts are also trade-marks of timber construction. The structure of the United Airlines Terminal concourse and departure lounges, Chicago, utilizes a limited vocabulary of two steel sections, the I-beam and the tube (Fig. 1 and Fig. 2).

Highly penetrated I-beams form the irregularly shaped beams of portal frames that articulate and modulate the concourses. Tubes function as purlins and also as clustered columns for each portal-frame leg. In several spaces the two sections combine to form a composite beam with a conventional top I-beam flange but a tubular lower flange. The architect has mostly used off-the-shelf sections, yet through varied structural form and consistent and refined detailing has facilitated a sense of liveliness, lightness and materiality. The high quality detailing of the exposed structure is largely responsible for this exemplary architecture that could have otherwise been a featureless and elongated space.

Fig. 1. The main concourse. United Airlines Terminal, Chicago, USA, Murphy/Jahn, 1987.

Fig. 2 Beam–column junction.

Terminal 1 is not a project in which it is possible to hide a poor symbiosis of architecture and engineering disciplines; it is obvious that Jahn [the architect] and the structural engineers at Lev Zetlin Associates worked well together in an understanding of what the result should be. It has been noted that the structural expression so prevalent in the project – rounded forms, exposed ribs and structural members with punched webs – recalls the structural parts of aircraft; this layer of meaning, says Jahn, was unintentional. The assembly shows elegance in every detail. Steel connections and finishes could

be the subject of a whole photographic essay in themselves. Joints, brackets, and end conditions have been taken past that point where they merely work, to become abstract sculpture.

3 Structural Actions

Detailing that expresses structural actions within members and connections also provides opportunities for architectural enrichment. According to Collins, Soufflot, the eighteenth-century Rationalist architect who reacted against the ornamental embellishment of structural details, advocated 'simply limiting aesthetic effects to those which logically followed from the nature of the structural component, and designing those components in accordance with rational criteria'. But the pendulum has swung since the 1700s. Now, architects such as Louis Kahn react against bland concrete and timber members muted by their rectilinearity in both cross-section and longitudinal elevation, and 'off the-shelf' steel sections that satisfy nothing other than the outcome of engineering calculations.

Referring to the pervasive use of steel I-beams, Khan criticized structural engineers who used excessive factors-of safety in conjunction with steel beam standardization. In his view, this led to overly large member sizes 'and further limited the field of engineering expression stifling the creation of the more graceful forms which the stress diagrams indicated.The exposed first floor beams at Jussieu University, Paris, express their internal structural actions. Steel box-beams, curved both in elevation and plan, express the relative intensity of their bending moments (Fig. 3).The beams are simply supported and their elevational profiles take on the parabolic forms of their bending moment diagrams. One notes in passing that the architect has privileged the articulation of bending stress rather than shear stress. Shear stress, which usually increases linearly from a value of zero at a mid-span to reach its maximum value at the ends of a span, is rarely expressed. The suspended floor trusses at Centre Pompidou, Paris, are an exception (Fig. 4).Their diagonal web members increase in diameter as they approach the truss supports in response to the increasing value of shear force. At the Stratford Regional Station, London, structural actions similarly inspire expressive detailing (Fig. 5). Although the focus here is upon just one detail, the base-connection of the portal frames, other details, such as how the primary curved frames taper to points where they are propped, equally express structural action. Each frame base-connection joins the frame rigidly to a concrete substructure. This base rigidity helps the frame resist gravity and lateral loads, and minimizes its depth. High-strength bars tension the base-plates down to the concrete via cast-steel bases.

Fig. 3 Beam geometry expresses the bending moment diagram. Jussieu University, Paris, France, Edouart Albert, 1965.

Fig. 4 Double-chords reduce the visual mass of the truss. Centre Pompidou, Paris, France, Piano and Rogers, 1977.

Rather than adopt usual construction practice whereby a column base-plate connects directly to a concrete foundation by vertical bolts whose shafts are concealed, this detailing expresses how the base-plate is clamped down. Not only are the bolt shafts visible, but their inclination aligns them parallel to the lines of stress within the frame member.

The base expresses and elaborates how tensions from the embedded bars compress the base-plate against the concrete, and how this compression stress that acts upon the base is dispersed uniformly at the steel-base to concrete interface.

Fig. 5 Curved frames spring from cast-steel bases. Stratford Regional Station,

London, England, Wilkinson Eyre, 1999.

4 Conclusions

We have to encourages a broad, creative and critical stance towards structure. It presents an alternative approach to some current practice where the most expedient structural engineering solution is adopted unless its impact upon the architectural concept is considered to be disastrous. For structure's potential as an enlivening architectural element to realized, collaboration between the architect and the structural engineer needs to be extensive and intensive.

Architects need to take an active role in all stages of structural design, working with the structural engineer in order to achieve mutually acceptable outcomes. Beginning with preliminary structural layouts through to detailed design at working drawing stage, both groups of professionals together need to wrestle with the various options. Structure is owned by both professions and it must satisfy simultaneously the requirements of both – load-bearing as well as architectural expression.

We have to bridge the gap between both professions.

References

1. Russell, J. S. (1999). Architectural Record, 07.99 Setting the pace for innovative transit design, Chris Wilkinson advances his station on the English architectural scene. Stratford Regional Station
2. Marlin, W. (1978). Architectural Record, 163 (2), A building of Paris. Centre Pompidou, Paris,
3. Murphy, J. (1987). Progressive Architecture, United Airlines Terminal, Chicago, 138–9, 157, 178, A grand gateway.
4. Andrew W. Charleson (2005)A Source Book for Architects and Structural Engineers , Elsevier
5. Ogg, A. (1987). Architecture in Steel: The Australian Context. The Royal Australian Institute of Architects
6. Holgate, A. (1997) The Art of Structural Engineering, Edition Axel Menges

The Natural Light In Alvar Aalto's Buildings

Parashqevi Tashi[1] , Ani Tola(PANARITI) [2]
[1,2] Polytechnic University of Tirana, Department of Architecture,
Faculty of Architecture and Urban Planning
Str."Muhamet Gjollesha" Nd.54 Tirana, Albania
e-mail: parashqevi.tashi@fau.edu.al
e-mail:ani.panariti @fau.edu.al

Abstract This study analyzes the design and implementation of various forms of architectural elements, the use of panels, materials, color resolution up to technical details that Alvar Aalto used for the natural light and illumination of interior spaces in buildings designed by him. First some of the most important buildings designed by Alvar Aalto were analyzed. Furthermore the types and forms of windows for natural lighting were demostrated in graphic ways, showing the efficient use of natural light in different seasons of the year and different positions of the sun. The aim of the research is to identify the details and methods used in natural light in the illumination of the interior spaces of different objects as libraries, museums, etc.. This study is important because it gives important conclusions of the architectural form importance, its various elements and the use of natural light efficiently lighting interior spaces in buildings.

Keywords: Natural light into the building, Alvar Aalto, Natural light, Modern architecture.

1 Introduction

1.1 Alvar Aalto's life (1898-1976)

Alvaro was born in Kourtane in 1898. His father was a surveyor, and his survey maps and outdoor fieldwork affected Alvar's understanding of terrain and the location of buildings in outdoors. In 1916 Aalto enrolled in the University of Technology, Helsinki, where he began to study architecture. In 1923 moved back to his home town, Jyväskylä, where he opened an architectural practice. In 1924 he married Aino Marsio, also an architect, but in 1949 she died and Aalvaro remarried in 1952.His new wife, Elissa Mäkiniemi, also participated closely in her husband's design work. The change in location marked the start of the architect's functionalist period. He moved towards a rational architectural language, inspired by Le Corbusier's ideas. Aalto was in contact with the international avant-garde of both architecture and art. He made a major contribution not just to modern architecture, but also as a designer of furniture and art glassor applied art. The architect received various awards, among the RIBA Royal Gold Medal for Architecture, the AIA Gold Medal and the Medaille d'OR of the Academie d'Architecture in Paris. He builded a new separate studio elsewhere in Munkiniemi, where his archives are still located today.

1.2 Alvar Aalto's works

During his entire career Aalto designed over 500 individual buildings, 300 of which were build, the majority of which are in Finland, but he has a few buildings in the USA, Germany, Italy and France. Alvaro's paintings were not made as individual artworks but as part of his process of architectural design.
Alvar Aalto's architecture was considered to be highly unic and personal in its nature. Aalto had never wanted to take part in discussions about its works because he thought that the object speaks itself. When studyind Aalto's architecture, we observe that his architectural elements, forms were, independent of chronological development throughout his work. Some of these elements include light, space fragmentation. The undulating surface is another element that has appeared in Aalto's work as ceiling,

wall, building form, space, glass vase, door handle, wood sculpture and furniture. In Aalto's works, most important it is the variety of scales at which the undulating surface is incorporated.
Natural lighting in the building is realized with the use of conical pyramidal skylights, and horizontal glazing. fan shape clerestory.

2 Case study:

North Jutland Art Museum"Kunsten" in Aalborg / Denmark, The Mount Angel Abbey Library, Oregon, Baker House Massachusetts U.S.A, Viipuri Library (Vyborg Russia), Main Building of the University of Technology.

2.1 North Jutland Art Museum "Kunsten" in Aalborg / Denmark (1958-1972)

The museum is a major work in the history of Danish architecture in being the only building in Denmark by the world-renowned Modernist architect Alvar Aalto and the Danish architect Jean-Jacques Baruël.

Fig. 1. Satellite image

Notes: geographical location of the building 56º 02' N 9º 54' E
The museum is designed to blend in with its natural surroundings, Situated on the edge of a large area of parks and woodland the North Jutland Art Museum, is a very flexible building, that, due to the mobile partition wall system, can change character, depending on the requirements of each individual exhibition .The clean lines of the marble clad building volumes, and the green copper roofs, blend harmoniously with the natural surroundings. The museum is famous for its beautiful natural light transmitted down onto the works of art via parabola-shaped skylight constructions.

Fig. 2. Aereal view

Fig. 3. Elongated skylights of the building

The total area is approx. 6000sq.m.With its roof rising in steps around the central hall, the building resembles a pyramid with a skylight in its lantern-like crown. The hall is flanked on two sides by a lobby and on the other by exhibition rooms, which can be divided flexibly by means of moveable wall units. Aalto here made use of a special lighting system consisting of two -sided, elongated skylights which on the south side prevent the sunlight from penetrating at an angle up to 56º (corresponding to Aalborg's latitude), but is open up to 90º on the north side.

Fig. 4, 5, 6. Parabolic reflecting surfaces

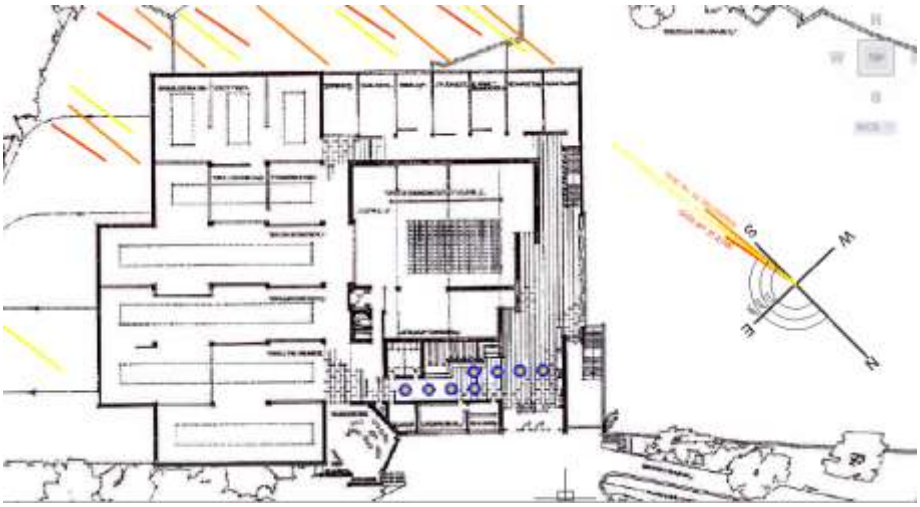


Fig. 7. Plan for the North Jutland Museum

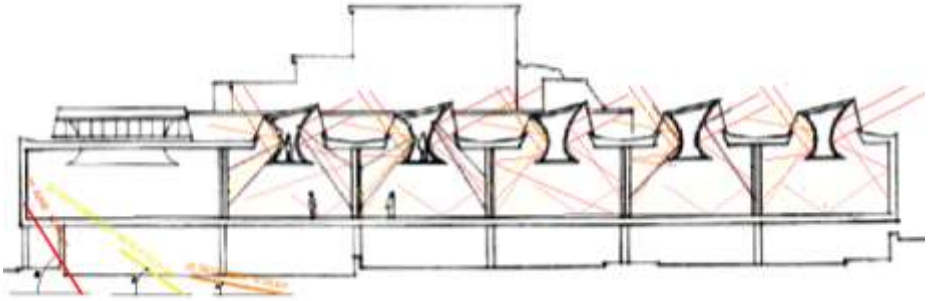


Fig. 8. Section of the North Jutland Museum

Notes: Sunlight angle of refraction and angle of reflection
Figure 8 represents the effect of using double parabolic reflecting surfaces. They are suspended from the ceiling, reflecting the light onto the walls shadowlessly. The main storey has a music room the natural lighting of which is realized with the use pyramidal skylights, and horizontal glazing. Sunlight angle in figure 2 is the result of the: Analysys of direct sunlight on 4 seasons.
summer solstice 21 june 2012 at 12:00 h
altitude 56°1' sunrise at 03: 26h
asimuth 169°5' sunset at 21:21h length of day 17.9 hours
winter solstice 22 december 2012 at 12:00 h
altitude 9°4' sunrise at 08: 59h
asimuth 174°6' sunset at 15:42h length of day 6.7 hours
spring equinox 21 march 2012 at 12:00 h
altitude 33°2' sunrise at 06: 20h
asimuth 171°7' sunset at 18:39h length of day 12.31 hours
autumn equinox 22 september 2012 at 12:00 h
altitude 33° sunrise at 06:07h
asimuth 176°.8' sunset at 18:20h length of day 12.2 hours

2.2 The Mount Angel Abbey Library, Saint Benedict, Oregon, USA 1964-1967

In 1964 Aalto designed a library building in the midst of the older educational and religious buildings in the countryside. The Mount Angel Abbey Library is a building where the pleasure of reading is combined with the efficiency and functionalism of a competent and specialized learning center.

Fig. 9. Satellite image

Notes: geographical location of the building, 45º 03' N 122º 46' W
An extensive shelf system configures the structure and the organization of the space. The building contains studio rooms and reading tables distributed on three rooms with good natural lighting.

Fig. 10,11, 12. Clerestory skylights and horizontal glazing

Natural lighting in the building is realized with the use of conical skylights, horizontal glazing and fan shape clerestory (Fig.10, 11, 12). A very functional modification is the addition of an artificial light source above the skylight which provides light during the winter days (fig.13) .The interior of the Library is organically pleasing. All of the pieces fit beautifully together. It is not just the lighting, but also the shapes, the volumes and the textures which all seem to come together quite nicely. The lending desk at the centre of the fan is surrounded by a curved clerestory skylight which provides shadowless light to the landings on three levels and to the connecting staircases. All of the lighting, no matter where you sit or stand, is soft. There are few shadows, even at night, when you no longer have the benefit of the soft natural lighting. The central skylight creates an atrium-like space that attracts people. The space is evenly illuminated, with few shadows. Without being outdoors, there is a sense of the weather and time of the day. Indirect sunlight enters the building from the main skylight and bounces off the surrounding ceiling and wall surfaces. The light comes from a multitude of directions.

Fig. 13. Artificial light above the Conical skylight

Fig. 14. Clerestory skylights

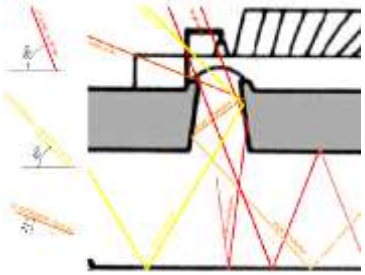


Fig15 Section: light angle of fall, angle of refraction and angle of reflection

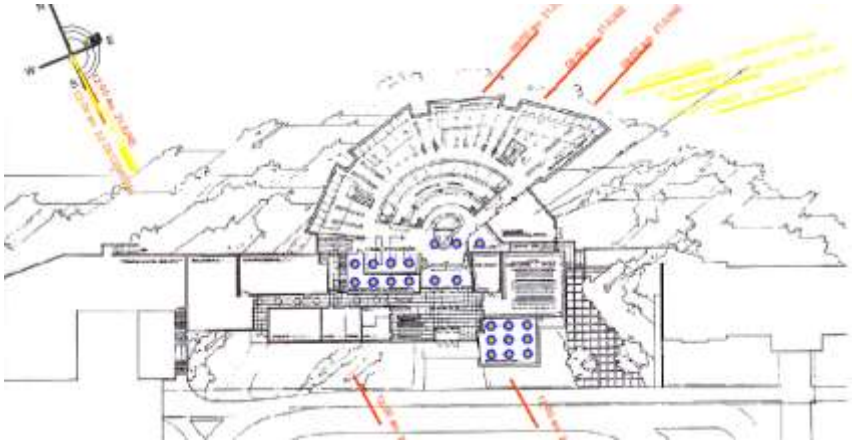


Fig. 16. Plan of Abbey Library

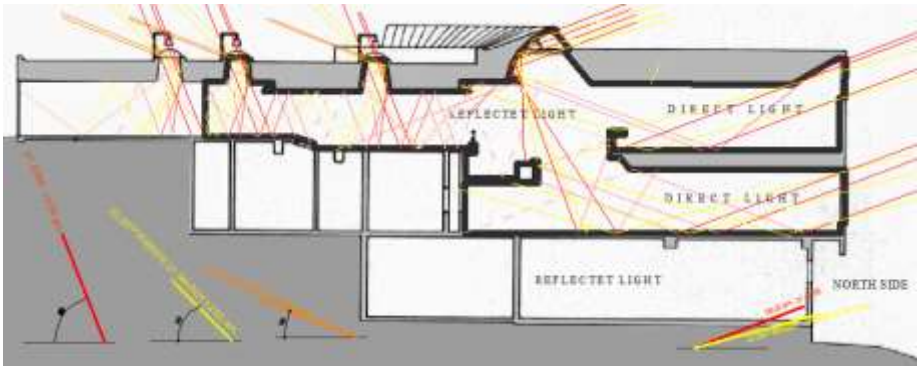


Fig. 17. Section of Abbey Library

Notes: sunlight angle of refraction and angle of reflection.
Figure 17 represents the effect of using conical and clerestory skylight. Alto using clerestory skylights and making a fragmentation to the space creates the opportunity to directly illuminate even the quotes below.
Sunlight angle in figure 17 is the result of the: Analysys of direct sunlight on 4 seasons
summer solstice 21 june 2012 at 12:00 h
altitude 68°3' sunrise at 04: 23h
asimuth 173°5' sunset at 20:00h length of day 15.6 hours
winter solstice 22 december 2012 at 12:00 h
altitude 21°5' sunrise at 07: 46h
asimuth 177°4' sunset at 16:32h length of day 8.7 hours
spring equinox 21 march 2012 at 12:00 h
altitude 45°5' sunrise at 06: 10h
asimuth 175° sunset at 18:25h length of day 12.25 hours
autumn equinox 22 september 2012 at 12:00 h
altitude 44°9' sunrise at 05: 58h
asimuth 175° sunset at 18:06h length of day 12.4 hours

2.3 Baker House

Senior Dormitory for MIT, 362 Memorial Drive Cambridge, Massachusetts, USA, 1946. In 1937 the institute gave him the chance to build in a response to the issues of technology, monumentality and

humanism, to design Baker House, a large dormitory for senior students. The chosen site on Memorial Drive was long and relatively narrow and ran parallel to the adjacent Charles River.

Fig. 18. Satellite image

Notes: geographical location of the building, 42º 21' N 71º 05' W
Despite his reputation as an intuitive designer whose ideas emerged from soft-pencil sketches. Aalto presented the project as an exercise in rational design. In a series of comparative studies, he illustrated the advantages and disadvantages of various more conventionally "functional" volumetric arrangements, evaluating each in terms of sun, view and privacy. His point was that while the serpentine, double-curved form he chose might appear "irrational", a formal echo of the meandering river rather than a logical solution to the problem, in fact it made best use of the site by affording nearly every room both sunlight and a view of the river.

Fig. 19, 20. Aereal view and perspective of the building

The serpentine plan generated a variety of room shapes, which the students soon named "coffins, pies and couches", and was set against an orthogonal, diagonally aligned, two-storey block containing the communal facilities. The building's undulating form also does not subject the views of the rooms to be oriented at right angles towards the busy street. The main corridor was broad and varied, swelling and narrowing in response to the density of use or to accommodate informal sitting areas. The form established a wide variety of room shapes, creating 43 rooms and 22 different room shapes per floor that although similar, still required distinct designs for the placement of built-in furniture. Aalto refused to design north-facing rooms since he wanted most rooms to have a view of the river from the east or west, and thus proposed enlarging the rooms on the western end into large double and triple rooms that receive both northern and western light.Instead of rooms, a stairway systems (Fig. 21, 22) is housed on the north side of the building with an unobstructed view of its surroundings. Aalto's choice of stairs – a cantilevered pair that cascaded, scalaregia-like towards the main entrance – gave the elevation facing the campus a distinctive, and decidedly monumental quality.

Fig. 21, 22. Image of stairway systems

Looking across the Charles, the building's silhouette shines in the dawn or dusk. Its hundreds of hardwood, custom-crafted windows bring the building to life as nothing else can. Originally, the pine windows were painted a light gray and required frequent maintenance. Then those windows were all replaced with aluminum in the 1970s. But the cold visual impression of metal could not erase the memory of the original architect's warm use of rich, vibrant wood.
For the brick walls, Aalto chose a rough clinker brick that came in a surprising variety of colors and irregular shapes. He asked that even the most erratically formed ones should be used – some are literally banana shaped and appear to be on the brink of falling out of the walls – and also specified that the bedding joints should be more deeply recessed than the vertical joints. The result is a building that reflects a flexible standardization. In Baker House, Alvar Aalto makes use of pyramidal skylights The skylights open spatially to the sky above and are heated by the lighting fixtures which also provide supplemental winter lighting, while keeping the snow off.

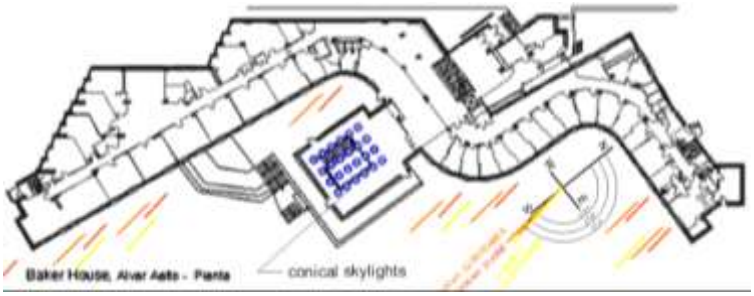


Fig. 23. Plan of Baker House

Figure 23 represents the effect of using conical skylights.
Sunlight angle in figure 23 is the result of the: Analysys of direct sunlight on 4 seasons.
summer solstice 21 june 2012 at 12:00 h
altitude 70°9' sunrise at 04: 07h
asimuth 188°7' sunset at 19:25h length of day 15.29 hours
winter solstice 22 december 2012 at 12:00 h
altitude 24°2' sunrise at 07: 10h
asimuth 185° sunset at 16:16h length of day 9.1 hours
spring equinox 21 march 2012 at 12:00 h
altitude 48°3' sunrise at 05: 45h
asimuth 184°3' sunset at 17:58h length of day 12.22 hours
autumn equinox 22 september 2012 at 12:00 h
altitude 47°4' sunrise at 05: 32h
asimuth 189° sunset at 17: 41h length of day 12.15 hours

2.4. Viipuri Library

Vyborg, Russia 1933-1835. In 1927, Aalto won the competition for the Viipuri City Library. Aalto drafted the final version and the library was inaugurated on October 14, 1935. The building compromises two elongated volumes that blend to create a common area that uses the entrance, the stairs and the vestibule to the auditorium, as well as some reading rooms and the children's library, which Aalto designed with special attention to the details.

Fig. 24. Satellite image Notes: geographical location of the building, 60º 42' N 28º 44' W

Fig. 25. Sketch of barrel skylights

Fig. 26. The Hall's undulating ceiling

Aalto reverted to his original idea of top-lighting for the lending and reading rooms, though this time he solved the problems of winter snow and direct sunlight with rows of round barrel skylights which rise above the roof surface and screen the light against brusque changes of illumination that would disturb readers. Other important innovations included a generous use of light, unpainted wood paneling, irregular serpentine lines in the interiors, and specially designed, functional light fixtures.

In Viipuri Library Aalto integrates the modern esthetic into his handling of volumetric, functional, spatial, and environmental relationships. The library's architectural core consists of reading and lending areas at different levels and plateaus while the centre and control area from the high point above the different levels.

In the ceiling of the meeting hall of the Viipuri Library the undulating surface (Fig.26) became a significant and dominant architectural element. The ceiling's importance lies in both its rational function, as seen from Aalto's statement concerning the flowing quality of the sound as it moves through the space

The diversity of architectural forms Aalto has created to bring light into his spaces, the manner the skylights spatially model the ceiling surfaces. and the manner in which the lighting forms mediate between inside and outside, make Aaltos 's utilization of light is important on several levels. This is a response to the dynamic Finnish environment, with its dark winters and light summers. A majority of the important spaces in Aalto's buildings incorporate the use of skylight and clerestories for obtaining natural light. The ceiling of conical skylights in the Viipuri Library reading area is as significant in Aalto's work as the undulating ceiling of the meeting room.

In the ceiling of the Viipuri Library, (Fig 27) Aalto developed the conical skylights in the reading area. Six feet in depth, they provide a diffused light to the space.

Aalto uses these skylights and also linear ones, to unify, reinforce and articulate the structure. Both skylights not only help define the particulars of the space, but modulate the ceiling to achieve a total synthesis of the ensemble.

Fig. 27. Interior of conical skylights

Fig. 28. Exterior of conical skylights

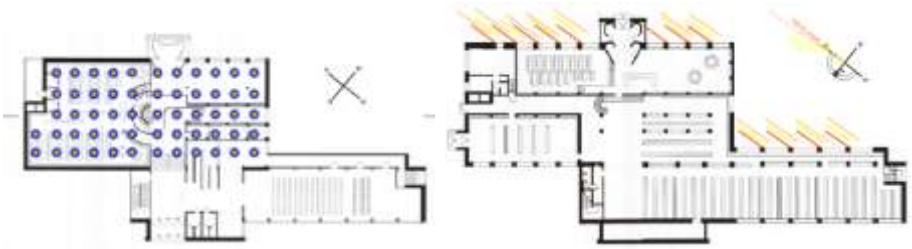


Fig. 29. Plans of Viipuri Library

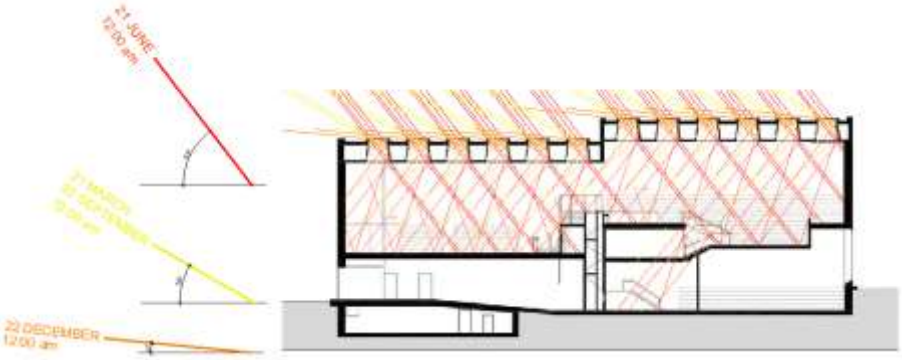


Fig. 30. Section of Viipuri Library

Notes: Sunlight angle of refraction and angle of reflection.
Figure 30 represents the effect of using conical skylights and horizontal glazing.
Sunlight angle in figure 30 is the result of the: Analysys of direct sunlight on 4 seasons
summer solstice 21 june 2012 at 12:00 h
altitude 53° sunrise at 02: 37h
asimuth 177°6' sunset at 21:39h length of day 19 hours
winter solstice 22 december 2012 at 12:00 h
altitude 06°1' sunrise at 09: 13h
asimuth 176° 8' sunset at 14:57h length of day 5.7 hours
spring equinox 21 march 2012 at 12:00 h
altitude 30° sunrise at 06: 04h
asimuth 176°2' sunset at 18:24h length of day 12.34 hours
autumn equinox 22 september 2012 at 12:00 h
altitude 29°7' sunrise at 05: 51h
asimuth 177° sunset at 18: 05h length of day 12.24 hours

2.5. Main Building of the University of Technology

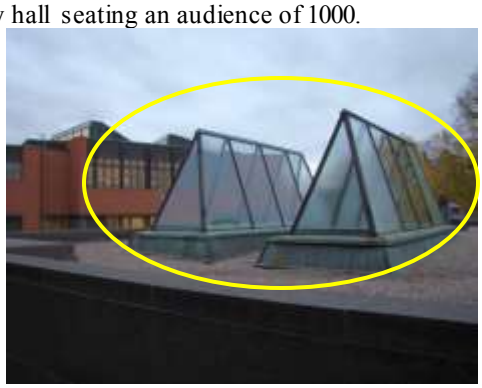
Helsinki University of Technology Otakaari 1 X, Otaniemi, Helsinki, Finland 1953-1967.After Aalto had won the competition for the technical University' new placing in Otaniemi outside the Helsinki city limits in 1949, a long-drawn-out period of development began in 1953, the basic design of the main building being completed in 1955. The building is one of Aalto's most powerful and convincing designs. Its centre point is the tower-like, beveled cylinder segment that soars from the high point of the site, (Pic.24) where the Otaniemi manor house once stood amid a park now integrated into the university campus.

Fig.31. Satellite image

Notes: geographical location of the building, 60º 11' N 24º 49' W

The original building program included an assembly hall seating an audience of 1000.

Fig. 24. Image of the building



Pic. 25. Image of pyramidal skylights.

Aalto wanted to have a further possibility of building this auditorium by placing in the tower two auditoria with identical cross sections, one seating 576 listeners and the other 327, separated by a temporary partition. Basically these form a single cavea, with staggered tiers in the shape of a circle segment rhythmically echoed by the steep rise of the roof, in which vertical "stair" surfaces are replaced by rows of windows. The two large, adjacent auditoria, furnished with acoustic wall elements, project a magnificent sense of space.

Pic. 26. Interior of the auditorium

Pic. 27. Interior view of conical skylights

Around this centre piece, which has an entrance hall at ground level, the other parts of the building complex are grouped irregularly on storeys 1-4 like dominoes which can be linked as needed, forming smaller courtyard patterns. On third floor to one side of the tower is the administrative section with the principal's office, council room, etc; on second floor is a rectangular auditorium and hall space; and on ground floor the teacher's and students cafeterias. On the other side are classrooms for first and second-year general studies, a physics laboratory lit by oblong prisms in the roof, and auditorium for 310 listeners, and the departments of surveying and architecture. One cannot help suspecting that Aalto favoured these two departments that for biographical reasons were closest to his heart: the other departments, with their laboratories, classrooms, etc, are in separate buildings designed by other architects.

In exterior planning, Aalto-true to his principles-separated motorized traffic on the outside of the complex from pedestrian traffic on the inside, where green lawns and pathways to the other departments and student housing from a peaceful campus. At the beveled lower tip of the tower, Aalto build a small open-air theatre as a termination to the staggered roof, a place for students to gather informally for discussions, sunbathing, or even to listen to the principal's speeches from an adjacent window in the administrative wing. All of the parts of the building are planned to allow extension without damaging the original structure. The main materials used for the building are black granite, specially manufactured dark red bricks, and copper. All of the departments are designed so as to accommodate enlargement without damaging the overall impression. The firs enlargement of the main building took place between 1966 and 1976, consisting of a new two-storey office wing on the south side and new auditoria and other additional space on the west.

Marble has been used for the places which are eventually intended to house a collection of architectural fragments, as especially the collection's historical parts will harmonize best with this material. This collection, which will certainly take time to develop, corresponds in the teaching of architecture to the other department's laboratories, and must therefore be placed on a par with them in budgeting.

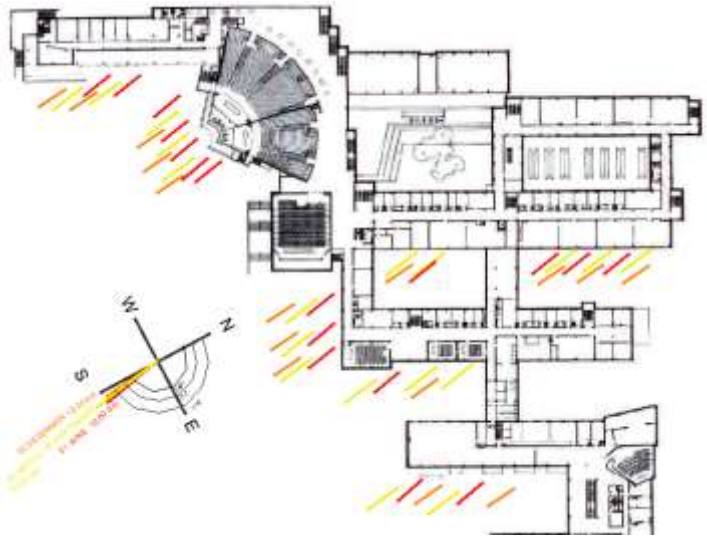


Fig. 9. Plan of Main Building of the University of Technology

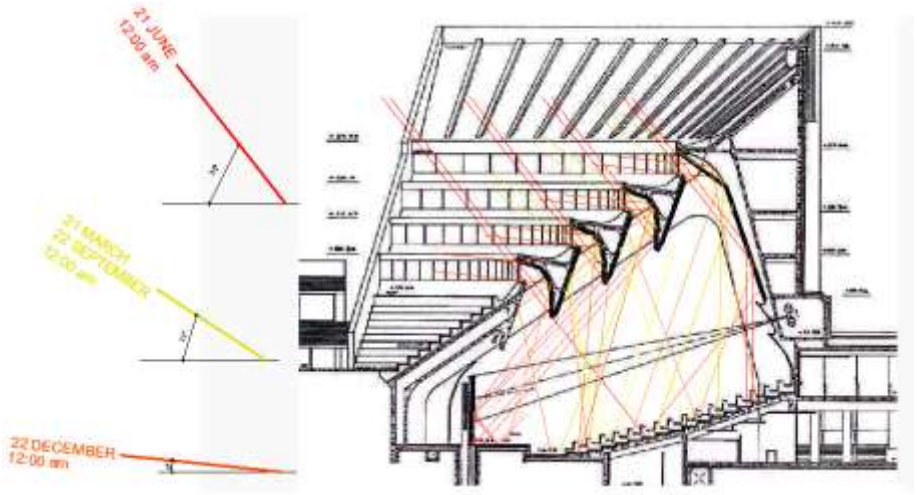


Fig. 10. Section of Main Building

Notes: Sunlight angle of refraction and angle of reflection.

Figure 10 represents the effect of using conical, pyramidal skylights, fan shape clerestory and horizontal glazing.

Sunlight angle in figure 10 is the result of the:Analysys of direct sunlight on 4 seasons.

summer solstice 21 june 2012 at 12:00 h
altitude 52°1' sunrise at 02: 56h
asimuth 171°6' sunset at 21:51h length of day 18.9 hours
winter solstice 22 december 2012 at 12:00 h
altitude 06°3' sunrise at 09: 26h
asimuth 174°2' sunset at 15:16h length of day 5.8 hours
spring equinox 21 march 2012 at 12:00 h
altitude 30°1' sunrise at 06: 20h
asimuth 171°6' sunset at 18:40h length of day 12.34 hours
autumn equinox 22 september 2012 at 12:00 h
altitude 29°9' sunrise at 06: 07h
asimuth 175°8' sunset at 18: 21h length of day 12.24 hours

Notes: Figures of Plans and Section with graphic drawings explainations of the sunlight angle of refraction and angle of reflection are part of personal research.

Conclusions

Alvar Aalto was a master at utilizing light which is very important to us in this climate and Aalto understood this

Alvar Aalto concerned himself with the problems of light, staircase and handrail, space, texture, the reconciliation of inside and outside, sinuosity, scale, and the passage of time, architectural concerns from which he developed an expressive architectural language. Aalto never forgot the role and purpose of the architect. His concerns were architectonic ones explored and examined in the context of designing and building. Alvar Aalto, the architect, believed in architecture as an affirmative act, and that the role of the architect is to design and build. His style was contextual and vernacular, he was very sensitive to contours of the land, angles and direction of the sunlight. He was very conscious of the need for social settings linked directly to natural surroundings with the use of natural landscape. They achieved this through natural living conditions, the use of natural materials, and integration within the boundaries of landscape and vegetation. Nature, sun, trees, and air all served as functions in creating a harmonious balance between natural and artificial.He is one of the most important architects of modern architecture and its influence is growing.

References

1. Goran Schildt (1994). Alvar Aalto,The complete catalogue of Architecture Desing and Art.
2. Karl Fleig (1994). Alvar Aalto.
3. Goran Schildt (1984). Alvar Aalto, vol. I The Early Years, Rizzoli. New York.
4. Goran Schildt (1986). Alvar Aalto, vol. II Decisive Years, Rizzoli. New York.
5. Goran Schildt (1991). Alvar Aalto, vol. III The Mature Years, Rizzoli. New York.
6. Fabio Mangone, Maria Luisa Scalvini (1993). Alvar Aalto. Laterza, Bari-Roma.
7. http://www.iie.org/en/Offices/New-York/about-alvar-aalto

The Impact of Socialist Realism Ideology in the Albanian Architecture from 1945-1990

Olisa Ndreçka[1], Florian Nepravishta[2]
[12] Polytechnic University of TiranaFaculty of Architecture and Urbanism
Tirana, Albania
o.ndrecka@gmail.com[1],f_nepravishta@yahoo.com[2]

Abstract. The socialist Style in the Eastern European countries was considered a great style. It was called the "proletariat style" that combined the communist ideology with the artistic image, a style that was socialist in content and national in form. Construction and Architecture in Albania after the Second World War until 1990, exactly for 45 years, were guided by certain principles, as aesthetic design concepts, as well as the norms and rules that were binding and strong for architects. "Canons" funnel architects relations with the government and the Party. The paper treats: historical description of socialist realism, the initial development of the architecture of the socialist realism in Albania, the influence of the decisions of the Labor Party of Albania (PPSH), how the Albanian architecture and the development conditions of the constructions were radically changed by the ideas of the socialist realism, how this style was strongly supported by the post-war architects, graduated in East and by the Soviet architects.

Keywords: socialist realism, architecture, ideology, dictatorship

1 Introduction

Totalitarian regimes are characterized by attempts to control everyone and everything at any cost; by force and propaganda, they impose a single truth about the world and people. Lenin's Bolshevik revolution in 1917 is conducted in the name of socialism and proletarian state power passes under the control of the party. After the Second World War the Soviet Union carried out a powerful invasion in many countries of Eastern Europe. Albania entered into the fold of Soviet Union, "impatient" to pay tribute to Stalin. New elements of the Stalinist economic system, urban planning and design were imposed. The relationship between architecture and politics is one of the dominant themes devoted to Albanian architecture from 1945-1990. Although the beginning of `90s was the end of the Socialist realism period in Albania still today, there is a "strange "approach to the heritage of that period. In fact, this is one of the main problems. First, it is not considered as a contribution in the Albanian history of architecture; on the contrary, there is a continued demand to destroy any trace or proof of the socialist realism period. Secondly, there are damages, destruction and loss of identity for the buildings that date back to that period. Thirdly, there is Lack of Maintenance and total abandonment phenomenon that make this heritage almost unrecoverable.

2 Historical Description of Socialist Realism in Architecture

Socialist realism is a style of realistic art, which was developed in the Soviet Union and became a dominant style in other socialist countries. Socialist realism is a teleologically-oriented style having as its purpose the furtherance of the goals of socialism and communism.

During the October Revolution of 1917, the Bolsheviks established an institution called Proletkult (the Proletarian Cultural and Enlightenment Organizations) which sought to put all arts into the service of the dictatorship. Socialist realism became state policy in 1932 when Soviet leader Joseph Stalin promulgated the decree "On the Reconstruction of Literary and Art Organizations". Accordingly, the

Moscow and Leningrad Union of Artists was established in 1932, which ended the history of post-revolutionary art. The epoch of Soviet art began..The style of socialist realism, according to Anders Aman, appeared for the first time in 1933 in the Soviet Union on the occasions of the national competition for the Palace of the Soviets in Moscow [1]. In fact, in February 1931, soviet architects received invitations to bid for the Palace of Soviets design. Until February 1933, several contests were held and many architects participated, but there was not any winner.

To indoctrinate the masses, the socialist realism ideology was also forced in the arts and sciences, culture, and architecture.This ideology became popular not only in the Soviet Union, but also among other eastern European countries, such as Romania, Bulgaria, Hungary, Czechoslovakia, Yugoslavia and so forth.

The congress of Architects in 1937 (Union Congress of All Soviet Architects, in June 19), was a very important event for Soviet architecture. In this congress was drafted the code of Socialist Realism architecture, which states: "The proletariat must create a style in Architecture"[11]. The Soviet architecture, borrows the form from the past, essentially by ancient Greek architecture that should incorporate new content with the old form. The only valid architecture by the Congress, is the classic architectural style, as literature requires a red Tolstoy, also architecture should have a red Palladio. In conjunction with the Socialist Classical style of architecture, Socialist realism was the officially approved type of art in the Soviet Union and in the Eastern European countries. All material goods and means of production belonged to the community as a whole; this included means of producing art, which were also seen as powerful propaganda tools. Architecture in the former Soviet Union during the Socialist realism period was called also Stalinist architecture, considering that the Soviet Union was under the leadership of Joseph Stalin Stalinist architecture is associated with the socialist realism school of art and architecture.

3 The Initial Development of the Architecture of the Socialist Realism in Albania

The Albanian Communist Party and his leader Enver Hoxha gained power in Albania in 1944. During the following years, the Soviet economic, political and ideological model was introduced in Albania, which became one of the strongest communist states, totally isolated from the rest of the world after 1978 when all connections to other countries had been broken. Hoxha ruled Albania as a dictator until his death in 1985. Albania was then the poorest country in Europe.

The communist ideology was reflected in the physical environment, which was changed in a harsh way during this period. New towns were built as well as many huge industries, city centers of existing cities were re-constructed, statues and monuments were raised and street names were changed. Historical buildings that did not suit the dictatorship were torn down. Religious buildings were demolished or turned into profane buildings since Albania in theory was an atheistic state. Construction and Architecture in Albania after the Second Word Ware until 1990, exactly for 45 years, were guided by certain principles of socialist realism, as aesthetic design concepts, as well as the norms and rules that were binding and strong for architects.

There were radical changes in social and economic structure, because of the ideas of socialist realism. In terms of architecture, after the war, the style, the "direction" or "language" of the Albanian architecture and urban planning was expected to be chosen. Almost all the options, where to choose the "direction" and the style from the examples of countries of Central and Eastern Europe, although in many Albanian cities were laid solid foundations of the Italian rationalist architecture, MIAR (Movimento Italiano di Architettura Razionale).

Albanian architecture "decided" and underwent the method of socialist realism. The Genesis of the Albanian architecture, in the communist period is found in Social realism theory and practice of the Soviet Union, namely the Congress of Architects in 1937.

4 The Soviet Influence

The Soviet influence was absolute, but from the years 1947-48 Albania was also under the influence of Yugoslavia, that had built up under the influence of western country's architecture, at least, Yugoslavia did not blindly follow the canons of socialist realism of the Soviet Union. From 1951 -52 the first Albanian architects of the post-war who had studied in the Soviet Union, after completing the studies began working at home, and later supported by many others who came from the popular democracies of Eastern Europe, Soviet satellites, as our country was. The latter ones were closer to the idea of contemporary architecture, thanks to a tradition rooted in these countries before the war. Education in the prevailing spirit of the time, consequently brought projects that strictly followed the Soviet example. Any deviation was called "antisovjetizem" and was punished. Punitive measures were conditioned by the status or class of the society of the individual and also their political credibility. Among the first buildings built in Albania that reflected the socialist style were; Industrial buildings such as "Stalin Textiles Factory" , designed by the Soviet and built in the early 50'in the suburbs of Tirana, and Faculty of History and Philology. Kino studio "New Albania" was designed again by the Soviet and built in 1951-1952 in Tirana. The Soviet project was correctly implemented. In the main boulevard of Tirana, the Central committee of Labor Party of Albania is another example of the Soviet influence in the Albanian architecture in that period. (Figure 1,2,3)

Fig. 1. Former Central Committee of Labor Party of Albania.

Fig. 2. Kino studio "New Albania".

Fig. 3. Faculty of History and Philology.

This situation continued until 1955-56. At that time, there was a turn in the XIX Congress of the Communist Party, in the Soviet Union, that revised the official history. Therefore, the rehabilitation of the contemporary architecture was made, and the current stream known at that time as regressive and archaic was criticized because it was obligatory in the 1930s. Before these years, the architecture was better compared to the world architecture. Even in our country, the ten years - experience was criticized due to the phenomenon that happened in the Soviet Union, because we quickly got used to their policy. The criticism focused on the excessive and the pointlessness decoration of the facades, while the core remained intact, planning through the urban policies, an industrial-agrarian development of the country where 70% of the population was situated in the villages. The unnecessary ornamentation was removed. Furthermore, the facilities built with low quality available materials, and without exterior plastering seemed poor. The architects had design requirements or prescribed conditions. For this reason the opportunities for something new, were restricted for usual facilities. Obviously, there were requests from the government for buildings of special importance. In such cases, the architecture had to make use of new ways of conception, and also construction with new good quality materials. This was a model also in Albania. Lack of decorations and many other elements that characterize the style of architecture up to that period for Albania, was considered as construction cost reduction, and loyalty to the Soviet Union decisions.

For several years, the Stalinist architecture was a model. The break of the relations with the former Soviet Union marks a relatively difficult period in the Albanian architecture in the early '60s. After the break of the relations, the friendly warm period in which the maximum was obtained from architectural projects and professionals from the former Soviet Union, ended. Many buildings (even some very important) were "abandoned", and Albanian Engineers and architects were forced to continue the construction of these major works by making changes, without excluding Stalinist ideology, but bringing it in the best rational form. The Palace of Culture was one of these buildings. It was built on the former Tirana's Old Bazaar. The first stone was symbolically put by the former First Secretary of the Communist Nikita Khrushchev in 1959. The building was a gift for Albanians from the Russian government. The Russian design group presented three versions of the project. The Politburo selected the winning version. In this version, changes should be made, so a part of Soviet designers stayed in Albania to correct the project- idea, also Albanian architects and engineers group took part to help in the matter.(Figure 8,9)

After finishing the project, the Russian staff left, keeping in touch with the group of designers, sending the project partially. The Albanian group of designers never had the full project design, so the break of the relations, caused a very big “cramp” for the work progress. The Work began followed by the drawings and supplements to the existing drawings, so that the project could be as close as possible to the soviet one. Meanwhile, the Party and the government wanted the Palace of Culture to become larger. As a result, the program was extended and the number of floors was increased, a library space was added even though it was not part of the project designed by the Soviets.(Figure 4,5,6,7)

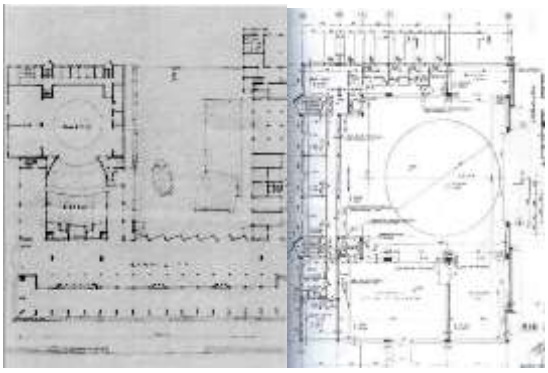


Fig. 4. The palace of Culture, the ground floor plan. **Fig. 5.** The palace of Culture, the second floor plan.

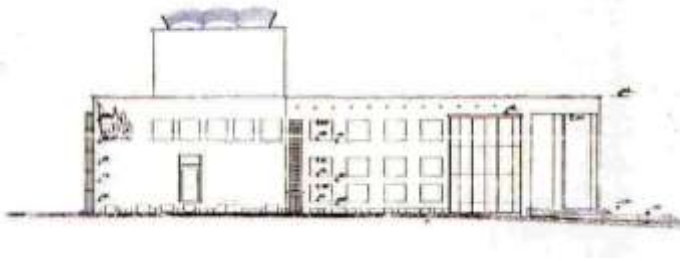


Fig. 6. The palace of Culture, section.

Fig. 7. The palace of Culture, section.

Fig. 8. The palace of Culture in the ’60.

Fig. 9. The palace of Culture.

5 The Influence of the Labor Party of Albania

The Genesis of socialist realism architecture in Albanian can be found in the decisions of the Labor Party of Albania and the totalitarian government. In the Politburo meetings that used to be called "Plenum", were processed and approved guidelines, thesis, principles, and codes. This style, in Albania was strongly supported by the group of the post-war architects, graduated in the universities of architecture in the former Soviet Union, and in other countries of the former communist camp, and it was also supported by the creativity of Soviet architects who were invited to design very important buildings in Albania.

The Party and the government led the policy of the construction and architecture in Albania, observing the Ministry of Construction as the principal institution in charge for designs, urban studies, engineering and architectural buildings. First buildings of the socialist realism in Albania are those with social, administrative and cultural character. The socialist realism style in the Albanian architecture was treated as a political and ideological approach, and was always mentioned by political propaganda, that this style is strong and conceived in such way to fight against the foreign architectural models of the capitalist countries. After the 1960, Albania, as a poor country met the demands, for a rational, simple and functional architecture based on the modern technology of that time, and the industrialization of construction. The method of socialist realism style was always a political dogma, because it had no executive value, It did not help as a design instrument . The socialist Content and the national forms remain only slogans.

"Let's build quickly good, and cheap." This slogan should have been followed, and under this motto were built most of the buildings in Albania.

In many cases, the architect's initiatives and attempt to "dare" "in functional and constructive solutions, or in the design of facades, were immediately rejected, claiming that these solutions would be costly. Architect of the time stated that: there was the ministry team of control that in separate social circles was called the "saving team that although the design of the facilities had a low budget, again there attempts to reduce the cost. For this reason, we can say that many of the buildings constructed in communist Albania could have been better. The influence of the party was present in the life of everyone because, under the socialist system there was a rigid rule that all specialists, as Party cadres, were under the management of a department (dikaster), in order to exercise centralized control. Whenever the architects wanted to have new bonds, the main instances were not satisfied. The project process was closed; it had to do with the constructing matter, not accepting its artistic attributes, since the construction itself was included in economical plans.

According to Hoxha "anything that will be built, will serve the masses, because they will live in these built cities, will walk in their streets and will enjoy the sunlight that will penetrate everywhere"[4].

The most important part of architecture, the artistic side, was left aside, neglected but was considered only on special occasions. Only the government, the Party, chose the facilities where the ornaments could be used. The key element in the construction matter was the functional solution. Every extra request was regarded as excessive and finally was not accepted. Following this method, the progress was very difficult. The technical councils were the only place where the discussions were held. It was up to the department functionary to make decisions on the matter. There were numerous cases when the Communist Party, present more than ever, was "revolted "against the professional's attempts to design and project facilities in a modern style, the so-called revisionist (or words ending in –ism) used at that time. The system had a policy; building low cost living facilities, and building the administrative state facilities with relatively high budget (considering the poverty in Albania. The initiatives and attempts of the architects, not to follow the rules, as mentioned above, were eliminated immediately, but there were courageous architects whose designs and works were attacked and punished from the system because of economical, ideological and political reasons.

An example of this is Maks Velo's residential building named as "Dice residential building". The building attracted the attention of the people, and certainly, was considered a trend towards cubism, not only by those who in a hidden way, shared the same opinion, but also by the ones who were insistent and mean and attacked the work together with its architect. The centrally located building would be a continuous provocation for the designing and projecting way of the time. The building itself would be a target of charges, especially after the architect was sentenced in prison. The building sometimes was called modernist, cubist and the government were in favor of its demolition.(Figure 10,11)

Fig. 10. Perspective Drawing of the Residential Building.

In an article in "Drita" newspaper was written; The cost of an apartment was doubled, in the residential building next to the store department (called Mapo). There was a drawback in designing the apartment, there was living and service unjustified space, of different sizes and shapes. Because of the "free architecture" the façade, not only has not functional balconies, but the foreign impact also affected the function and the facade of the building. The impact was immense in the economic aspect, because the budget used in this building, would be enough for building twice the number of the apartments. The contradict comes from the foreign impact and trend. The saving regime is strengthened by the beauty and simplicity, which is in harmony with the national style, contradicting the redundancy, the luxury and the overuse of expensive materials.
Despite the written and spoken comments, the project of this building normally was introduced in the technical counsel as well as another special commission of the Ministry of Construction that purposely checked this building. As mentioned above, for the buildings that were considered important for the government, there was a considerable budget and for their design, the most successful architect was called. The National Historical Museum was one of the buildings, and the government had great requirements and expectations of its construction. The impact of the party, stronger than ever decided and assigned how it should be designed and built. "The museum stands as a monument which the party raised in the glorious and heroic history of our country in centuries "was said in one of the newspapers of that time.

Fig. 11. Photo of the Residential Building.

The National Historical Museum was inaugurated on 28 October in 1981, and is one the biggest museum institution in Albania. Located in the western side of the square of "Skanderbeg", the museum is one of the most important architectural works, playing an important role in the urban formation of the center of Tirana.(Figure 12)

In the first ages of the project, frequent meetings with the government were inevitable, because their thoughts and suggests, served as a solid foundation for the development of the project. In Enver Hoxha's works, there are certain remarks regarding the construction of the National Historical Museum in terms

of, its volume and the impact of the ideology used for the design of the building. He was dissatisfied for the lack of the political, ideological, cultural and military concepts in the content of the museum, and he urged to reveal (from this building) the Marxism-Leninism point of view.

The dictator himself did not hesitate to give his opinion on the architectural concept, forcing the professionals not to have extravagant ideas about graceful and gigantic buildings. On the contrary, they had to give the museum national and traditional features. There were more and more orientations and suggestions, and there were comparisons and parallelism such as "the belt of ammo", as an identifying element or symbol of the national war of liberation, leaded by the communist party. Such interventions were at some extending harsh, when intervening in the creative process and the work of the architect[4].

Fig. 12. Photos of the National Historical Museum.

6 Discussion and Conclusions

For several years, the Socialist realism style was a model for the Albanian architecture and urban planning. After the break of the relations with the former Soviet Union, the ideology led the policy the construction and architecture by the directives of the Communist party. The ideology led the policy of the construction and architecture in Albania during 1945-90 and this heritage needs to be preserved for next generations. The socialist realism ideology affected not only a few culture, media and public-political buildings, but also social, educational and service buildings. The common point of view among the people is to totally forget, destroy any memories facts and buildings of that period, maybe these happens because the communist period is still recent and many Albanians directly or indirectly suffered during this period, but on the other hand, there are several buildings considered as communist heritage that carry cultural values and represent an important period in the Albanian architecture. The communist heritage should be recognized from the younger and future generations, and the best way is to give a possibility to better understand the past of their society as well as the present and themselves. There are several facilities/ buildings that are regarded as important examples of architecture and ideology, and they represent aesthetics and functionality features. The socialist realism ideology affected the landscape and cityscape in almost every aspect of architecture and urban planning. The most important thing to do with the built heritage from this period is; to not divide buildings constructed in that period, from the history of Albanian architecture. Although this is considered hard to do in a cultural landscape produced and transformed by a dictatorship, because some of the buildings clearly belong to the system's ideology. Many other elements and shapes of this architecture are found again in later buildings that were constructed after the 1990's creating, so a stereotype of the architectural elements used mainly by the architects. The rest of the remaining heritage, part of the Albanian architecture in socialist realism, should necessarily be preserved because; Despite the conditions of the political system, the attempts of a great number of architects, succeeded in projecting many buildings that even today have a special and noticeable importance. It is an asset of that period in the field of designing and constructing that reveals the mentality of that system. It reflects and transmits the concepts and ideological principles of the architecture of the time. Even though the economic capacity was unsatisfactory, the values of the tradition and heritage shown in the buildings could also be noticed in the field of design and construction.

References

1. Åman, A. A.(1992), Architecture and Ideology in Eastern Europe during the Stalin Era : an aspect of Cold War history (Cambridge: MIT Press)
2. Bego, B. M. (2009). Skeda Arkitekture 1965- 2004 Ne kroniken e nje jete te dallgezuar, Monografi: Ceshtja e strehimit ne periudhen e socializmit real.Shtypi:Gent Grafik.
3. Caushi , C. T. (1975)Estetika ne edukimin komunist. Shtypshkronja"8 Nëntori"
4. Hoxha, H. E. (1977) - Vëllimi 62 Korrik 1977-Nëntor 1977
5. Pirgu, P. I.(2011) Semih Pashallari Arkitekti i heshtur.Shtepia botuese ILAR
6. Velo, V. M.(1998) Paralel me arkitekturën.Shtepia botuese ILAR
7. Ivanov, I. V.S. (2007)Unknown Socialist Realism.The Leningrad School
8. Instituti i Historisë. (1983)Historia e Shqipërisë, Vëllimi i katërt (1944-1975),
9. Drita newspaper, march 5th 1972
10. Dmitry Khmelnitsky. Stalin the Architect(2007)
11. http://gazeta55.al/index.php?artikulli=17188
12. http://en.wikipedia.org/wiki/Socialist_realism
13. http://www.marxists.org/history/ussr/events/revolution/index.htm
14. http: //history1900s.about.com/od/Russian-Revolution/a/Russian-Revolution.htm

Pervious Concrete-New Solution for Sustainable Urban Street Construction Case: Prishtina and Tirana

Driton R. Kryeziu[1], Mevlan Qafleshi[2], Fisnik Kadiu[3]
[1] University for Business and Technology, Faculty for Architecture, Prishtinë, Kosova
[2]Faculty of Mathematical Engineering & Physical Engineering, Polytechnic University of Tirana, Tirana, Albania
[3] Civil Engineering Faculty, Tirana, Albania

Abstract. Great problems resulting from the rainfalls, or saying explicitly: The water runoff on roads, streets, pavements, parking lots, squares, etc., require solutions. We are all witnesses of how streets of Prishtina and Tirana look like during rainfalls. Each one of us has been in one or other way participants in any of these occurrences, whether as pedestrians, vehicle operators or passengers. What was your impression and answer to it? The main goal of preparing this paper consists in a solution that would result as ideal perfection in preventing and avoiding entirely the urban water runoff and floods, the consequences of heavy rainfalls that last for long periods of time with stormy showers. The solution as per this study would be the utilization of pervious concrete. Pervious concrete is a construction material featuring the property that all water falling onto its surface to pass through it and be drained to the bottomside and flowing underground. This is enabled due to its composition and porous structure, accordingly all water-rain falling onto it will be drained and the surface remains water-free and easily passable. Pervious concrete, having the property of draining the water, has a positive impact on drivers steering the vehicles by the effect: no water-moisture on the roads, no vehicle sliding. Many countries all over the world apply this, especially in the USA where the application of pervious concrete has been applied for more than 40 years owing to innovative requirements of the American Government and awareness of employers, constructers, designers, urbanismarchitects on the advantages and benefits of pervious concrete. By the application of pervious concrete, the streets and roads of Prishtina and Tirana will not be flooded anymore, the pedestrians would be able to walk comfortably during wet weather conditions, the traffic flow will not be obstructed and stopped, and owing to its high porous structure this application will have a positive impact in lessening the acoustic pollution being as one of the major problems of urban sites.

Keywords*:* Pervious concrete; sustainable street; environment; storm water, porosity, durability, etc.

1 Introduction

1.1 Generals on Pervious Concrete

Pervious Concrete has been around for hundreds of years. The Europeans recognized the insulating properties in structural pervious concrete for their buildings constructions. Europeans have also used pervious concrete for paving including on the Autobahn (eng-Highways). Stories passed down through the years tell us that our soldiers didn't mind walking on pervious roads during World War II because it meant their feet would be dry! [1].

In the 1960s, when pervious concrete pavement first made its appearance in North America, it simply didn't catch on widely. Over the next several decades, while there were many installations of these pavements, they were localized to certain regions. In today's environmentally conscious climate, the benefits of pervious concrete to sustainability have reinvigorated interest in these free-draining

pavements. And though it's appealing for its technical benefits, pervious concrete hasn't necessarily been attractive…until now. Renewed attention to pervious pavements has led some people to experiment with improvement of the surface aesthetics—and spawned a new type of concrete sometimes referred to as "architectural pervious concrete" (APC).

Pervious concrete pavement has been used for over 30 years in England and the United States (Youngs 2005; Maynard 1970). PCPC is also widely used in Europe and Japan for roadway applications as a surface course to improve skid resistance and reduce traffic noise (Beeldens 2001; Kajio et al. 1998). Currently, full-depth PCPC is used in the United States for parking lots, pathways, and, in some cases, low-volume roads for storm water applications (Tennis et al. 2004) [2]. This Concrete has the feature of very high permeability, very suitable for parking lots, sidewalks, driveways, greenhouse floors or low-speed applications such as golf course paths and residential streets, tennis courts, patios, slope stabilization, swimming pool decks, , zoo areas, shoulders, drains, noise barriers, friction course for highway pavements, permeable based under a normal concrete pavement. Pervious concrete is generally not used solely for concrete pavements for high traffic and heavy wheel loads [3]. Pervious concrete is an innovative building material with many environmental, economic, and structural advantages. The proper utilization of pervious concrete is a recognized Best Management Practice by the U.S. Environmental Protection Agency (EPA) for providing first-flush pollution control and storm water management. Property owners and developers can also reduce fees and enhance the bottom line by using pervious concrete, which commonly provides 20-40 years of service with little or no maintenance [5], [16].Pervious concrete is a high porosity concrete used for outdoor flatwork that allows water to pass through it. It is a low water/cement ratio, low-slump mix consisting of cement, narrowly graded coarse aggregate, little or no fine aggregate, water and admixtures. It is held together by cementations paste at the coarse aggregate contact points since there is limited paste and fine aggregate to fill the voids between the coarse aggregate [2].

Pervious concrete - a zero slump mix that allows rainwater to pass through the pavement and into the underlying soil at an astonishing rate of 100 to 750 liters per minute per square meter. This is also referred to as "no-fines concrete" or "porous concrete," this material is a simple mix of coarse aggregate, cementations materials, water, and in some cases, fibers for binding. Carefully controlled amounts of water and cementations materials are used to create a paste that forms a thick coating around aggregate particles without flowing off during mixing and placing. Using just enough paste to coat the particles maintains a system of interconnected voids in the order of 15% to 35% depending on materials and intended application. Pervious concrete is one of the hottest topics in global development today. As owners, architects, land developers, and concrete professionals become familiar with its benefits, the interest in pervious concrete continues to grow. The use of pervious concrete pavements provides a solution to new requirements under Environmental Protection Agencies regulations that call for decreasing the amount of surface water runoff and initially treating the runoff.

1.2 Applications Review

Although not a new technology, in the USA, (it was first used in 1852 (Ghafoori and Dutta 1995)), pervious concrete has received renewed interest, partly because of Federal Clean Water Legislation in the USA. The US Environmental Protection Agency's (EPA) Phase II Final Rule requires the operators of all municipalities in urban areas to develop, implement, and enforce a program to reduce pollutants in post-construction runoff from new development and redevelopment projects that result in the land disturbance of greater than or equal to 1 acre. The above is a requirement in order to attain a National Pollutant Discharge Elimination System (NPDES) permit. Among other things the municipalities are required to develop and implement strategies which include a combination of structural and /or non-structural best management practices (BMPs) [3], [13].

Pervious concrete pavement is recognized as a Structural Infiltration BMP by the EPA for providing first flush pollution control and storm water management. In addition to federal regulations there has been a strong move in the USA towards sustainable development. Sustainable development is development that meets the needs of the present generation without compromising the needs of future generations. In the US the US Green Building Council (USGBC) through its Leadership in Energy and Environmental Design (LEED) Green Building Rating System fosters sustainable construction of buildings. Projects are awarded Certified, Silver, Gold, or Platinum certification depending on the number of credits they achieve.

Pervious concrete pavement qualifies for LEED credits and is therefore sought by owners desiring a high LEED certification.As regulations further limit storm water runoff, it is becoming more expensive for property owners to develop real estate, due to the size and expense of the necessary drainage systems. Pervious concrete paving reduces the runoff from paved areas, which reduces the need for separate storm water retention ponds and allows the use of smaller capacity storm sewers. This allows property owners to develop a larger area of available property at a lower cost. Pervious concrete also naturally filters storm water and can reduce pollutant loads entering into streams, ponds and rivers. It captures the first flush of rainfall (the first 30 to minutes of rainfall which will lead to a runoff with most pollutants) and allows that to percolate into the ground, so that soil chemistry and biology can treat the polluted water. Pervious concrete functions like a storm water retention basin and allows the storm water to infiltrate the soil over a large area, thus facilitating recharge of precious groundwater supplies locally. All of these benefits lead to more effective land use. Pervious concrete can also reduce the impact of development on trees. A pervious concrete pavement allows the transfer of both water and air to root systems allowing trees to flourish even in highly developed areas [3], [10], [13].

2 Ultra-Urban Areas

Ultra-urban areas are densely developed urban areas in which pervious and naturally draining surface area is reduced. Pervious concrete pavements are a good option in these areas because they allow for additional use of land by eliminating the need for storm water retention systems.

In three last decades in Tirana, respectively two in Prishtina we are facing a rapid urban development. Random constructions, without detailed urban design of multi stories buildings has resulted with a chaotic urban and architectural state. Many times we witness events of water-runoffs and storms on our streets and other areas built with conventional materials: asphalt, normal concrete, paving blocks, etc. during rainfalls. This needs to cope with. In mitigating this, the Pervious Concrete is, if not the only, is the best solution.

a) Tirana after rainfall b) Prishtina after rainfall

Fig. 1. Images of Tirana and Prishtina during overfloods.

As mentioned before, in many countries this is already applied. So we can proceed this to solving our problems: Ideal application for pervious concrete pavement is around buildings (walkways, courtyards, etc.) and parking areas, as well as low-volume roadways. Pervious concrete pavement may also have some application on highways, where it could be used in shoulder and median construction for storm water runoff mitigation. There may also be application for its use as a surface material to reduce hydroplaning, splash and spray, and mitigate tire-pavement noise.

Additionally, we can apply the PC for sidewalks and replacing the concrete culverts with PC, as shown in Fig 2.

Fig. 2. Application of Pervious Concrete in construction of sidewalks and culvert.

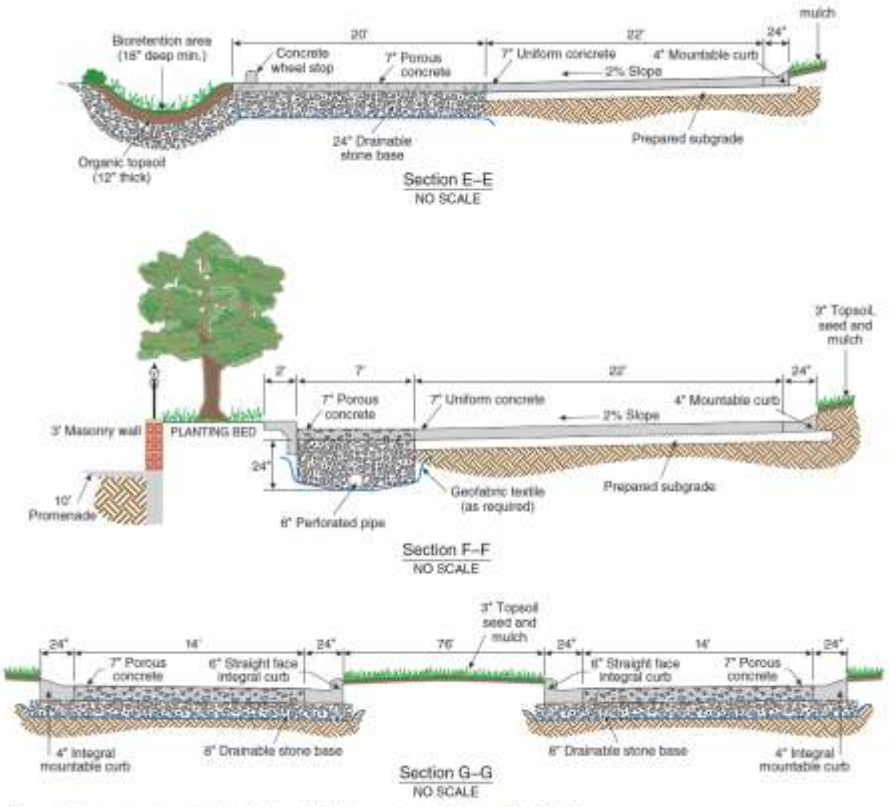


Fig. 3. Optional solution for applications of Pervious Concrete

Source. Illustrations from the Lost Peninsula Marina project in Erie Township, Michigan.

3 Materials and Properties

Pervious concrete, also known as porous, gap-graded, permeable, or enhanced porosity concrete, mainly consists of normal Portland cement, coarse aggregate, water and additives. In normal concrete the fine aggregates typically fill in the voids between the coarse aggregates. In pervious concrete fine aggregate is nonexistent or present in very small amounts. Also there is insufficient paste to fill the remaining voids with the result that pervious concrete has porosity anywhere from 15 to 35% but most frequently about 20% [3]. Aggregate could be of river origin or crushed and depends on the type of required surface texture.

Aggregate grading used in pervious concrete are typically either single-sized coarse aggregate or grading between 2/4, 4/8 and 8/16 mm. (2/4, 4/8 and 8/11.2 mm), i.e. no fines.

a), PC, aggregate used 2/16 mm b), PC, aggregate used 2/11.2 mm

Fig. 4. Pervious Concrete of various textures

All types of cementations materials conforming to their EN 197-1 specifications can been used. Pervious concrete can be made without chemical admixtures, but it is not uncommon to find several types of chemical admixtures added to influence the performance in a favorable manner. [21]. Due to the weather conditions in Tirana, Pervious Concrete may be applied without any admixtures for improving freeze-thaw cycles resistance. Prishtina is the opposite case; This implies the use of air entering admixtures either chemical or mineralogical as plasticizers, retarders, accelerators or Silica fume, Fly Ash, Powder, etc.

Table. 1 shows mix proportioning for pervious concrete. Contrary to possible intuitive thinking that this kind of mix may lead to weak concrete, it has been shown that pervious concrete exhibits flexural strength in the 1.0~3.8 MPa and compressive strength in the 3.5~28.0 MPa range. [24].

Table 1. Typical* Ranges of Materials Proportions in Pervious Concrete**

Cementitious materials	***270 to 415 kg/m^3 (450 to 700 lb/yd^3)***
Aggregate	*1190 to 1480 kg/m^3 (2000 to 2500 lb/yd^3)*
Water-cement ratio (by mass)	*0.27 to 0.303***
Aggregate-cement ratio (by mass)	*4 to 4.5/1****
Fine-coarse aggregate ratio (by mass)	*0 to 1/1*****

* These proportions are given for information only.

** Chemical admixtures, particularly retarders and hydration stabilizers, are also commonly used.

Use of supplementary cementations materials, such as fly ash and slag, is common as well.

*** Higher ratios have been used, but reductions in strength and durability may result.

****Addition of fine aggregate will decrease the void content and increase strength.

(Source: http://www.secement.org/PDFs/ct043[1].pdf

Table 2. shows the typical properties of pervious concrete mixtures. This table is intended to be a guide; particular mixtures should be trial batched to determine properties prior to use. Often, concrete producers will have experience with mixture designs based on available materials and can provide guidance. ACI Committee 522 is preparing a comprehensive document on pervious concrete. [24].

Table 2. Technical Properties of Pervious Concrete

Property	***Typical Values***
Slump	*20 mm*
Density (unit weight)	*1600 to 2000 kg/m^3*
Setting time	*1 hour**
Porosity	*15 % to 25 % by volume*
Permeability (flow rate)	*120 L/m^2/min to 320 L/m^2/min***
Compressive strength	*3.5 MPa to 28 MPa*
Flexural strength	*1 MPa to 3.8 MPa*
Shrinkage	*200 x 10 $^{-6}$*

* May be extended to as much as 2.5 hours with chemical admixtures.

** Laboratory mixtures with flow rates as high as 700 L/m²/min have been prepared.

Fig. 5. Samples of pervious concrete with different water contents formed into a ball:

(a) too little water, (b) proper amount of water, (c) too much water.

(Source: http://www.secement.org/PDFs/ct043[1].pdf

4 Mixture Proportioning

Based on the results of many researches on Pervious Concrete and respective standards, we have designed three mix-Desing of PC.

In table 2. there are presented the physical and mechanical properties of our mix-Designs, that we have prepared in laboratory " VELLEZERIT E BASHKUAR " L.L.C. The compressive strength has been determined at the age of 2, 7 and 28 days.

Materials used are of local origin: aggregate and powder from the quarry of " VELLEZERIT E BASHKUAR" L.L.C,

Cement, type CEM II 42,5 N, of SharrCem-Kosovo, Plasticizers from TKK Srpenica, Slovenia.

Table 3. Properties of the three Mix-Designs of Pervious Concrete

Property	***Typical Values***		
	MIX- 1	***MIX-2***	***MIX- 3***
Slump	*20 (mm)*	*25 (mm)*	*15 (mm)*
Density (unit weight)	*1880 (kg/m^3)*	*1810 (kg/m^3)*	*1930 (kg/m^3)*
Setting time	*70 (min)*	*75 (min)*	*105* (min)*
Porosity	*20 (%)*	*22 (%)*	*18 (%)*
Compressive strength	*7.2 MPa, 2 days*	*6.5 MPa, 2 days*	*8.8 MPa 2 days*
	16.9 MPa, 7 days	*14.4 MPa, 7 days*	*18.1 MPa, 7 days*
	24.3 MPa, 28 days	*21.8 MPa, 28 days*	*26.5 MPa, 28 days*

* Admixture Cementol Delta Extra in this case has a higher dose, thus it is noticed a prolonged of setting time.

5 Construction Process

5.1 Pervious Pavement Design

Two factors, which determine the design thickness of pervious pavements, are: the ***hydraulic properties***, such as permeability and volume of voids, and the ***mechanical properties***, such as strength and stiffness. Pervious concrete used in pavement systems must be designed to support the intended traffic load and contribute positively to the site-specific storm water management strategy. The designer selects the appropriate material properties, the appropriate pavement thickness, and other characteristics needed to meet the hydrological requirements and anticipated traffic loads simultaneously. Separate analyses are required for both the hydraulic and the structural requirements, and the larger of the two values for pavement thickness will determine the final design thickness [3]. [15].

5.2 Hydraulic properties- Hydrologic Design

In evaluating the hydrologic design capabilities of a pervious pavement, the approach is to determine whether the characteristics of the pervious concrete pavement system are sufficient to infiltrate, store, and release the expected inflow of water (which includes direct rainfall and may also include excess runoff from adjacent impervious surfaces). [22].

In essence, the hydrologic design of pervious concrete pavements should consider two possible conditions to ensure that excess surface runoff does not occur (Leming et al. 2007):

1. Low permeability of the pervious concrete material that is inadequate to capture the "first flush" of a rainfall event.

2. Inadequate retention provided in the pervious concrete structure (slab and subbase) [10].

Details on hydrologic design are beyond the scope of this document but are available in the literature (Leming et al. 2007; Wanielista et al. 2007; Rodden et al. 2011).

5.3 Mechanical properties- Structural Pavement Design

Pervious concrete is a unique material that has a matrixand behavior characteristics unlike conventional portland cement concrete or other pavement materials. Although these characteristics differ from conventional concretes, they are predictable and measurable.

Pervious concrete pavements can be designed using either a standard pavement procedure (AASHTO, WinPAS, PCAPAV, ACI 325.9R, or ACI 330R) or using structural numbers derived from a flexible pavement design procedure. Regardless of the procedure used, guidelines for roadbed (subgrade) soil properties, pervious concrete materials characteristics, and traffic loads should be considered. In the fig: 5 it is shown a typical cross section of pervious concrete pavement construction.

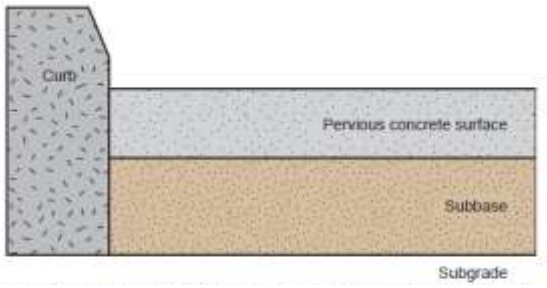


Fig. 6. Typical cross-section of pervious concrete pavement. Source: Tennis, et al, 2004, adapted from Paine 1990.

Subgrade and subbase. In the design of pervious pavements, foundation support is typically characterized by a composite modulus of subgrade reaction, which should account for the effects of both the subgrade and the sub base. An open-graded sub base is commonly used beneath pervious concrete pavements not only to provide an avenue for vertical drainage of water to the subgrade, but also to provide storage capabilities. Special subgrade conditions (such as frost susceptibility or expansive soils) may require direct treatment.
Compressive strength. Pervious concrete mixtures can develop compressive strengths in the range of 500 psi to 4000 psi (3.5 MPa to 28 MPa), which is suitable for a wide range of applications. Typical values are about 2500 psi (17 MPa). As with any concrete, the properties and combinations of specific materials, as well as placement techniques and environmental conditions, will dictate the actual in-place strength. Drilled cores are the best measure of in-place strengths, as compaction differences make cast cylinders less representative of field concrete. [16].

Concrete flexural strength. Flexural strength in pervious concretes generally ranges between about 150 psi (1 MPa) and 550 psi (3.8 MPa). Many factors influence the flexural strength, particularly degree of compaction, porosity, and the aggregate: cement (A/C) ratio.

The flexural strength of concrete is an important input in concrete pavement structural design. However, testing to determine the flexural strength of pervious concrete may be subject to high variability; therefore, it is common to measure compressive strengths and to use empirical relationships to estimate flexural strengths for use in design (Tennis et al. 2004).

Shrinkage. Drying shrinkage of pervious concrete develops sooner, but is much less than conventional concrete. Specific values will depend on the mixtures and materials used, but values on the order of 200 x 10 -6 have been reported (Malhotra 1976), roughly half that of conventional concrete mixtures. [20].

Freeze-Thaw Resistance. Freeze-thaw resistance of pervious concrete in the field appears to depend on the saturation level of the voids in the concrete at the time of freezing. In the field, it appears that the rapid draining characteristics of pervious concrete prevent saturation from occurring. Anecdotal evidence also suggests that snow-covered pervious concrete clears quicker, possibly because its voids allow the snow to thaw more quickly than it would on conventional pavements. In fact, several pervious concrete placements in many places have been in service for over 10 - 20 years. The lack of fines aggregates to fill the voids is overcome by the cement paste to be resistant to freeze-thaw cycles due to deicing salt. This property is improved by air entering admixtures, ETA S, ETA S1 and the same.

Traffic loading applications. The anticipated traffic to be carried by a pervious pavement is commonly characterized in terms of equivalent 18,000-lb (80 kN) single-axle load repetitions, which many procedures compute directly based on assumed truck-traffic distributions. Most pervious concrete pavements are used in low-truck-traffic applications. [16]. Currently there are no thickness standards for pervious concrete pavements, but many pervious pavements for parking lots are constructed 6 inches (150 mm) thick, whereas pervious pavements for low-volume streets have been constructed between 6 and 12 inches (150 and 300 mm) thick (ACI 2010).
Apart aforementioned, in designing the pervious concrete consideration should be given to other aspects: Textural aspect, Architectural aspect, Permeability, Sulfate resistance, Abrasion resistance etc.

5.4 Pervious Concrete Placement

The production of PC is not a difficult process, normally it requires additional attention that final product to meet the mix design requirements. Special care should be paid to the water content. In particular, the water content of pervious concrete is limited to a narrow range to provide adequate strength and permeability, and prevent the paste from flowing off the aggregates and closing of the open structure. Transport and placement of PC are done by truck mixers. Other technics of placing are not excluded. Care should be given during the concreting at hot weather conditions and low relative humidity. These two weather factors, affect in the rapid loss of water of concrete and due to this decrease of workability and compressive strength. It is recommended that before concreting the sub base to be sprayed with

water. Pervious concrete pavement may be placed in either a fixed-form or slip-form paver. Place the concrete from the truck discharge chute near its final position in order to minimize raking and shoveling. Pumping is not recommended due to the zero or low-slump concrete mix. Since pervious concrete has little water in the mix, it should be placed as quickly as possible. While the fresh concrete waits to discharge, it will be hydrating, using valuable water needed for the placing and curing stages. If a fixed-form is used, place the concrete approximately 12 mm higher than the required final elevation with the use of risers along the forms.
After depositing the concrete, quickly bring it to the correct elevation with a rake or other hand straight edge tool. Vibratory screeds are acceptable and encouraged. Caution should be taken to minimize pulling or shoveling the concrete into position, filling the voids or walking on the pervious concrete [10].

Fig. 6. Placing, roller screeding fresh Pervious Concrete

Fig. 7. Joint roller, commonly referred to as a "pizza cutter" and curing (R. Banka)

Finishing. Pervious concrete pavements are not finished in the same manner as conventional pavements. In essence, the final surface finish is achieved as part of the consolidation process, which leaves an open surface. Normal concrete finishing procedures, such as with bull floats and trowels, should not be performed. [6],[10].

Jointing. Jointing is commonly done on pervious concrete to control random crack development. These joints are commonly formed (using a specially designed compacting roller-jointer) to a depth between one-fourth and one-third of the slab thickness. [6].

Curing and protection. After the concrete has been jointed, it is important that the concrete be effectively cured; this is commonly achieved through the placement of thick 0.15mm plastic sheeting over all exposed surfaces. The plastic sheeting should be applied no later than 20 minutes following discharge of the concrete, and should remain in place for at least 7 days (longer times may be required under cold weather placement conditions or if supplementary cementations materials are used in the mix). Liquid membrane curing compounds are not commonly used because they prevent surface moisture loss and do nothing to prevent evaporation from within the pervious concrete (Kevern et al. 2009).

Fig.8. Plastic sheeting should be used to cover the perviousb concrete to prevent moisture loss. (R. Banka)

6 Maintenance in the service life

Maintenance of pervious concrete pavement consists primarily of prevention of clogging of the void structure. In preparing the site prior to construction, drainage of surrounding landscaping should be designed to prevent flow of materials onto pavement surfaces.

The two commonly accepted maintenance methods are pressure washing and power vacuuming. Pressure washing forces the contaminants down through the pavement surface. This is effective, but care should be taken not to use too much pressure, as this will damage the pervious concrete. Power vacuuming removes contaminants by extracting them from the pavement voids. The most effective scheme, however, is to combine the two techniques and power vacuum after pressure washing. [1], [10]. [14].

Fig. 9. Maintenance in the life service.

7 Advantages And Limitations

Despite many advantages the Pervious Concrete is associated by some disadvantages that limit its applications.

The Table 4, summarizes some of the major benefits and limitations associated with pervious concrete.

As described above, perhaps the most significant benefit provided by pervious concrete is in its use as a storm water management tool. Storm water runoff in developed areas (often the result of or

exacerbated by the presence of conventional impervious pavement) has the potential to pollute surface and groundwater supplies, as well as contribute to flooding and erosion (Leming et al. 2007) [10].

Pervious concrete can be used to reduce storm water runoff, reduce contaminants in waterways, and renew groundwater supplies. With high levels of permeability, pervious concrete can effectively capture the "first flush" of rainfall (that part of the runoff with a higher contaminant concentration) and allow it to percolate into the ground where it is filtered and "treated" through soil chemistry and biology (Tennis et al. 2004; ACI 2010) [10], [16].

Other major benefits include reduction in heat island effects (water percolating through the pavement can exert a cooling effect through evaporation, and convective airflow can also contribute to cooling (Cambridge 2005)), reductions in standing water on pavements (and associated hydroplaning and splash/spray potential), and reduced tire–pavement noise emissions (due to its open structure that helps absorb noise at the tire–pavement interface) (ACI 2010).

Along with its many benefits, there are some limitations associated with the use of pervious concrete. First and foremost, pervious concrete has typically been used on lower trafficked roadways, although there are a number of installations on higher volume facilities, and research is being conducted on the structural behavior of pervious concrete slabs (see, for example, Suleiman et al. 2011; Vancura et al. 2011). In addition, pervious concrete exhibits material characteristics (primarily lower paste contents and higher void contents) and produces hardened properties (notably density and strength) that are significantly different from conventional concrete; as a result, the current established methods of quality control/quality assurance (e.g., slump, strength, air content) are in many cases not applicable (ACI 2010). Moreover, a number of special practices, described later, are required for the construction of pervious concrete pavements. And, while there have been concerns about the use of pervious concrete in areas of the country subjected to severe freeze–thaw cycles, available field performance data from a number of projects indicate no signs of freeze–thaw damage (Delatte et al. 2007; ACI 2010).

Table 4. Summary of Pervious Concrete Benefits and Limitations (Tennis et al. 2004; ACI 2010) [16].

Benefits/Advantages	***Limitations/Disadvantages***
✓ *Effective management of stormwater runoff, which may reduce the need for curbs and the number and sizes of storm sewers;*	✓ *Limited use in heavy vehicle traffic area;*
✓ *Reduced contamination in waterways;* ✓ *Recharging of groundwater supplies;* ✓ *More efficient land use by eliminating need for retention ponds and swale;.* ✓ *Reduced heat island effect (due to evaporative cooling effect of water and convective airflow;.* ✓ *Elimination of surface ponding of water and hydroplaning potential;* ✓ *Reduced noise emissions caused by tire–pavement interaction;* ✓ *Earned LEED® credits*	✓ *Specialized construction practices;* ✓ *Extended curing time;* ✓ *Sensitivity to water content and control in fresh concrete;* ✓ *Lack of standardized test methods;* ✓ *Special attention and care in design of some soil types such as expansive soils and frost-susceptible ones;* ✓ *Special attention possibly required with high groundwater;*

8 Summary and Future Needs

From all that it is mentioned so far, the application of Pervious Concrete can be considered as genius finding which in a easy way and practical would avoid negative effects after a heavy rainfall continuing over a long period in both, in Tirana and Prishtina case.
In other countries the use of pervious concrete has increased significantly in the last several years, perhaps largely because it is considered an environmentally friendly, sustainable product. The use of pervious concrete provides a number of benefits, most notably in the effective management of storm water runoff. Other significant benefits include reducing contaminants in waterways, recharging groundwater supplies, reducing heat island effects, and reducing pavement–tire noise emissions. These are convincing features for applications in our countries.
The benefits of pervious concrete pavements are well known, but concerns over the freeze-thaw resistance may prevent many designers from using pervious concrete in colder climates, which in Tirana Case is of not a matter of concern. Research on freeze-thaw resistance of pervious concrete pavement is ongoing every day. This is in favor of application of PC in Prishtina. Pervious pavements should be placed by experienced installers and the structure and surrounding details should be designed to accommodate the anticipated water flow and drainage requirements.

References

1. Handbook for Pervious Concrete Certification in Greater Kansas City, CPG Pervious Certification Program.
2. Ashley, E. 2008. "Using Pervious Concrete to Achieve LEED™ Points." *Concrete Infocus*. National Ready Mixed Concrete Association, Silver Spring, MD.
3. Obla, K., Ph.D., P.E. Recent Advances in Concrete Technology, ‘’Pervious Concrete for Sustainable Development”, Sep. 2007, Washington DC.
4. American Concrete Institute (ACI). 2008. *Specification for Pervious Concrete Pavement.* ACI 522.1-08. ACI, Farmington Hills, MI.
5. American Concrete Institute (ACI). 2010. *Report on Pervious Concrete.* ACI 522R-10. ACI, Farmington Hills, MI.
6. Kevern, J. T., V. R. Schaefer, K. Wang, and M. T. Suleiman. 2008. "Pervious Concrete Mixture Proportions for Improved Freeze–Thaw Durability." *Journal of ASTM International,* Vol. 5, No. 2. American Society for Testing and Materials, West Conshohocken, PA.
7. Tennis, Paul D., Leming, Michael L., Akers, David J.. Pervious Concrete Pavements. Engineering Bulletin 302, Portland Cement Association. Skokie, Illinois, 2004.
8. Determinazione dell’indice di abbattimento fotocatalitico degli ossidi di azoto in aria da parte di materiali inorganici fotocatalitici: metodo di prova in flusso continuo. UNI 11247, 2010.
9. Determinazione dell’attività fotocatalitica di leganti idraulici, Metodo della rodammina. UNI 11259, 2008.
10. V.R. Schaefer, K. Wang, M.T. Suleiman, J.T. Kevern. Mix Design Development for Pervious Concrete in Cold Weather Climates. National Concrete Pavement Technology Center, Center for Transportation Research and Education, Iowa State University, 2006.
11. V.R. Schaefer, J.T. Kevern, K. Wang. Pervious Concrete Overlay Design, Construction and Performance.
12. Second International Conference on Sustainable Construction Materials and Technologies, Università Politecnica delle Marche. Ancona, June 2010.
13. K.C. Mahboub, J. Canler, R. Rathbone, T. Robl, B. Davis. Pervious Concrete: Compaction and Aggregate Gradation. ACI Materials Journal, Vol. 106, No.6. November-December 2009.
14. AASHTO Guide for Design of Pavement Structures. American Association of State Highway and transportation Officials, 1993.
15. National Ready Mixed Concrete Association (NRMCA), 2006. Text Reference for Pervious Concrete Contractor Certification. NRMCA , Publication #2PPCRT. Silver Spring, MD.
16. Watershed Management Institute (WMI). 1997. Operation, Maintenance, and Management of Stormwater Management Systems. Prepared for U.S. Environmental Protection Agency, Office of Water, Washington, DC.
17. W. Arent, Carolinas Ready Mixed Concrete Association, “Pervious Concrete Pavement”

18. The AdvAnced concreTe PAvemenT Technology (AcPT), TechBrief ACPT DECEMBER 2012 | FHWA-HIF-13-006
19. Pervious Pavement Manual, Florida Concrete and Products Association Inc., Orlando, FL. http://www.fcpa.org.
20. Meininger, R.C., "No-Fines Pervious Concrete for Paving," Concrete International, Vol. 10, No. 8, August 1988.
21. Storm Water Technology Fact Sheet Porous Pavement, United States Environmental Protection Agency, EPA 832-F-99-023, September 1999. www.epa.gov/npdes
22. ACI Committee 522, Pervious Concrete, 522R-06, American Concrete Institute, Farmington Hills, MI, http://www.concrete.org
23. Ghafoori, N., and Dutta, S., "Building and Nonpavement Applications of No-Fines Concrete,".
24. NRMCA, "What, Why, and How? Pervious Concrete," Concrete in Practice series, CIP 38, SilverSpring, Maryland, May 2004, Association (PCA), Skokie, Illinois, 2004.
25. Prof. Erdogan M. Sener, "Porous Concrete Pavement Construction: Opportunity for Alternative Drainage Methodology Emphasis in Construction Education," Indiana University – Purdue University Indianapolis, Spring 2007, American Society for Engineering Education
26. Concrete Technology Today, Portland Cement Association, CT 043, Vol.25, No.3, Dec 2004.

The Influence Of Digital Culture In Tectonics And The Language Of Form In Architecture TOYO ITO, GREG LYNN, PATRICK SCHOUMAKER

Denada Veizaj[1], Gjergji Islami[1]
Polytechnic University of Tirana
Department of Architecture, Faculty of Architecture and Urbanism,
Albania
E-mail: denada.veizaj@yahoo.com, gjerislam@yahoo.com

Abstract. The last three decades show how is evolved a complicated relation between architecture and digital technologies, through an absolute skepticism to moments of enthusiasm. The new rhetoric of digital technologies tents to embrace fundamental concepts of architecture, by theorizing another time as in the modern tradition, correlations between form-space-structure. The objective of this paper is to verify the hypothesis which admits that digital culture is changing the relations between space-form and tectonics. In the ambiguous contemporaneity, on the symbioses between spirit and the digital, Toyo Ito's outcome seems to be the one of the most convincing. This paper tents to analyze the Ito's work in the perspective of the new poetics and metaphors deriving from a liberated architecture from materiality. This understanding is made through a comparison between authors as Greg Lynn or Patrik Schumacher that also have implemented in their work the digital technologies but in different dimensions.

Keywords: digital technologies, concepts of architecture, , Toyo Ito, Greg Lynn, Patrik Schumacher.

1 Introduction

"Digital architectures are profoundly changing the process of design and construction. By integrating design, analysis, manufacture and assembly of buildings around digital technologies, architects, engineers, and builders have the opportunity to reinvent the role of master-builder and reintegrate the currently separate disciplines of architecture, engineering and construction into a relatively seamless digital collaborative enterprise, thus bridging the "gap between designing and producing that opened up when designers began to make drawings. (Kolarevic 2001)

During the last two decades, the modern society has been facing radical developments of the computer science that have transformed it in the so called Information Oriented Society. The implementation of the digital technologies in all processes of our everyday life has caused a great change in our convictions, influencing also researching the nature of the future habitat.

But till now the role of digital tools in the design process is ambiguous. The major part of energy is focused on pure formal issues. We can mention a lot of authors which celebrates their "synthetic" forms going beyond Euclidian systems. We can find various acrobatic and spectacular forms generated through advanced algorithmic systems which give an uninspected freedom of conceiving and thinking in three dimensions. But till now for describing the relations between form and space we are using the concept of the container separated from the content. The last ten years the possibility of conceiving 3d organic shapes, Blobs or Nurbs through digital tools has fascinated the most part of architects. Names as Greg Lynn or Patrik Schumacher are known for their ability on using advanced geometrical systems to generate forms. But till now this process is separated from the debate between forms – space-tectonics. These architects find their solutions in synthetic materials and advanced digital cutters to realize their unusual forms. The involvement of digital technologies on the process tents to avoid this debate by focusing the form poetics only on the non-Euclidian shapes.

One of the most interesting formal interpretations of influence of digital culture on the design process remains the parametrism.

"It is the elegance of ordered difficulty and the sense of continuous differentiation that relates to natural systems". Schumacher, Patrik: Parametricist Manifesto at 11th Architecture Biennale. Venice, 2008
This reference to nature reminds us what le Corbusier proclaimed about the language of form in modern architecture when the right angle and the straight line are methods through which the man conquers nature. The above paragraph of Schumacher point out a contradiction in the vision of le Corbusier, but not in the need of order, but in the restricted concept of the order related to the Cartesian geometry. The nowadays formal virtuosity is a response towards the complex character of the physical space. **Can architecture bee just a geometrical virtuosity? By the other side, can the digital influence on design process produce metaphors on radical compositional themes distant from formal issues?**
"The language of architecture is built up of signs and symbols (...) specific shape forms and textures have specific meanings" (Hellman 1988)
As long as we talk about signs, systems of recognition or semiotics in architecture it's impossible to not bring up metaphor. As a phenomenon metaphor is a mechanism of analogy in which a concept that belongs to a certain conceptual domain in terms of another conceptual domain is conceived, and in which correspondences between the attributes of both domains are established... (Lakoff and Johnson, 1999)

2 Patrick Schumacher- Digital Culture and the complexity of form

In parametric design the generation of form is achieved through programming and the process parameterizes and calculates the influence on the form of all the conditioning elements. This complex process of calculations materializes the inputted parameters in architectural form. The *Schumacher's latest work tries to give* a wider dimension to the debate, from a formal discussion to the effort of conceiving a new methodology to produce architectural space. To evaluate the efforts of this author to improve parametrism from form to philosophy or style, we can see some his notes in his work "Autopoiesis of Architecture" The "Autopoiesis" is a metaphoric term which is related to the self-production. The term is introduced in biology in 1970 describing that for each living organism exists a complex closed system which reproduces all its specific components out of its own life process. In analogy architectural or urban systems should reproduce parts of themselves even after their lifecycle. Referring to digital advanced systems and to this theoretical concept Schumacher introduces another time the analogy between the architectural organism and a living one. *Contemporary avant-garde architecture is addressing the demand for an increased level of articulated complexity by means of retooling its methods on the basis of parametric design systems." Schoumacher, Patrik: Parametricist Manifesto at 11th Architecture Biennale. Venice, 2008* The symbiosis between digital technologies and architecture in this case remains enclosed to the generative process of the physical space.
He elaborates the influence of digital culture just on a theoretical plane and in formal terms, avoiding two radical issues; tectonics and materials.

Fig 1.P.Schumacher and Z.Hadid

Fig 2 P.Schumacher and Z.Hadid, 2012 Venice Biennale

3 Greg Lynn – Digital Culture and the Expansion of the Formal Vocabulary

Through the work of this author, we find another dimension of the symbioses established between architecture and digital technologies which became generators of geometrical systems.
As Lynn admits at the base of his philosophy remains the metamorphosis of the perceptual and geometric model of the nature. Classical geometry was based on ideal numbers and proportional series that were discrete and could be fractionally divided. At the 15 century the decimal point is discovered and another model of seeing nature will be proposed. Today we have a new model of natural form which is calculus based and which is using digital tools.
"Line is a curve without inflections"-he says.
"Symmetry is not sign of order, but presence of the missing information" His complex formal vocabulary is based on blobs and folds. Through the work of Grieg Lynn, the form generation process is dependent from the advanced geometry and digital tools. Compositional elements as the pattern will assume new gravity through the involvement of digital methods. The digital tools help Lynn to not see the architectural form in terms of "shapes" or as a "predicted" characteristic added to the organism, but as a process, as a consequence. This is the main metaphoric key to read his work. In fact in all his proposals it is easy to read the "**process of form**", the dynamism and the movement.
The digital technologies help Lynn to give a new dimension and meaning to the organic and complexity. His organic architecture means holism, proportions, and harmony and synthesis. Syntheses mean intricacy as a relationship, between massing, structure, envelope, aperture, decoration. Natural and organic surfaces are the most interesting examples where pattern, structure and decoration are merged into a complex relation that brings equilibrium.

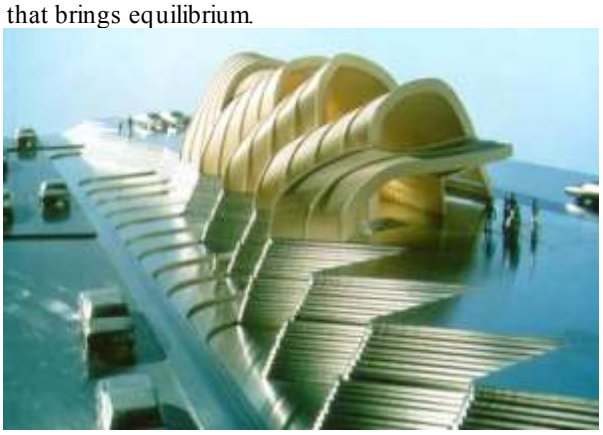


Fig 3 Greg Lynn Hydrogen House 1996

3 Toyo Ito – Digital Technologies to Re-dimension the Relations Between Form-Tectonics-Structure

Toyo Ito is one of the architects who have interpreted in his work all the changes and the new orientations in the design processes in the contemporaneity. This evolution process starts from the early '80 when he started dematerializing architecture and continues to his nowadays experiments on structures. He tries to find a new dimension of the present by conceiving the structure as the materiality of the nature. This crucial concept of Ito's works is an interpretation influenced at the same time by the Eastern culture differently by the European or the American experience. Ito elaborates a design methodology which derives from his culture. But he is not attracted from the traditional formal language of Japan in the literal sense; he is much more interested in a deeper and intrinsic dimension of his civilization which tents to undo the unnecessary.

Let's see how Ito involves digital technologies in important compositional themes.

The most particular characteristic of Ito's philosophy is that he sees in the use of digital technologies a way to go closer to the nature. And this consists mostly in the reproduction of the advanced natural geometric systems through digital tools and methods. This interest on digital processes is related with his first child experiences with the nature. He is impressed by the nature, by the presence of morphogenetic forms as characteristic of natural reliefs. Beside this, another fact that impresses him is the unstable dimension of natural forms, characterized by the metamorphosis and the continuous change. This will be the most important concept of his architecture, the metamorphosis, fluidity of form from a state to another. "Life source from water"…in a metaphoric plane his architectural creations are born and raised under a continuous formal metamorphosis. In fact, the main remark that he makes to the modern tradition (Corbusier) is about the separation from nature that brought the machine conceived through the pure geometry. The most successful experience of the contemporaneity is the new approach to nature as a possible formal vocabulary. "Now we are duplicating nature much more than in the modern age when we referred to pure geometry by celebrating cubes and spheres. Another radical element that will influence his architectures is the East culture. As he will admit that there are enormous differences in perceiving nature between the East and the West cultures. To his concept, nature is everything, even the buildings or the city, not just plants or the biosphere. His dream is to see an architecture that tends to merge into the nature, to produce architectures that grow under the natural, complex geometrical systems and materials.

In his philosophy the digital technologies are the most important collaborators. The fluidity of form and the need to imitate nature will be supported by advanced geometrical systems. In fact he says that 'due to the technologies there will be not more difference between the people that draw an idea, from that one that realize it. Another time we talk about the digital enterprise of Kolarevic. Now the design phase is separated from the realization in place of the architectural form. Due to the development of digital technologies, there will be a synergy between the two phases. He thinks that this will be the future architecture in the 21 century. The architecture of the 20th century was industrial, the future will bring an "agriculture-architecture" when you "plant a building" by working on the PC. He is an architect that gives a very importance to the form, because of his conviction that architecture is a "sensitive" experience. Now let's see how is materialized in Toyo Ito's architecture this idea of fluidity and natural forms. Let's see how the "emergent grid" as he describes his generative formal system, is a combination of patterns, geometry and structure. The combination of these three elements generates fluid forms. His first important conviction is that the geometry is an internal quality of the structure. He says that for many years his creative activity and his designs were inspired by the phenomena of fluids and movement. Despite the simple geometry used in the early nineties, his work communicates strong notes of formal digital metaphors. In his famous Tower of Winds, he tries to materialize the intangible through digital fluxes. We can easy understand that the metaphor is defined through the metamorphosis of the perception of space/form.

3.1 The Serpentine Gallery – The skin theme and geometrical metamorphosis

Let's see how the Ito's work is now focused on structural and tectonic elements. A great exercise on symbiosis between form tectonics and digital algorithms is the Serpentine Gallery in London.

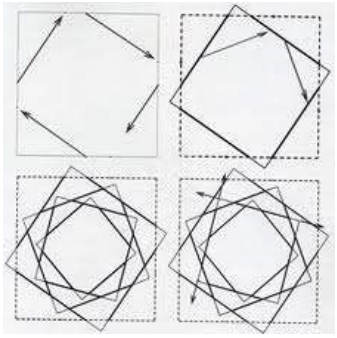


Fig 4 Algorithm of the self-rounded square used in the form generation of the Serpentine Gallery

For more than a century, the modern architecture tried to find balances between form, function, and structure. Now with the use of algorithms, which is a non-lineal process that repeats itself at infinite, we can achieve great structures starting by simple boxes or lines and still talking about balances between form structure and function. This is the way in which both Ito and Cecil Balmond describes their work on the Serpentine Gallery of London. Now the digital formal metaphor is in another level: metamorphosis of a box; escaping from Euclidian geometry. From his earlier works to the newest, his design methodology is structured by a process that starts from the concept to the form. His atelier is still understood as a laboratory when he can use simple materials to realize his models. All his designs go under a selective process which "cleans" all the unnecessary at the aim of generating a pure and very clear concept. His work brings to us another time the der Rohe's poetics of "less is more", but this time under the eyes of the digital generation. He considers digital technologies as tools that help to minimize the use of materials in structures. This fact is also influenced by his culture. His atelier is plain of Origami models. He sees his dream of contemporaneity becoming reality in this simple paper converted in a solid 3-dimensional structure. Technology is not a neutral tissue, is the mechanism which modifies our way of creating social relations. Ito's architecture tents to be liberated from the materiality and the gravity. It's a new poetic which put on a critical position our traditional concept of tectonics. In this point of view Ito sees in the Pavilion of Barcelona of Mies one of the most enthusiastic example of the past century. Through the extension of horizontal planes Ito sees the beginning of his interpretation of fluidity. He is not surprised by the plastic of the steel pilasters but by the incredible merging of materials and space.

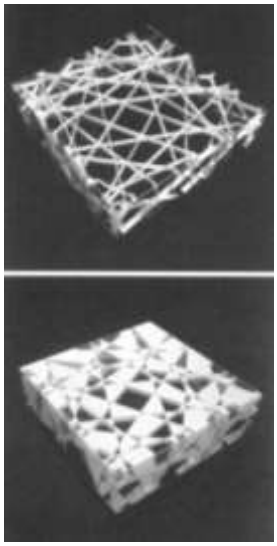


Fig 5 3d-models used in the form generation process of the Serpentine Gallery

Afterward Ito will elaborate a narrative which tents to privilege the effect of the intangible more than tectonics.The research on the relation between tectonics and fluidity is much more developed in his

proposals of the Serpentine Gallery. In this work is introduced a new era where art, mathematics and abstraction are merged together. His philosophy is developed through his 3d models but the spatial outcome is developed through digital technologies.

By discovering the Ito's work we can find some interesting resemblances with the National Gallery of der Rohe. During his work in America Mies brought another time in his rhetoric an important debate on typology, space and structure. The difference this time is the presence of the steel technology of the '50-60. It is a main conviction of his work that the architect is at the same time responsible of the structural issues and should be concerned about tectonics. At his pavilion of berlin he proposes an internal space free from the vertical pilasters. This free box is positioned on 8 pilasters. This concentration on structure and tectonics in fact brings the theoretical debate in other terms. We see a similar attention to structures and tectonics in the Ito's work. But if in the first case tectonics is the poetry of materiality, in the second case structure is used for dematerializing architecture. Toyo believes that only through structures he can liberates architecture from materiality.

Fig 6 Serpentine Gallery

Toyo in collaboration with Cecil Balmond of the Arup society elaborates the algorithm of a square that expands during his rotation. Diagrams visualize the intersection and the multiplication of real and imaginary lines. The final outcome arrives through a process which select over many proposals. It's about a box of 17.5mx17.5m plan and 5m height. At the same time digital tools are used to calculate the thickness of steel elements that in this case are 55 cm. In difference with der Rohe in this case not only the internal pilasters are missing. Even Mies tried to liberate architecture from internal structures by adding new space definitions, he could not separate from their tectonic connotations elements as pilasters, horizontal planes etc. In the Ito's work structural elements are merged with space limits elements generating new definitions on interior-exterior relations.
As a virtual limit is light that defines space qualities. Ito uses technology in favour of a narrative. His poetics tents to correlates architecture to our perceptive capacities. To perceive his architecture is not required a material experience. It's not the same experience with the visitor of archaeological sites which tents to touch everything to accomplish his perceptions. The dialog body-perception in the Ito's architecture goes over the materiality in a much more deep intangible dimension.

3.2 The TOD'S Gallery – The skin theme and fractals algorithms as natural geometric system

Fig 7 Conceptual phases of the design process

“Trees are organisms that stand by themselves, so their shape has an inherent, structural rationality” – Toyo Ito

Here we find another interesting example of the skin theme.

The skin of the building becomes the most important symbolic element in the conceptual level. Here we can read his strong reference to natural forms, as wonderful systems when form and structure creates the perfect harmony. In this façade we see evolved the fractal algorithm of the recursive subdivision of the primary shape. The branch algorithm is the celebrative image of the fractal structures.

This plane “printed” version of the branch fractal algorithm became a strong element of identity of this building in the immense urban tissue of Tokyo. At the same time celebrates the Ito’s reference to natural systems by escaping another time to Euclidian Systems. The metamorphosis of the box container from a Euclidian space to a fractal system generates the metaphor of the digital design.

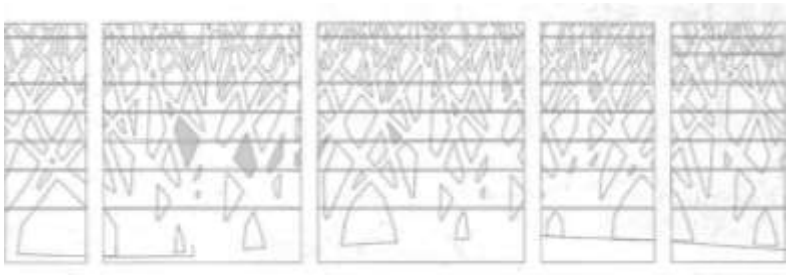


Fig 8 Conceptual phases of the design process-tectonic facades

This skin, interpreted in the tectonic point of view is transfigured in a gradual way from the bottom to the top of the building. The thickness of the structural elements is bigger in the ground floor and began diminishing progressively to the top, by the logic of the recursive repetition and division of the concrete elements.

3.3 The Sendai Mediatheque – Box metamorphosis

Another time, nature remains the principal compositional theme of his work. Another time, the metamorphosis of a transparent box merged in the intense centre of Sendai as a giant aquarium of flows becomes the winning concept of a wonderful architectural “creature”. The fluidity becomes the compositional order of space. Algorithmic and latticed “tubes” flow vertically through the box becoming transporters of energy, movement and light. For more than a century the structure was considered “a dead” party of the functional space, and in this proposal Ito implant function into those structural tubes, establishing in this way a new equilibrium. The formal metaphor is defined by the analogy established through the space morphology of the **cube** and the one of a living organism.
Ito mentions Cecil and his concept about geometry as a trace of moving points. This is a conceptual start to add dynamism to those rigid geometric elements.
In this case we can see another metamorphosis of a box, but now in a much more complex dimension.
In difference from the first case (Serpentine Gallery) the Ito’s energy is focused in the internal space of the box, not just in the skin.
In the Sendai’s project we can see being elaborated some interesting theoretical issues that concerns Ito’s philosophy. Here for the first time we can see materialized his convictions about the intangible dimension of the phenomenon of the city or the human body. Let’s see how digital calculations transform a rigid structure to a living aquarium. Another theme elaborated from Ito is the dematerialization of the architecture. Through his designs, we see how he uses technology to fade the space limits by conceiving the architectural building as a compressed entity of energy and fluxes.
How are treated in the optic of the digital culture themes as tectonic form and space in the Ito’s work?

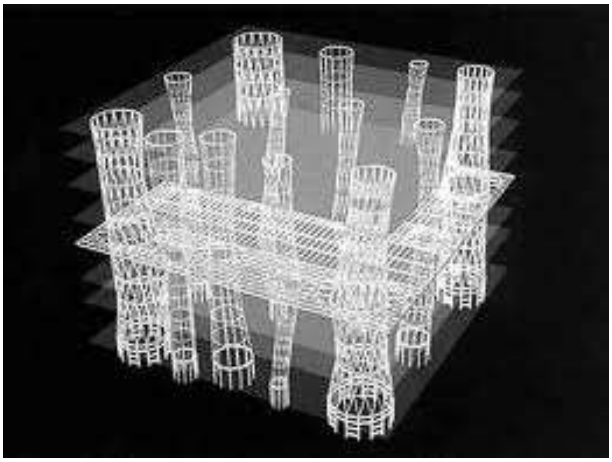


Fig 9 Conceptual rendering of the digital structure

As we saw in the Serpentine Gallery, in difference from other contemporary authors that ignore the tectonics as a constraints or element that influence form, Ito sees in the structure the physical dimension of the form. This is the reason of Ito's interest in structural issues.
The body is an entity of fluids. An interesting phase of the Ito's work will be his essays in finding new ways to understand the human bodies. In his notes on "the human body considered as a fluid" he underlines the idea of a deep analogy between the human body and architecture. From the Vitruvian system of understanding the human body by spheres and squares proportions he passes to a contemporary interpretation of the living organism as a compressed energy. In the classic vision, the body is considered in a quantitative way and exteriorly. There is nothing about the inside human body, about the morphology or about understanding him as a structured system. The word Fluid will be a key-word in his creative philosophy. The concept of "Fluxes" will "affect" also his ideas about the city. Since the 80 in his works the city is described as an entity composed by two dimensions; the material or the physical dimension and the virtual, the information and the intangible one.
As we can understand there is another analogy made by him between the human body and the city. From the geographic Vitruvian understanding of the city we pass to the concept of the fourth dimension, of the movement, of the city of fluxes. Ito admits that more than ever his concept of the city is going far from the material dimension. The intangible dimension is generated from lights of energy which nourish a fading reality. The nowadays cities have an intangible component which is virtual or phenomenological and distant from the materiality. He makes a similitude to the city as a transparent plastic film.
In fact one of the most interesting topics derived from the involvement of digital technologies is related to semiotic systems or metaphors due to their influence mostly in the vanishing of geometrical limitations.

4 Conclusion

Digital technologies are changing relations between form-space and structure in architecture. There are different answers by architects to this phenomenon due to their cultural ambiance. North American and Occidental architects propose a digital architecture much more focused on formal issues. By the other side an alternative answer arrives from architects of the East culture by involving the digital in a deeper dimension concerning the materiality, the metamorphosis and the space limits.

References

1. Marotta, A.: Toyo Ito - Construire il Vuoto

2. Frampton, K.: Poetica della forma architetteonica nel XIX e XX secolo. 2007
3. Kolarevic, B.: Designing and manufacturing architecture in the digital age. 2001
4. Schumacher, P.: Parametricism as a style-Parametricist Manifesto 11th Architecture Biennale. Venice, 2008
5. Aish, R. Kilian, A. Hudson, R.: Fundamental concepts for parametric design. With Grasshopper
6. Schumacher, P.: -Autopoiesis of Architecture –Volume 1, A New Framework for Architecture, published by John Wiley & Sons, 2010
7. Schumacher, P.: On Parametricism - Let the style wars begin- Article on Architects Journal.co.uk
8. Lynn, G.: On calculus in architecture
9. Lynn, G., Rashid, H.: Architectural Laboratories- NA 2002
10. Lynn, G.: Intricacy, Pennsylvania University Press 2002
11. Sacchi, L., Unali, M.: Architettura e cultura digitale
12. Source of Images
13. http://glform.com/
14. http://aroundarch.wordpress.com
15. http://www.toyo-ito.co.jp

Strategic Management Of Secondary Raw Materials In Kosovo As Economical Potencial And Environmental Protection For The Country

Ibrahim Krasniqi
University for Business and Technology, Prishtina,
Republic of Kosovo
Ibrahim.Krasniqi@ubt-uni.net; ibrakrasniqi@gmail.com

Abstract : The perspective of economic growth, nowadays without promoting an clear environmental protection policy, is no longer possible. However every developing country has to pay so called "ecological bill" in the transition period in order to move through growth and sustainability. Specifically this is an issue if we are talking about the energy raw material impact in ecological conditions and possible new ecologic management that is based on the principles of reducing, reusing and recycling raw material. The main purpose of this work was to analyze the possibility application of lignite fly ash from Kosova Power Plants for the production of self – compacting cement pastes and his use in other industry branches with interest. For the analyses in labor , from the Kosova Power Plants Kosova A and Kosova B in Kastriot were chosen fly ash samples, and the same was tested in the laboratory to show the chances of the application as the additive material and analyzing the exothermal profile of cement pastes with replaced cement from fly ash . The results obtained show that the possibility application of lignite fly ash for the production of self – compacting materials is existing and the same can be used for other industry branches. This is a god opportunity for the use of fly ash as a secondary material which has characteristics of one pozolanic material, with good binder characteristics; it can also clearly improve the rheological properties of fresh concrete and other self – compacting materials.

Keywords: strategic management, economic growth, ecological management, raw materials, self – compacting materials and volume changes,

1 Introduction

Any product has a possibility of turning into waste when it loses its economic value with the passing of time. Once raw materials are used and waste is created, the properties of the materials are not necessarily lost but can be restored using regenerative processes. Despite the fact that properties of the primary materials have been lost, the waste still carries both the subjective human work and energy used in its production. Differences between the properties of secondary materials (waste) and those of primary raw materials are not substantial; many times these changes are only superficial. The reason is that primary raw materials often have not undergone fundamental changes during the production process. Waste accumulates over time unless decomposed in the ecosystem or recycled. Today, the accumulation of waste has reached such a magnitude that it can become a real threat to the existence of the whole ecosystem (Li-Teh et al.). The promotion of environmental management and the mission of sustainable development worldwide have exerted the pressure for the adoption of proper methods to protect the environment. All over the world, various researches on economic and ecological profitability of secondary materials recycling in the substitution of raw materials was presented by many authors. Conclusions were presented which suggested that economic viability is likely to occur when the cost of landfilling exceeds the cost of bringing the waste to the recycling center and the cost of using primary aggregates exceeds the cost of using recycled aggregates (Xavier et al. 2006). The rapid industrialization globally has been the main source, bringing in its melee billions of tons of industrial byproducts from many chemical process industries and coal- based thermal power plants. The mineral materials mutely existing in the interior of the earth are mined out and processed into various products, may it be for

fertilizers, steel or power. As per one study about 8% of the mined material is only getting converted into usable material and the remaining 92% is left as byproduct. The natural resources have been used in a squandering way without much concern on the welfare of nature and environment. The harm caused to the mother earth is insurmountable in this direction. But every cloud has a silver lining. Many of the byproducts befit themselves for the production of building material like bricks, cement and concrete owing to the calcareous, siliceous and/or argillaceous base of the former.
Remnant products of coal are increasingly being used as basis or additives for other industrial sectors. In the world, there are different experiences which have shown achievements in this field. Knowing that utilization of ashes in substituting cement and its sub-products is much known, we will shortly hold on to other experiences which have shown the potentials of using ashes in an adequate manner. In the USA, apart from increasingly being used in construction material industry, ash is being used in paving roads, as a foundation or component of asphalt, in combination with other elements. Also, in Australia, India, China, Germany and other countries, utilization of ashes in such a manner is assuming pace. Since the eighties, when the Japanese found the formula of constructing self-compact concrete, the utilization of ashes has grown considerably as an additive or substitute of cement in many types of constructions, be that a building, a road, a bridge, etc.
Kosovo, with relatively small territory, is one of the richest regions with lignite, and this resource serves as basis for generating the country's energy. In this process, the existing thermal power plans discharge extremely large ash amounts, deposited in superficial landfills, which in turn largely pollute superficial and underground waters, the entire environment. Considering that Kosovo possesses an infrastructure not so modern, and a large demand for development of facilities and road infrastructure, there is quite a great opportunity for using ashes in many segments. As was stated, the Kosovar ashes pertains to the C class, and based on laboratory analysis, it complies with the majority of criteria of use in different manners and sectors, as an additive. That for during the work we have made a large number of experiments that show the hydration and temperature behavior of fly utilization and according to the results obtained, we made a conclusions for further possibilities in this field.

1.1 Production of materials of self-compressing concretes and cement mortars

Knowing the importance of utilization of fly ash, which comes from generation processes, it was thought of stimulating its use in producing cement and its sub-products, namely in producing self-compressing concretes, then its use in larger projects of infrastructure (roads), and also the promotion of ideas for potential use in other sectors. Here, one must take into account that Kosovo imports large amounts of cement and its sub-products, and in this case it would be very profitable to stimulate a greater utilization in this sector, since productivity would grow at the one hand, import rates would diminish, and financial means would be saved, and invested in another sector, on the other hand. Another positive impact from this would be the decreased environmental pollution, which is a problem in itself in Kosovo.

2 The possibility use of Kosovo secondary raw materials in different fields

Apart from construction and construction materials, ash may be widely used in other sectors, such as road infrastructure, airport development, agriculture, etc. In the occasion of the development of the Highway which would link Kosovo with Albania, this would present another good case to being using it in the field of road construction, and later utilization would be extended to construction of internal national roads. In other countries such as USA, Britain, Australia, etc., ash has taken the role of a partial substitute of cement in large public facilities, airports (Heathrow – London, Amsterdam, etc.) and the same may be done in constructing Kosovar airports.

In many countries of the world, ashes used also in improving land quality, and enhancing cultivated lands, while on its use as a material for land reclamation in depleted mines there is a great knowledge, and not more room shall be spent to clarify that.

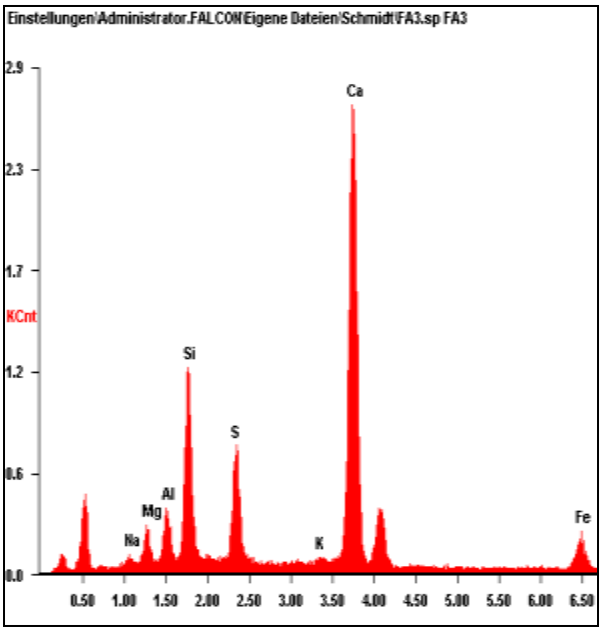
3 The Experimental Part of Work

3.1 Lignite fly ash impact on materials of self-compressing concretes and cement mortars

In our experimental work, the main aim was to see the possibilities of using Kosovo ash in mortar materials and cement mixtures, specifically focusing on studying volume changes, depending on the amount of ashes and the exothermal behavior of these materials. For the laboratory work, ash samples from different TPP locations in Kosovo were taken to be analyzed for their chemical composition and physical attributes, and studies were made on the particle size and morphology, etc. samples were taken from the TPP-s Kosovo A and B, ash deposits, and also analysis were made on coal-lignite taken from different mining locations, supply storages, and from mills after material preparation.

Chart.1 REM fly ash analysis

3.2 Chemical and physical analysis of lignite ash



Based on chemical analysis on different samples of Kosovo lignite ash in laboratories, the chemical composition below has resulted (graph 1 and tab.1) and have been presented in an analytical way below

Tab.1-Chemical composition of FA

3.3 Methodology of the work

For the development process large number of examples is analyzed in different devices and conditions with specific important point to the study of temperature changes in these samples. It was stated that in Schwindkegel the temperature measurement was directly made, and the data was transferred to the data center, and then transferred into the chart. On the other hand, in the other device Schwindrinne, the temperature was continuously measure during each experiments, but with a different device that was connected.

In general, apart from the impact of the water amount into the sample, the cement type, other additives used (fly ash in our case) and plastification masses, an important role is assigned to the temperature and the hydration process in regards to the material attributes and its processing. Hydration implies that chemical bond of water, and this reaction begins after the water intake into the cement mixture, and on this case a chemical exothermal reaction is registered between water and other components of the sample. This process has a few phases, were in the beginning we have the formation of $Ca(OH)_2$ In the form of crystals with a hexagonal structure. After one or more hours of reaction development, the hydration processes of a second and third scale begin, and on this case the formation of silicates, hydrates, CSH, etc). as a result of hydration and temperature changes, Different strains are produced,

and this in turn results into certain volume changes. For this reason the temperature developments have been analyzed in different samples and in different conditions, and the whole thing was then presented in respective charts

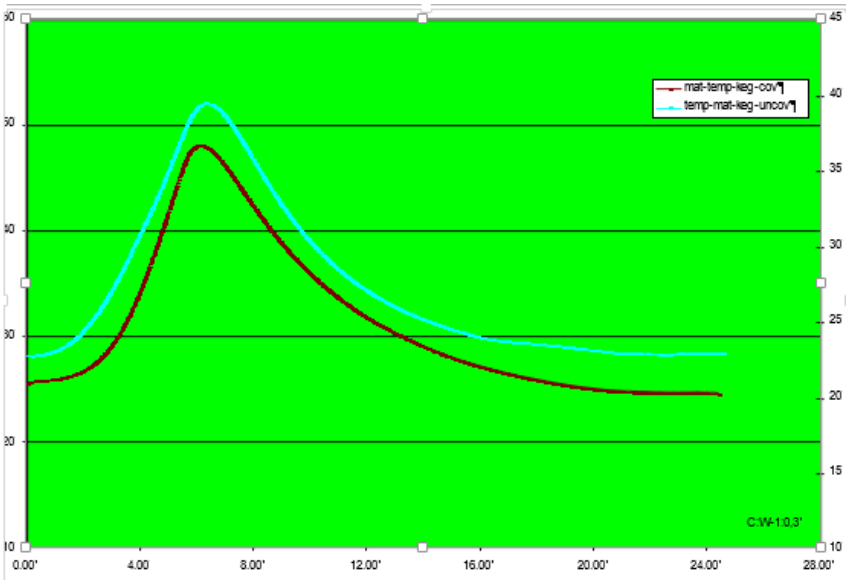


Chart.2. Temperature development in Schwindkegel device (covered/ uncovered)

Due to the utilization of the lignite fly ashes, with a high content of CaO, and also resulting in reactions of CaO with water in experiments, we have a visible process of hydration, also resulting in considerable early volume changes. The plastic additives provide the possibility for the materials with a relatively small water content gain fluidity and be easier to process, even easier than the conventional. The same reduce the concurrent and inter-particle forces, and eliminate the possibility of creation of agglomerates, strengthening this way the particle dispersion.

On this case the hydration process will be affected, in the way that adding such plastic masses would slow down the creation of new stages of CSH, which means that after the adding of plastic masses, the durability time for cone and stable faces is lengthened. In general, construction materials, including mortars and self-compressing mortars, in the initial stages of solidification process is, are subject to development of a certain temperature, representing thus the hydration process, which depends on the composing stages of cement, which continues until the and of full hydration. The heat of hydration in a construction material is greatly reduced by adding puzzolanic, inert and latent hydraulic materials. Usually, such a process, as seen in experiments made in our case, has a great development in the first two to four hours, and later such a reaction comes to a decline. Also, the temperature of the environment has a certain impact on development of the internal material temperature, and if the external temperature would change for 10 K, then the internal material temperature would even.

Based on our experiments, it can be seen that in the Schwindkegel device, the maximum is usually a cheese and around seven to eight hours after the experiment starts, and this is clearly seen in cement mortars without ashes content low (Graf. 2). After all this time, when one thinks that the fold hydration process has been achieved, and material solidification has already taken the certain shape, the temperature continues to fall, and the after an interval of 24 hours, that returns to the values that almost had when the sample examination began.

Usually the temperature changes are also associated with the changes of internal strains, and such a thing brings early volume changes, which can specifically be spotted in self-compressing cement mortars, and development or the nation and correlation of these two phenomena. Also, it can be seen that a consequence of disallowing the water discharge As a result of covering the same sample, the temperature for the same mixture changes in these conditions, and is higher.

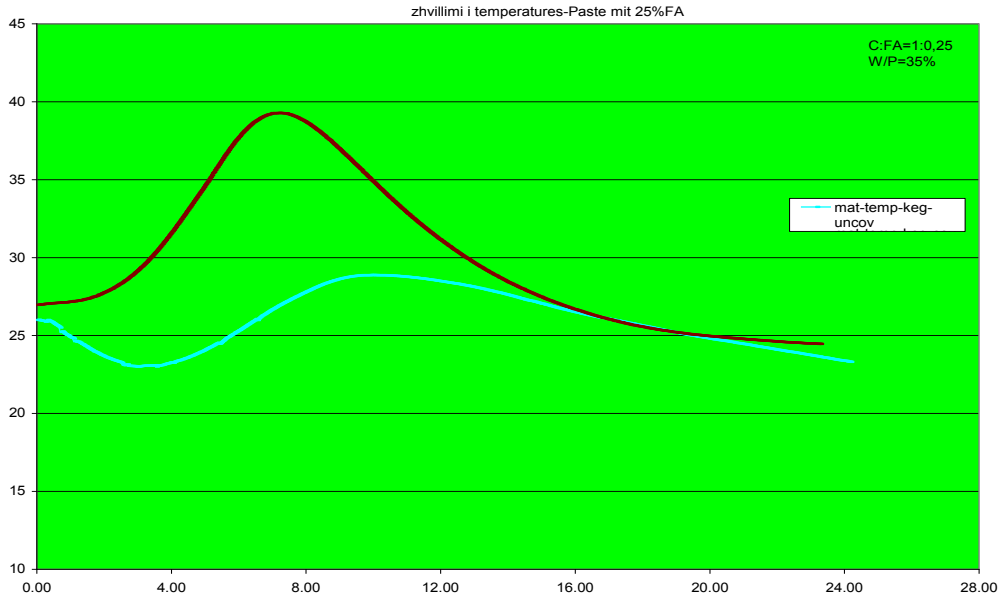


Chart.3. Temperature development in cement pastes with 25% fly ash

In the chart 3, we can see the temperature changes in cement mortars, where the cement mass is substituted at the 25% extant with fly ashes, which does not bring a large change, only in the case where the sample is covered by a plastic sheet, the temperature maximum is achieved later when compared to pure cement mortars. Hence, such a temperature peak is achieved after a ten to twelve hours, and is longer than before, not as a result of the ash composition used as the additive, since in this case the times of initial and final solidification are Longer in their start.

By adding the ashes mass up to 50%, then based on the chart 32 the impact of this ash layer is seen even clearer, in temperature evolution and the delay in achieving its maximum development, but in this case there is no clear maximum as in cases above, and temperature development is more constant. So, it may be concluded that the utilization of ashes has a stabilization role, and the hydration process is slower.

4 Environmental and Economic Benefits

Concrete is the most common building agent in the world and is the second most consumed resource behind water. The primary binding agent in concrete is portland cement. The production of portland cement accounts for approximately five to seven "percent of the world's carbon dioxide output." "One of the most common and effective" means of reducing these carbon dioxide emissions is to "replace a portion of the portland cement with fly ash." In 2007, the American Concrete Institute found that incorporating fly ash in concrete production resulted in a beneficial 15 million ton reduction of carbon dioxide emissions. Thus, replacing portland cement with fly ash, a material which would otherwise end up in a landfill, serves the dual purpose of limiting the adverse environmental impact of cement production and reducing the fly ash burden on landfills.

Government and industry recognize that to achieve sustainable economic development we need to dramatically improve the efficient use of our natural resources. The need to meet statutory targets for waste reduction, recycling and recovery further strengthens the case for closing the loop on resource use. There are opportunities for improvement throughout the product life cycle. The benefits for business and society start with product design and extend through the efficient use of raw materials and energy to recycling and secondary markets for recovered resources. The benefits of efficient waste and resources management for an organization include minimizing environmental impacts; enhancing

reputation; complying with regulatory controls; rebates on any climate change agreements; savings from emissions reduction trading; improving resource usage forecasting; and savings on raw material and utility bills.

5 Conclusions

Research made and results obtained have shown that in analysis made in samples and different mixtures, and different conditions and devices are rather diverse, and in general it can be concluded that the utilization of Kosovo lignite fly ash in self-compact materials and cement mortars is possible, and may turn useful in many aspects. Temperature behavior in those samples is within technological parameters and according to this it may be concluded also that this type of ashes may be used as a connecting material, and as a substitute of cement, and also as an additive. In our surveys, we have seen that in contradiction with usual information in literature, where usually the use of ash additives has an impact on reduction of water demand, in our case such a thing does not happen, but independent of that, the general parameters remain within allowed limits. The initial and final solidification times are shorter than in cases when ash is not used as an additive, but still remain in allowable limits. As seen by tests and analysis made, volume changes of these materials are evident, but always remaining in acceptable limits, in the technical and technological aspects, while never passing the value of 10 mm (DIN EN 450), even in the case when used as an additive and substitute, the lignite fly ash at the extent of 50%. Also, in materials of self-compact mortars, research made have also shown relatively satisfactory results, and especially in sample mixtures where ash additives are brought to the 30% extent, then the results are good, and the early volume changes are within the conditions allowed.
The use of lignite ash in materials of construction industry has a positive impact not only in improving hydraulic attributes, but also in improving rheological attributes, as a consequence of its regular particle shape. The negative impact of ash use in material attributes is negligible, as in the case of cement mortars and self-compact mortars. The achievement of stabilizing volume changes in mortar materials and cement mortars remains a task to be resolved with further studies, and for each type of lignite, specific analysis, so that on their basis their use might proceed. In principle, many authors (Malhotra, Mehta etc) think that in the 21st century, none of the connecting construction materials and other fields should not be produced without including ashes and other secondary materials in their structure.

References

1. [1] Wittmann,F.: Grundlagen eines Modelles zur Beschreibung charakteristischer Eigenschaften des Betons, DAfStb Heft 290, 1977
2. [2] Setzer, M.J.: Einuss des Wassergehalts auf die Eigenschaften des erharteten Betons, DAfStb Heft 280, 1977
3. [3] Hilsdorf, H.K.: Austrocknung und Schwinden von Beton, Rusch-Festschrift,W.Ernst&Sohn, Berlin, 1969
4. [4] Budelmann, H.: Zum Einuss erhohter Temperatur auf Festigkeit und Verformung von Beton mit unterschiedlichen Feuchtegehalten, Dissertation TU Braunschweig,1987
5. [5] Linjiti i Kosovës –Inkos,Kastriot,1985
6. [6] Tazawa, Ei-ichi: Autogenous Shrinkage of Concrete, Proceedings of the International Workshop, Hiroshima June 13-14 1998, E & FN Spon London and New York,1999
7. [7] Fleischer,W: Einfluß des Zements auf Schwinden und Quellen von Beton. Dissertation der TU München (1992)
8. [8] Stark,D.: Handbook For The Identification Of Alkali-Silica Reactivity In Highway Structures. Strategic Highway Research Program,Washington 1991
9. [9] Grube, H.: Ursache des Schwindens von Beton und Auswirkungen auf Betonbauteile. Schriftenreihe der Zementindustrie, H. 52, Beton-Verlag GmbH, Düsseldorf 1991
10. [10] Springenschmid, R.: Die Ermittlung der Spannungen infolge von Schwinden und Hydratationswärme in Beton. Beton- und Stahlbetonbau 79 (1984) H. 10, S. 263-269

11. [11] Janssen, D.: Moisture in Portland Cement Concrete. Transportation Research Record 1121 (1981) S. 40-44
12. [12] Pickett, G.: Shrinkage stresses in concrete. American Concrete Institute Journal17 (1946) H. 3, S. 165-204
13. [13] Blaine, R. L.: A Statistical Study of the Effects of Trace Elements on the Properties of Portland Cement. Proc. 5th Int'l Symp. Chemistry of Cement, Tokyo1968, Vol. III, S. 86-91
14. 26] Tazawa, E.: Autogenous Shrinkage of Concrete. Proceedings of International Workshop organized by JCI, Hiroshima, June 1998
15. [27] Hobbs, D. W.: Influence of Aggregate Restraint on the Shrinkage of Concrete. ACI Journal, September, pp.445-450, 1974
16. [39] Mehta,P.K"Properties of Portland Cement Concret Containing Fly Ash and silica fume",Cem,Concrete researches., 12,1982,pp683-696
17. [40]Ramachandran,V,S and Malhotra V,M "Superplastizers"Noyes Publication, Park Ridge,1984
18. [42]Brameshuber,W"Selbstverdichtender Beton",Schriftenreiche Spezialbeton Band 5,verlag bau+Technik (in german),pp 20
19. [43] Bier T.A "Karbonatisierung und Realkalisierung von Zemnetstein und Beton",PhD thesis,massivbau,baustofftechnologie,TU Kalsruhe,Heft 4,1988

The Analysis of Interface of Social-Technical Aspects within Transport Planning and Urban Design

Ylber Limani [1], Binak Beqaj[2], Vlora Aliu[3]
[1,2,3] University for Business and Technology,
Department of Architecture and Spatial Planning,
Prishtina, Kosovo
ylber.limani@ubt-uni.net, bbeqaj@ubt-uni.net,vlora.aliu@ubt-uni.net

Abstract. This paper discusses the essentials of social-technical aspects of urban development and transport planning. It describes the role and position of human factor in urban development and transport planning and its interface with technical elements. The paper argues the possibilities of optimization of the correlation between human factors and technical elements using the social-technical insights related turban design and transport planning. The research methodology has been based on qualitative empirical and theoretical approaches using the methods of combination the direct observation and the analysis of documents, and the literature. The working methodology has been based on the concept of organizational science emphasizing the importance of balance between human health, well-being and technological effectiveness.

Key words: urban development, transport planning, sustainability, social aspects, technical factor

1 Introduction

The social-technical aspects of urban development and transport areas are various, and the prospect of extracting and using them is abundant. Since the concept of sustainable development was placed on the agenda of many planners and developers, the social aspects together with economic and environmental aspects have been studied and included in the policies, plans and programs, and in the various projects around the world. However, the requirements of sustainable development conception concerning urban development and transport planning are complex and they need more research. Transport Planning (TP) and Urban Design (UD) developments should be considered together, specifically the social-technical aspects in this regard are important and they require higher attention. In this paper, we adopt that the concept of sustainable development would not be implemented without fully incorporation of social, environmental, and economic issues. Moreover, we recognize that this concept is changing because of changing the social/human needs in one side, and engineering opportunities at another side. Consequently, there are discussions among the urban and transport planning communities concerning the inclusion of other factors to the concept of sustainability such as sustainable urbanization (UN, 2008), and sustainable transport (Black, 2010; Limani and Beqaj, 2012). In this matter, social-technical aspects of UD and TP are highly important since they are considered to be an essential measure of the triple-bottom line for sustainable development.
This research is performed concerning a central question:
How might the transport planning and urban design may be more effectively understood in order to contribute in building of more sustainable social environment?
The sub-questions raised in this research try to answer how the social-technical aspects of transport and urban development interact with each other, and how they should be managed in certain decision making under uncertainties. The approach is supposed to serve as a module for educational objectives and as a tool for improving the awareness and decision-making behaviour of engaged governmental departments, individuals and other community groups in urban design and transport planning.
The research is further limited to the analysis of social-technical interface within the transport planning and urban design. This analysis is performed combining the qualitative and quantitative research

methods. Subsequently, the resolution of this research is categorized as exploratory, descriptive and explanatory.
Explorative study addresses the questions concerned with the identification of the contemporary circumstances concerning social aspects of transport and urban development by assessing the related events in an original approach. In this regard the depth analysis of social-technical aspects of TP and UD is undertaken. The dataset generated from this analysis is used to further analyse the interface within TP and UD.
In the first part of Section 2 the social-technical aspects of transport planning is performed showing the main issues in this regard (Limani and Beqaj, 2012). The second part of Section 2 shows the analysis of social-technical aspects of urban design. This analysis has been performed by examining two distinct assessments. First exploration includes the assessment of the social value of urban design, where social technical-aspects of UD are identified and analysed (Ministry for the Environment, 2005).
Descriptive study is concerned with the most possible description of related studies, events, engaged individuals and groups, users, technology and related environments.
With a short *explanatory* study, this paper founds and reports some remarkable and valuable relationships between human factors (social issues) and technical variables (land use and spatial elements) in the field of urban design and transport planning. The relationship between UD and TP is analysed through scenario development and scenario analysis. In this respect, the results concerned with the relationship between UD and TP are presented. In the conclusions, particular significant recommendations are given, which are aimed for educational and decision-making purposes.

2 The analysis of social-technical aspect within transport planning and urban design

2.1 Social-technical aspects within transport planning

The simple understanding of transport purpose is to benefit the society. In this perspective there are some conditions constrained with transport when its impact on the society need to be assessed. The essence of the existence and the development of transport is to provide mobility for people and haulage for goods. However, this simple resolution has become more critical and complex when rising social needs have been converted into transport issues. Transport planning should create preconditions for a transport which will provide with mobility and accessibility for all, which is safe, secure and fair, which will minimize accidents and will increase equity, and which will be environmentally responsible. Moreover, transport should be able to maintain a degree of mobility to contribute effectively to the economic development of countries and regions. In the latitude of sustainable transport, transport planning objectives should be directed to maximise mobility and accessibility, to maximise community cohesion, to minimise traffic noise, to reduce and possibly to eliminate accidents, to reduce air pollution, and to protect valuable cultural objects and places.
Though, this part of research is focused on social-technical aspects of transport planning, the discussion will be further focused on envisioned topic. The impact of transport on the society is supposed to produce positive effects, however, often it produces negative effects (Limani and Beqaj, 2012).
Most important social aspects of transport planning that further have been analysed in this research are listed as follows: accessibility, mobility, equity, safety, security, noise, community cohesion, and preservation of cultural objects and areas (Limani and Beqaj, 2013).

2.2 Equity

Social equity reflects the protection of fundamental rights of all people and ensuring that, regardless of age, income or disability, all communities enjoy equal access to all aspects of society (employment, access to public services or educational institutions, enabling consumer and recreational possibilities). Equity means neutrality and objectivity guiding reflection to the suitable dissemination of benefits and costs of transport.

The equity can be analysed depending on how, where and when the measurement of transport occurs.

In general three types of equity should be included in transport planning (Litman, 2002):

- *Horizontal equity*, which treaties everybody equally. Transport user pays, while individuals bear the costs they impose without favouring one group to another.
- *Vertical equity with regard to income and social level*, which supports transport subsidies for disadvantaged groups and opposes the price increase.
- *Vertical equity with regard to mobility need and ability*, which assumes that everyone should enjoy the basic level of access and mobility.

Horizontal equity is well measurable taking into consideration it is based on transport investment costs. This equity type is most common in transport analysis because it considers market effects. Vertical equity with regard to social level can be measured by taking into account the basic mobility needs of disadvantaged people and possibilities of balancing other types of travel (business, luxury and leisure).

Vertical equity considering mobility needs and ability should be analysed in terms of mobility needs (luxury or essential) and in terms of ability (non-drivers, low-income drivers, persons with disabilities). Equity is a difficult subject to be measured; however there are many ways of measuring it. The equity as an indicator of social and economic impacts of transport should be disaggregated in smaller indicators to be measured (Limani and Beqaj, 2012). Affordable housing and activity accessibility, share of transport costs, quality of accessibility for people with disadvantages (TRB, 2008).

2.3 Accessibility and mobility

Accessibility and mobility are two pointers having most consideration in transport planning. Depending on the impact area the mobility and accessibility may reflect multiple impacts. They can measure both impacts of transport: social and economic. Accessibility may be more attributed to measure transport social impact, while mobility may be attributed to measure transport economic impact. However, there is a considerable degree of simultaneous impact of both mobility and accessibility in the social life of people.

Accessibility at the social level is defined as the ease of access for all people in different locations where they can travel to their activity place using desired and needed transport system modes and facilities (TRB, 2008). Decisions affecting accessibility can be complex. Even a well specified accessibility indicator such as the total average travel time to a specified workplace for residents of an area includes many complexities about walking, public transport schedules, road congestion, and the travel time being substituted, work on roads and urban areas, accidents, and people's ability to use a specific mode or to access a transport facility, etc.

Mobility and accessibility represent two main influences of transport on the society and at this level they can be measured against their quality. Indicators for quality measurement may be affordability, access to employment and social services, educational opportunities and household tasks, quality of accessibility facilities for people with disabilities, inclusion possibilities improvement through enhancing pedestrian, cyclist and public transport spaces and facilities (Limani and Beqaj, 2012).

2.4 Safety and security

Transport planning objectives should be based on more safe and secure traffic for all users. Despite of the many improvements in EU transport policy related to safety and security issues shows the number of people killed by accidents remains high. In 2009 in road accidents in the EU, 34826 persons were killed (EC, 2011), and in the USA from total transport accidents 35929 people were killed in 2008 (U.S. DOT, 2011). Although the number of road fatalities was lower by more than a third in comparison with 2001, road accident remains the main cause of fatalities and injuries, crashes, loss of properties and opportunities. The main measurable indicator which indicates safety and security item is the accident. Accident as an indicator at social level can be measured through negative effects produced and consequences such number of fatalities, injuries, losses from crashes (substantial measurable and psychological difficult to measure losses), and opportunity losses. The transport planning objectives should be oriented to increase road safety and to reduce crash risks. Comprehensive evaluation of transport system components could be more effective to increase safety and security than examining the

whole transport system. Utilising this method transport system component may become positive feedback system by considers more integrated solutions and providing multiple benefits.

2.5 Noise

Transport noise has been qualified to have negative effects on the environment by disturbing the wildlife and on the human health. Increasing noise levels have a negative impact on the urban environment reflected in falling land values and loss of productive land uses. The World Health Organisation (WHO) has defined the noise annoyance as a feeling of displeasure induced by noise. However, noise above 50 decibels (dB) is considered to be dangerous for human health. According to the WHO noise impact produces following effects: annoyance, speech intelligibility and communication interference, distribution of information extraction, sleep disturbance, and hearing impairments, (WHO, 1999). According to the United Nations Economic Commission for Europe and WHO, it has been estimated that about 30% of EU15 are exposed to levels of transport noise more than 55dB (A), although WHO limits noise levels for residential areas to 55dB during the day and 45dB during the night (UNECE-WHO, 2008). The UK has well established procedures for assessing the annoyance to people caused by road and rail traffic-related noise and vibration. UK Department for Transport has recently commissioned a research study aimed at converting noise impacts to monetary value.

2.6 Community cohesion and preservation of cultural areas

Community cohesion means the level of configurations of social networking within a region or community. Transport is vital in connecting people with their residences, workplaces, schools, hospitals and other activity locations. Efficient transport planning should consider all possibilities in order to find better solutions for balanced accessibility and efficient mobility of all categories of people. Contrary, poor transport planning and insufficient facilities possibly will lead to social exclusion, inequity, destruction of cultural heritages, more accidents, and noise above allowed levels, and the disturbance of communities.

Table 1: The summary of social aspects of transport planning

Social Technical aspects of Sustainable Transport Planning	**R**	**Social Values and/or disvalues**
Accessibility	**29**	Accessibility at the *social level* is defined as the ease of access for all people in different locations. Primarily concerns *people* with *special needs* such as people with reduced mobility, disabled people, elderly people, and families with young children and the young children themselves (EC 2010).
Mobility	**20**	*Safe and secure* movement of people. Mobility and accessibility have a considerable degree of simultaneous impact on the social life of people.
Equity	**17**	Ensures that the benefits and costs of transport are reasonably *equally* distributed. Focuses particularly on users with *special needs.* Concerns with improving accessibility, saving the environment and providing safety (EC 2010). Protects user's interests and rights.
Safety and security	**15**	*Safe and secure* traffic for all *users*
Noise	**13**	Causes negative impact on the urban environment and on the *social life* of people. It affects the health of people.
Community Cohesion	**4**	The level of configurations of *social networking* within a region or community.

Pollution of air, soil and water	2	Has negative impacts on *people's health* and *welfare.*

Source: Limani & Beqaj 2013

The impacts of transport on community cohesion may produce positive effects as well as negative effects. Positive effects possibly will generate new development, community and residential reliability and stability, may change property values, etc. Negative effects may indicate in inconsistency and isolation of residents from community facilities. This impact category is not relatively quantitatively measurable and it overlaps with a number of other impact categories (e.g., safety, noise, or urban sprawl).

2.7 Pollution of air, soil and water

The transport's other negative impact that produces negative effects for the social life of humans and for other living beings on earth is pollution of air, land and soil. This aspect is more related to the environmental impact of transport, therefore it will not be explored in this paper.

2.8 The assessment of social value of transport planning

The selected and previously described social-technical subjects in TP are further evaluated using common Multi-Criteria Analysis (MCA). The ranking of the subjects is performed by pairwise comparing the presented subjects with reference to the social aspect of TP. The results are displayed in

2.2 The Analysis of Social-Technical aspects within urban design

Urban design primarily reflects the necessity for social cohesion. It includes and requires individual and collective adaptability and resilience, acceptation, cooperation, organization and integration of various factors. It takes time and place simultaneously on a logical and planed scale. All these aspects of urban development have social, environmental and economic impact and they represent the factors for sustainable urbanization. Adaptability in urban development reflects the balance of urban system with the natural system and requires high tangible and intangible flexibility. Resilience or elasticity is represented from people, businesses, wealth, power and knowledge with a definite boundaries capable to develop and maintain a balanced state.

However, the urban development is recently based on practical issues such as landscape, energy efficiency, air quality, safety and security, water management, mobility, accessibility, time, space, costs and benefits, community cohesion, technology, etc. This research limits to the social-technical aspects of urban design, respectively social-spatial aspects of urban design.

The main social-technical aspects of urban development adopted in this paper are aspects expressed through pragmatism, cooperation, consciousness, confidence and integration. The social side of Urbanism may be simply explained through the interaction between societies and Urbanism, while the technical part may be explained by defining the interaction between engineering and Urbanism. The two assumptions are supported by the exploratory research of different approaches considering integration of social and spatial aspects of urban design.

2.9 Integration of social-technical (spatial) aspects of urban: design-layered approaches

Table 2: Social-technical aspects of urban design

Key urban design elements	Social Values
Local character	Reinforce a sense of *identity* among the residents of the neighborhood. Encourages people to become actively involved in *managing* neighborhood. Offers a choice among a wide range of distinct places and experiences
Connectivity	Enhances natural surveillance and *security*. Encourages walking and cycling, mainly for non-work trips, leading to *health* benefits. Shortening walking

	distances, encouraging people to walk.
Density	Is difficult to disentangle from the benefits of *mixed use* and other factors. Can contribute to *social cohesion*. Tends to promote *health* through encouraging greater physical activity. Enhances vitality
Mixed use	Improves *access* to essential facilities and activities Provides *convenience*. Encourages walking and cycling, leading to health benefits. Reduces need to own a car. Increases personal *safety*. Can enhance social *equity*
Adaptability	Increase diversity and duration of use of *public space* Gives ability to resist functional obsolescence
High quality of public realm	Higher participation in community and *cultural* activities Increased use of *public space*. Gives a greater sense of personal *safety* Attracts *social engagement*, pride and commitment to further achievements. Public art contributes to greater community engagement with public space
Integrated Decision-making	Encourages people to take advantage of opportunities presented by good urban design. Provides *equity* of *opportunity* for a range people to benefit from good urban design
User participation	Improves fit between design and *user needs*. Develops *user ownership* of positive change. Enhances sense of community, a sense of well-being and *democracy*. Legitimizes *user interests*.

Source: Adapted from the Ministry for Environment 2005

Analysing the Table 4 the following subjects have been identified: identity, management, choice, safety and security, health, social cohesion, access, participation, convenience, equity, diversity, public space, culture, social engagement, user needs, ownership, community, well-being, user ownership, user interests, democracy. We suggest the inclusion of aesthetics and tradition as important subjects related to the local character of urban design.

Table 3: Relative importance of UD elements and extracted social-technical issues of UD

Key UD elements	Relative Importance for UD	Extracted social-technical issues of UD
Connectivity	19%	Safety security, Health
Density	5%	Mixed use, Social cohesion, Health
Mixed use	12%	Accessibility, Convenience Health, Safety, Equity
Adaptability	5%	Public space
High quality of public realm	27%	Cultural activities, Public space, Safety Social engagement, Community engagement
Integrated decision making	14%	Equity, Opportunity
User participation	5%	User needs, User ownership
Local Character	12%	Identity, Neighborhood management, Choice

Table 4: Ranking of shared and exceptional social-technical subjects of UD

Shared subjects	Ranking	Exceptional subjects	Ranking
Safety and security (Health)	23%	**Management**	7%

Social cohesion (Social engagement)	16%	**Public space**	4%
Accessibility (Convenience)	13%	**Choice**	4%
Equity (Democracy, Well- being)	11%	**Diversity**	2%
Culture (Tradition/identity/aesthetics)	8%		
User needs (User interests)	7%		
Public Participation (Community engagement)	3%		
Ownership (User ownership)	2%		

The identified subjects are further approximately categorised into very important, important and less important as displayed in the Table 5. Analysing the subject displayed in the Table 5 we have concluded that there may be subjects that are coinciding among more than one urban design element. For this purpose, we have used simple multi-criteria analysis in order to classify the selected urban design issues. The table displays the results from the multi-criteria analysis.

3 The interactivity (interface) within the transport planning and urban design concerning social-technical aspects

From the view of the system thinking the urban system and the transport system are both social systems and physical-technical systems at the same time. The two systems consist of many dependent subsystems or sectors and they are difficult to be assessed. The dynamics of transport system depend on the dynamics of urban system and vice versa. Among many aspects of both systems, like economic, environmental, etc. The social-technical aspects of two systems highly depend on each other.

Transport planning and urban design should be considered as an interactive development representing the most important issued of urban dynamics. There are various aspects showing the necessity of treating urban design and transport planning interactively.

This paper is limited and focused on the social - technical interface within urban design and transport planning with the objective to provide more understanding of human demand related to transport and urban development. This section exploits and deduces the quantitative and qualitative studies carried out in the Section 2 and provides with the new perspective concerning the social-technical issues of transport planning and urban design. In this section the similar and different aspects of urban design and transport planning have been examined using multi-criteria analysis.

Through the synthesis of analysed issues, only the similar aspects of TP and UD hare further evaluated. This method is not dedicated to finding optimal solutions for potentially identified contexts. It is an approach with the purpose to support decision-makers and planners to analyse different issues of TP and UD, and to compare them in order to find their proper values with respects to social aspect and their interaction altitude. It is more a pair comparison method which compares each selected subject from the section 2 and evaluates those criteria alongside two main topics: TP and UD.

The results show the interaction altitude within TP and UD and validate our assumptions made in this research.

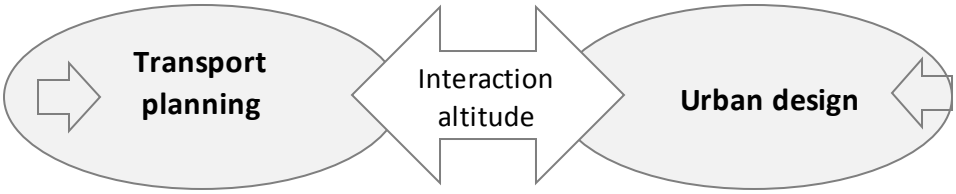


Fig 2: Transport planning and urban design- Interactive development

Table 5: Selected social issues for TP and UD

Social-technical issues	The Importance of subjects in %		The average TP and UB (in %)	
	TP	UD	Inc. Other issues	Excl. Other issues
Safety and security	29	22	25	34
Accessibility	20	13	17	23
Equity	15	10	13	17
Community/Social cohesion	13	15	14	19
Cultural Areas Preservation/Culture	2	8	5	7
Other social issues	21	32	27	

Table 5 displays selected social-technical subjects of TP and UD, which are used for further comparison and analysis. The selected subjects are approximately similar for both developments, therefore they are adopted as shared subjects within TP and UD.

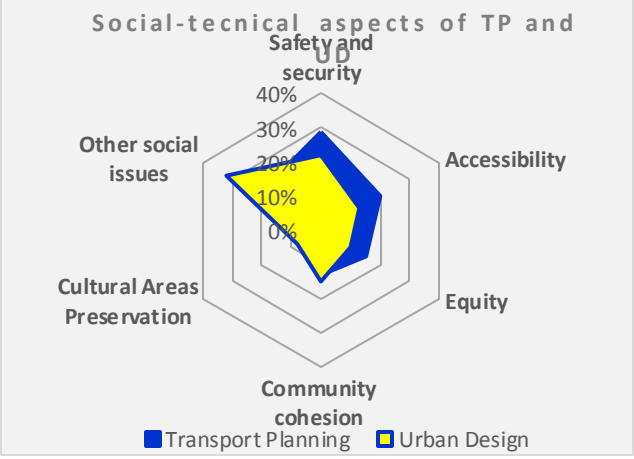


Fig 3: The comparison of main social-technical issues of TP and UD

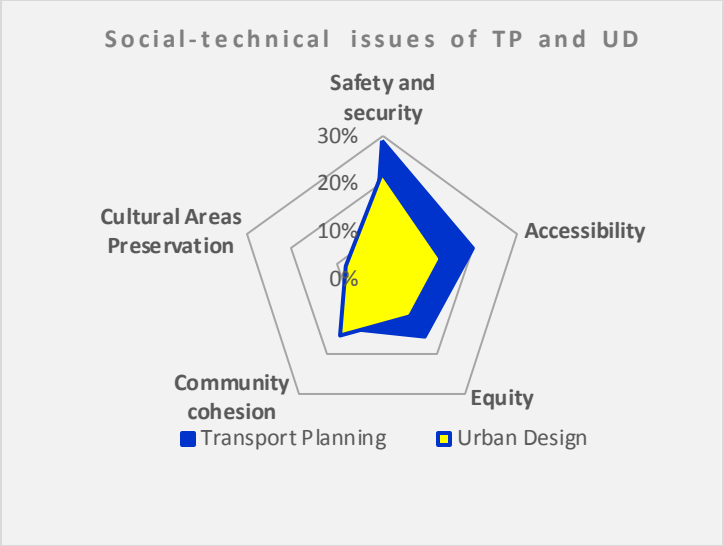


Fig 4: The comparison of main social-technical issues of TP and UD (excluding other social issues)

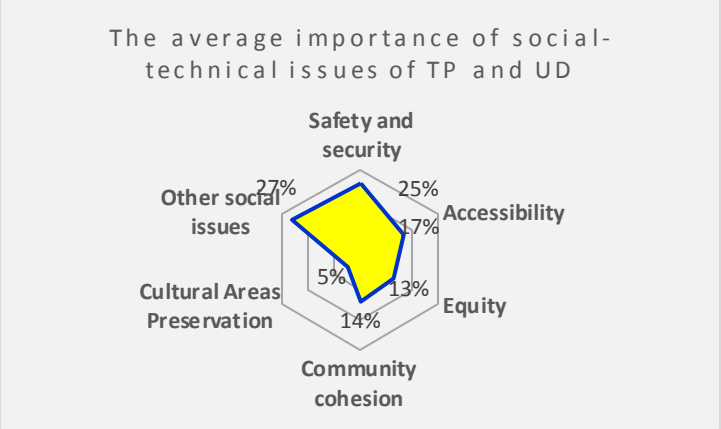


Fig 5: The average of main social-technical issues of UD and TP

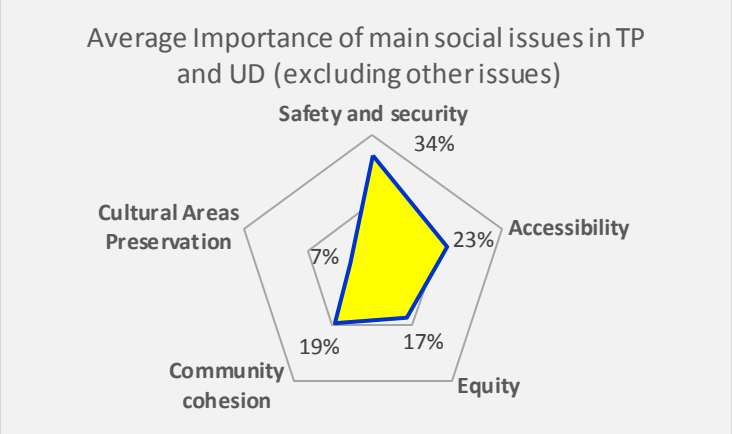


Fig 6: The average of main social-technical issues of UD and TP (excluding other social issues)

3.1 Scenario development

For the scenario development we used the dataset created in the previous sections. The dataset corresponds to the problem of identification and prioritization of UD and TP main elements. For the simplification of the research we have adopted four main elements (alternatives): high quality of public realm, connectivity, integrated decision making and mixed use. The selected alternatives are further evaluated against 5 criteria: safety and security, accessibility, equity, community cohesion, culture/preservation of cultural areas. For this purpose we have used VISUAL PROMITHEE 2 multi-criteria method. The five selected criteria also have been used to evaluate four different alternatives, which are HQPR, Connectivity, Integrated DM and Mixed Use. For the simplification of research the adoption of these alternatives is made also for the transport planning topic.

3.2 Scenario Comparison

The scenario comparison is performed using Visual PROMETHEE method. The evidence is that UD scenario have more compact preference flow showing that HQPR is preferred to other alternatives. Integrated DM alternative is the worst case in both scenarios. In TP scenario HQPR shows better preference flow comparing with UP scenario. Connectivity and Mixed Use are approximately the same for both scenarios and show some kind of neutrality. However, connectivity shows better preference flow in both scenarios compared with Mixed Use. The conclusion is UD is more optimal when compared with UD relating to social-technical aspects, and the TP need more attention and requires more improvement.

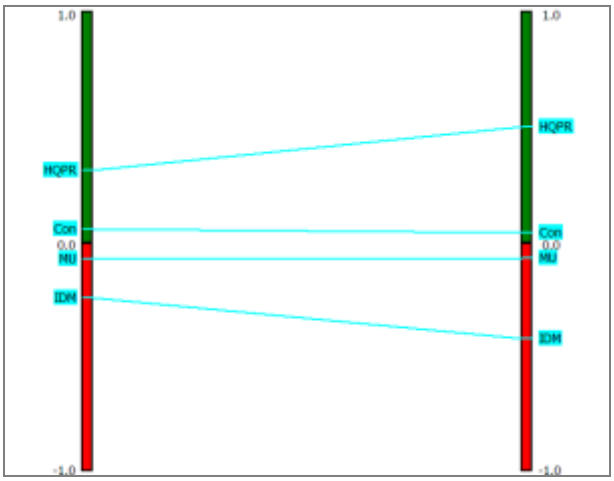
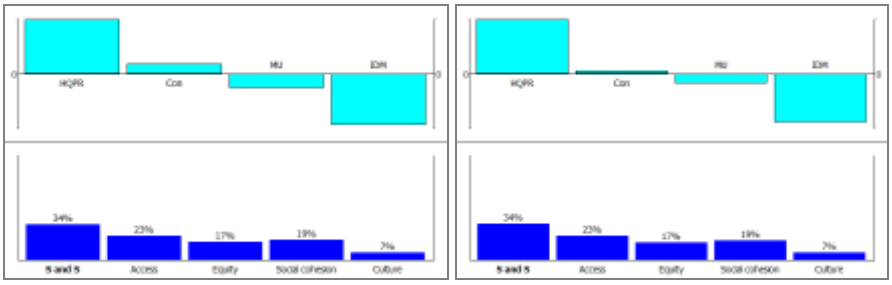


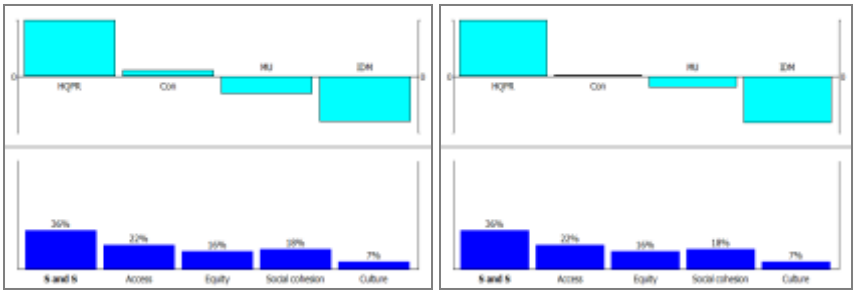
Fig 7: The results from scenario comparison

3.3 Sensitivity analysis



a) b)

Fig 8: The demonstration of walking weighs a) UD scenario, b) TP scenario



a) b)

Fig 9: The demonstration of walking weighs after 5% increase of S and S criterion weight a) UD scenario, b) TP scenario

Table 6: Preference flows of alternatives in the TP Scenario

	TP	Original approach			5% Increase of Safety and Security criterion		
Rank	Alternative	Phi	Phi+	Phi-	Phi	Phi+	Phi-
1	HQPR	0.2967	0.45	**0.1533**	0.5035	0.6138	**0.1103**
2	C	0.0567	0.33	0.2733	0.0148	0.3213	0.3065
3	MU	-0.0767	0.2633	0.34	-0.0955	0.2921	0.3876
4	IDM	-0.2767	0.2267	0.5033	-0.4228	0.261	0.6838

The Figure 8 and Figure 9 display the effect of criteria weights and impact on the evaluated alternatives, respectively the sensitivity analysis using "walking weighs method". It represents the complete ranking of alternatives in the upper bar and the criteria weighing as conducted in the previous section in the lower bar. It can be identified that the HQPR alternative score is higher, while Integrated DM score is low. Between those two alternatives lies Connectivity with marginal positive score, and Mixed Use with the marginal negative score. This figure represents an original approach as established in the section 2 of this research work.

To conduct the sensitivity of our findings, the marginal decrease of input values, i.e., the weight of the criteria is performed as shown in the Figure 9. The increase of the weight of Safety and Security criterion of 5% affects the other criteria as shown in the Figure 8a causes changes in the input value (weight) of Equity criterion. Consequently Equity criterion weight decreases for about 11.5%. Regarding the results it may be concluded there is no much space to change some of criterion weight, no matter if they are considered to be positive. However in the complete ranked alternatives change is acceptable only for the alternative HQPR, since its preference flow increases as shown in the Table 7. Other alternatives have negative preference flow. The preference flows are computed to consolidate the results of pairwise comparisons of the alternatives and to rank all the alternatives from the best to the worst ones. Positive flow measures how much one alternative is preferred to other alternatives. Negative preference flow measures how much other alternatives are preferred to one alternative. The net preference flow is the balance between the positive and negative flow. It can be both positive and negative. The larger the value of the net flow, the better the alternative.

Table 7: Preference flows of alternatives in the UD Scenario

Rank	**Alternative**	**Original approach**	5% Increased S and S

		Phi	Phi+	Phi-	Phi	Phi+	Phi-
1	HQPR	0.2975	0.4505	0.153	0.3065	**0.4557**	**0.1493**
4	Connectivity	0,0550	0.3292	0.2742	0.0375	0.3213	0.2837
3	Mixed Use	-0.078	0.2627	0.3408	-0.0923	0.2564	0.3487
2	Integrated DM	-0.2745	0.2277	0.5022	-0.2517	0.2383	0.4900

As shown in the Figure 8 and in the Table 9 in the case of UD scenario the influence of increase input values is lesser than in the TP scenario. It may be resulted from the generalizations made in the case of alternative selection.
The conclusion is both UD and TP show improved preference flow when Safety and Security criterion increases in its importance. However, this finding will not tell us much about the interface within TP and UD concerning social-technical aspects since all studied aspects in this paper need to be maximized. It would be required to include other issues that are supposed to be minimized, thus negative issues of TP and UD. This paper is limited to the analysis of interactivity within UD and TP concerning social-technical aspects, and for the simplification of research it includes main subjects with same altitude, i.e., with positive importance for both UD and TP.
The results show TP scenario to be weaker, while UD scenario stronger when they become concerned with the social-technical aspects. This would mean TP needs more research and more improvement in order to become more sustainable. There is also space for improvement of UD considering that social-technical issues need to be more accurately balanced and prioritized.

4 Conclusions and recommendations

This research has been focused on the interactivity issue of TP and UD concerning social-technical aspects. This means that we have analysed many underlying issues, and finally we have selected some of important subjects to analyse and to compare them. The results show how the social-technical aspects of UD and TP should be assessed and prioritized in the decision making process under certainty. A conclusion can be drowned that the transport and urban developments impact on society produces positive and negative effects and the designing and planning objectives should be directed in mitigating negative effects of transport and urban development and in promoting and continuously improving positive effects of UD and TP on the society. Another important conclusion is that in the case of TP, it would not be a good solution when planners get highly focused on one issue, no matter how such issue may be important. In this research we have concluded that even when the sensitive issue such Safety and Security criterion become increased in its value or weight, it will not produce positive effects for all alternatives. In conclusion three main indicators of community cohesion adopted in this research are: quality and quantity of community interaction; property value change, and community activity participation level. The subjects identified as an important for urban design should be captured by the urban development responsible and engaged authorities. The urban authorities can correct any eventual deficiency by developers using the criteria developed in this paper. Urban design elements may be included in the creation of urban design protocol there where it does not exist. Concerning other important issues, which have not been captured by this research, it may be recommended more research in the frame of sustainable development, especially in the frame of economic and environmental aspects of UD and TP. It would be also recommended to conduct more research in the direction of the policy and planning level in order to enforce the regulations concerned with the social-technical issues of TP and UD. The legal regulations should be based on prevention and reduction of improper behavior of policy makers and planners in the field of TP and UD. The research should be conducted to explore the negative effects of TP and UD as sub-systems and as a whole system. This may include urban sprawl,

car dependency, noise pollution, air pollution, congestion, land use, land take, land fragmentation, energy use, aesthetics and biodiversity, etc.

References

1. Black, W. R. (2010). Sustainable Transportation: Problems and Solutions. The Guilford Press, New York, London.
2. EC (2010). Thematic Report Summary: Equity and Accessibility. Transport Research Knowledge Centre [online]. Available at: http://www.transport-research.info/web/index.cfm.
3. EC (2011a). EU Energy Transport in Figures. Statistical Pocketbook 2011. Office for Official Publications of the European Communities, Luxemburg.
4. Limani Y., Beqaj B. (2012). An Approach for Integration of Sustainable Transport Planning Indicators. International Conference on Business, Technology and Innovation, Prishtina, Kosovo. ISSN66488.
5. Limani Y., Beqaj B. (2013). Improving Transport Planning Policy in Developing Countries of Western Balkan Region Using Inclusive Integration Methodology: Exploration and Comparative Development.
6. Litman T. (2002). Evaluating Transportation Equity. World Transport Policy & Practice, Volume 8, Number 2, (2002) 50-65.
7. Ministry of the Environment (2005). The Value of Urban Design. The Economic, Environmental and Social benefits of Urban Design [online]. Ministry for the Environment, Wellington.
8. TRB (2008). Sustainable Transportation Indicators Subcommittee of the Transportation Research Board (ADD40 [1]). Paper 09-3403, 2009 Transportation Research Board Annual Meeting [online]. Available at: http://www.vtpi.org/sustain/sti.pdf.
9. U.S. DOT (2011). Research and Innovative Technology Administration Bureau of Transportation Statistics. National Transportation Statistics 2011, Washington.
10. UN (2008). Achieving Sustainable Development and Promoting Development Cooperation. Dialogues at the Economic and Social Council. United Nations Publications, New York.
11. UNECE-WHO (2008). Transport, Health and Environment: Trends and Developments in the UNECE-WHO European Region (1997–2007). New York.
12. WHO (1999). Guidelines for Community Noise. World Health Organisation, Geneva.

Urbanization and Socio-Urban Developments in Prishtina in Post-Conflict period

Besim Gollopeni
University for Business and Technology, Prishtina, Kosova
E-mail: besim.gollopeni@gmail.com

Abstract. At the beginning of the XXI century, the life started to be very dynamic in Kosovo with emphasis on large urban centers. Ruined houses started to be reconstructed, new houses were built, and small and medium enterprises were established, as well as new institutions. Thus, the migration of population simultaneously occurred from small urban centers and rural areas to large urban centers, and developments were particularly focused in Prishtina. The growth of urban population in Prishtina happened for many reasons, but I will mention the most important ones such as: Establishment of the entire central administration, public/private universities and health institutions, as well as international headquarters, the concentration of economic business, etc., which enabled better chances for education and employment. Given such a whole urban population in Prishtina, many institutions were unprepared - without urban conditions to cope with the influx of population.
Keywords: population, migration, unplanned development.

1 Introduction

Many researchers and experts have been focused on urbanism studies including: sociologists, urban ecologists, urban planners, civil engineers, geographers and professionals from other fields. Such interest to study urbanization is due to the fact that the process of urbanization is affected by a number of social, economic, political, and other factors, which has implications in everyday urban life and beyond. Urbanization is a very complex process which is not measured only by an indicator for example: population size, but there are other indicators including culture of urban life, socio -economic structures of the general population, the city functions, technical - technological advancements, etc. One of the theorists of urbanization, Harvey points out that urbanization is an aspect of the environment created and caused by the spread of industrial capitalism. In traditional societies, city had significant differences from the village. In the modern world, industry reduces the division between city and countryside. The agriculture is mechanized and run simply on the basis of the price and profit principle. As work in the industry so this process reduces the differences of lifestyle among the people living in town and village (Giddens, 2002, pg. 537). The same as Harvey, Castells points out that the spatial form of a society is closely linked to the overall mechanism of its development. The growth of urban population in developed countries rapidly increased after the industrial classic revolution in Western Europe in the second half of the XVIII and XIX century, as a result of the process of industrialization and deagrarization, while in the XX century and especially after World War II, concentration of population in cities and the expansion of urban settlements included all countries of the world, particularly developing countries ("Third World") (Islami, 2008, pg. 385). Urbanization and development of urban life in Kosovo with all his pace and dimensions is new, even though some cities have relatively long history and tradition. Until XX century, respectively after World War II, about 10 % of the total population of Kosovo was urbanized. Thereafter, the life had an intense dynamic in all its dimensions and urban population had continuously increased. The number of cities increased from 5 cities (1948) to 30 cities by the end of the 80-s, and among them had even mixed cities – towns, neither town nor village (Klina, Skenderaj, Malisheva, etc.). On the other hand, a particular phenomenon that has accompanied the development of most cities is the lack of design and implementation of general urban planning of that time in most cases and more than 1,400 rural settlements were left out of spatial planning process, with the exeption of Prishtina which had urban general plan. However, the expansion of settlements generally had the character of concentration throughout the last century, which enables

spatial planning and at the same time investments can be of less cost. Since 1999 the situation changed, something new happened in this respect, because both urban and rural settlements began to take the shape of dispersed settlements, especially along the roads and agricultural land. This deteriorated situation still continues, because despite of the rapid growth of urban population, (most) Kosovo municipalities were without municipal and urban development plans. Even those which have such plans do not implement them. In this case, Prishtina has urban development plan but it has not a municipal development plan (July 2013). The current challenge is the lack of implementation of the urban development plan as well as other ones associated with it. Problems like this and others mentioned above led to urban and sub urban chaos of Prishtina territory. After the last War in Kosovo ('99), migration from villages around Prishtina and beyond, but also from other less urbanized (developed) urban centers moved to Prishtina, thus creating a real urban chaos. As a consequence of this is the traffic jam, illegal construction, uzurpation of public and private property, environmental pollution, lack of parking, etc.
The paper aims to reflect urban demographic trends, physical expansion and urban challenges in order to have a clearer picture of trends of urbanization in Prishtina and challenges facing the city today.

2 A brief history of urbanization

Urbanization and urban life in Kosovo is relatively new, even though some Kosovo towns have inherited old urban tradition and culture. As it is known, Kosovo was much undeveloped until the second half of the last century (XX). Later penetration of capitalist economic elements, lack of economic development in its territory, the country's colonial position, concentration in the agrarian sector, etc., have led to a specific urbanization. Such a situation began to change in the second half of the last century (XX), icluding late industrialization, economic development, advancement in education and health system, as well as other social - economic and political advancements. During that time, with the expansion of the municipal system began demographic trends in large cities (Prizren, Peja, Gjilan, Ferizaj, Mitrovica, Gjakova), especially in the capital of Kosovo, Prishtina. After the establishment of the first public university in Prishtina (1970) and other important institutions, it began to become more attractive to people from rural areas and small urban centers throughout Kosovo, but also from East Kosovo and other regions inhabited by Albanians.
The development of urbanization in Kosovo dates from ‘70s onwards, where besides the large urban centers began to extend to smaller urban centers which were previously rural areas with a central position, but later became municipal centers. Significant developments in the demographic growth of cities ocurred until the end of ‘80s - up to 1990 and 1991 where a stagnation of development was caused due to a bad political situation in the country. All public institutions with few exceptions were closed, and the Albanian workers had been violently fired from their jobs. Educational and health institutions had also been closed. During these years the public life had stagnated. Another phenomenon that happened in most cities in Kosovo and especially in Prishtina was the process of colonization of the territory by the ethnic Serbian, Montenegrin, Bosnian, etc., with the aim and political background (increasing numbers of non-Albanian community). But even this process of colonization by Serbian chauvinist policies did not work. Despite the great migration of the Albanian population throughout the 90s and before, and unfavorable situation (survival) were strong indicators such as the tieas with the family and homeland, as well as high fertility and solidarity between Albanians have made stronger as a community until the liberation ('99) and the country's independence (2008).
The urban population constituted 15.5 % in 1953, 32.4 % in 1981 and about 36 % in 1991 (estimate) in the overall population. The number of urban population was about 71.000 in 1948, it increased to approximately 730.000 inhabitants in 1991. In the period 1953-1981 the urban population increased to 388.300 inhabitants or 306.9%, while in the period 1953-1991 around 600.000 inhabitants, or about 480%. It is estimated that currently between 45-50 % of Kosovo's population lives in the city (Islami, 2008, pg. 386).
The rate of urbanization in seven regional centers according to the census of 1981 and 1991 (estimate) has no significant differences, except of Prishtina, which leaves behind the other urban centers. Hence, it is worth mention that during the period of 10 years, all regional centers of Kosovo have marked an urban demographic increase about 10% - 20%. See the chart;

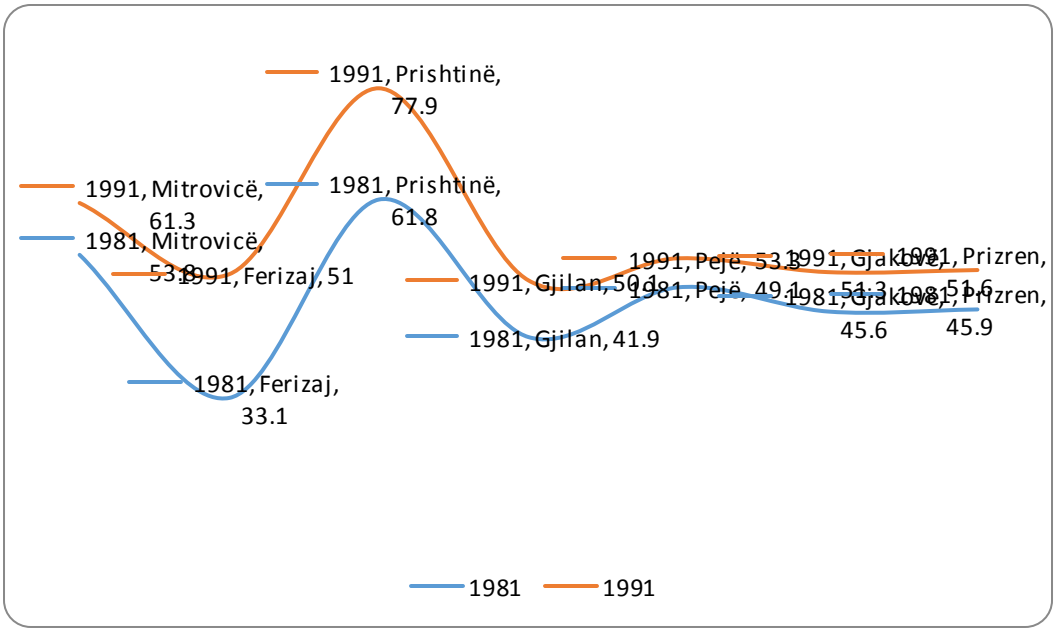


Fig. 1. Urban demographic growth in 7 regional centers from 1981 to 1991.

The life started to be very dynamic in the post war Kosovo. Ruined houses started to be reconstructed, new houses were built, and administrative, educational, cultural institutions, as well as new businesses were established. During this period, life began to take its right meaning but also accompanied by many challenges. Transitional period, in which the country is going through in general, especially the capital of Kosovo, Prishtina, is accompanied by many challenges in the field of urbanization. Migration from rural areas - remote rural, small urban centers, but also from large urban centers - regional centers and other areas inhabited by Albanians especially from East Kosovo have led to an increase in population and expansion of the city and urban suburbs, associated by major irregularities in the field of urbanization. Usurpation of public - private property, unplanned construction, traffic jam, lack of parkings, lack of public spaces, clash of rural - urban cultures, became part of life in the capital - Prishtina. Currently, according to the results of the census, households and dwellings in Kosovo (April 2011), Prishtina has about 200.000 residents and this number could be many times larger if we add the number of non-resident persons and daily migrations. We do not want to discuss here about the quality of the results of the population census (2011), because we consider that it has been discussed quite a lot so far without success. All population estimates indicate that Prishtina could have over 300,000 resident inhabitants. If we add daily and weekly migration, the number of population can be higher. Considering a poor urban aspect of Prishtina with the lack of infrastructure, traffic jam, degraded urban environment, lack of housing and high cost of living, became the most discussed issues and problems faced during recent years by the citizens visiting Prishtina and especially Prishtina citizens.

3 Demographic and spatial growth

Demographic growth of cities throughout Kosovo had been during all second half of the last century. As we mentioned above, there was a demographic increase mainly in 7 largest regional centers including Prizren, Peja, Mitrovica, Gjilan, Gjakova, Ferizaj, and especially Prishtina. Demographic growth of urban centers was caused by both natural components and mechanical components such as migration of population.Prishtina Municipality has 48 villages, organized in 16 counties (local communities). According to data available to the municipality, about 7,000 families live in such villages. In some villages, especially those belonging to Malsia e Gollakut (Gallap), is noticed a great movement of the population (especially young people) towards urban areas (Prishtina). Thus, some villages that have been overpopulated now have a very small number of people, such as Nishec, Radashec, Kukaj,

Hajkobilla, Gllogovica etc. (KK.Prishtinë, 2008, pg. 25). Migrations of population from rural areas caused the constant demographic growth of Prishtina. See table;

Table 1. Movement of Prishtina population in the period 1948-1999

Year	Number of population	Grow in % in period	
1948	19.631	1948-53	22.7
1953	24.081	1953-61	60.3
1961	38.893	1961-71	80.1
1971	69.514	1971-81	55.5
1981	108.083	1981-91	43.9
1991	155.499	1991-99	26.3
1999	195.000	1948-99	893.3
2011	198,897	1999-11	***

Source: For the years 1948-1981 official census of population 1991-1999 (until the end of March) estimate, (Islami, 2008, pg. 398). For year 2011, refer to census of population (2011).

Demographic data show that the largest urban growth in Prishtina has occurred between '60s – '70s, where urban growth reached up to 80%, then to continue with a gradual decrease to '90s. Whereas, from '50s to '90s, urban demographic growth had reached 900%. According to the census of 1961, Prishtina had only 49.3% Albanians, 58.6 % in 1971, whereas in 1981 (census), the number of Albanians in Pristina was 75.803 (70.1 %), the Serbs 16.898 (15.6%), Montenegrins 4.169 (3.9 %), Roma 5.101 (4.7 %), Bosniaks 2.504 (2.3 %), Turks 1.922 (1.8 %), etc. In 1991 from the total of 155.499 inhabitants, Prishtina had about 120.000 Albanians (77%), around 21.000 Serbian - Montenegrins (about 13 %), about 7.000 Roma (4.5 %) etc. (Islami, 2008, pg. 399). About 90 % Albanians comprised the total population of Prishtina, based on the 2011 census.
The residential and other non - residential area (commercial buildings, roads, kindergartens, etc.) had a constant increase both in urban and rural areas. Today, 14 years later (since '99), Prishtina has marked a rapid increase of both inter urban and suburban areas, which led to a confusion on distinction of the cadastral boundary of its urban space. Prishtina city has already joined with Fushë Kosova town almost even with that of Lipjan and Obilic.
The expansion of business activities along the national road from Prishtina to Peja and cheaper price of living (lower prices of land and housing/flat) has led the developments to focus on this part of the urban area.

On the other hand, alongside the national road Prishtina – Skopje are also concentrated commercial buildings, creating thus closer tieas between Prishtina and Lipjan. Given such a large urban growth and constructions expanded along the roads (Prishtina - Ferizaj), makes us believe that, for nearly one decade Prishtina will be coneccted to Ferizaj. Prishtina City and its suburbs, for just one decade (the last decade) was expanded (built) about 200%, including entire neighborhoods with individual and collective housing, commercial buildings, etc. Urban and suburban developments with such a rapid growth were almost totally unplanned where all rude developments caused a "rural area" of certain neighborhoods which have multidimensional and long term consequences. See the map;

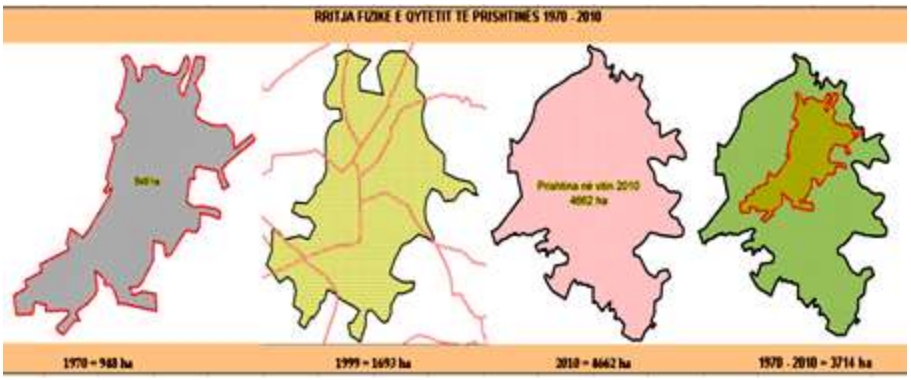


Fig. 2. Expansion of Prishtina city from 1970 to 2010.

Urban space built in 1970 was about 948 hectares, in 1999 was about 1693 hectares, in 2010 marked a record increase (expansion of the city) around 4662 hectares. Expressed in percentage from 1970 to 1999 marked an increase of 78.59%, while, from 1999 to 2010 the city was expanded of 175.37%. On the basis of this analysis for 30 years (1970-1999) Prishtina has not been expanded in physical-urban aspect as it is increased only in the last decade (1999-2010). Currently, in Prishtina the quality of housing construction is (mostly) of high standards, but one thing which makes life hard in such modern apartments is unplanned construction. Today, in the center and suburbs of Prishtina as well, the life has become very hard, due to the rude construction with the lack of natural lighting, lack of physical infrastructure (roads, car - parking, sidewalks, etc.) and social one (kindergartens, schools, health centers), etc. Another increasing phenomenon in Prishtina and beyond is, known as "Urban Deintegration" from the majority world – urban area, is the creation of separate inter-urban districts independently urbanized, constructed and administered by individual private companies. This form of new districts creates social groupings - deep social urban differences as well as territorial deintegration, though such concepts are unacceptable to developed countries. In such neighborhoods can live only people with very high income! But the concern is that the establishment of such suburbs is like "prisons" surrounded by high walls and separated from the majority urban – world. The clash of different cultures within the community that lives in such neighborhood, and other urban culture surrounding neighborhood, causes individual dissatisfaction, stress, etc. It is another concern the fact that such districts are constructed in the most qualitive agricultural land. See fig.

Fig. 3. Constructions of neighborhoods in Prishtina.

4 Causes of spatial and demographic growth

During '60s - 70s of the last century (XX) and especially in the first decade of the XXI century, major changes of demographic concentrations and spatial expansion took place in urban and suburban areas. In the second half of the last century, migrations were at a slower pace, but after 1999 onward,

considering the latest stage of migrations, and the most important one, which caused the rapid growth of cities and especially of Prishtina. At this time, migrations from village - city, from small towns to bigger towns and from other Albanian territories were a routine of time, and everyone had the chance to use it. But the target of young people (students) was particularly Prishtina. Pristina became a generator of population concentration and social-economic development as well as hopeful for the population, because the opportunity to have a better life (education, job, etc.), was greater than elsewhere (Gollopeni, 2012, pg. 6). The urban growth reasons are divided into two groups: demographic and spatial (urban) growth reasons.

4.1 Causes of demographic growth of the city

- Prishtina as a University center - until last war in Kosovo ('99), Prishtina was the only university center in Kosovo. Large number of young people came to study not only from Kosovo but, also from Macedonia, Montenegro and East Kosovo (Albanian nationality). After graduation, a number of youth lived in Prishtina, where they began a new life, thus gradually turning from an immigrant into a citizen of Prishtina;
- Establishment of central administration and other institutions (economic, business, cultural, international residencies, etc.), created new jobs very much needed by the society;
- Destruction of houses and businesses - during the war ('99) especially in rural settlements caused the migration of population from rural to urban areas. After the war, a large part of the rural society began investment in larger urban centers in the country, especially in Prishtina, hoping to have a greater, faster and more safe market;
- Concentration of economic investment in greater numbers than in all other centers, led especially youth population towards Prishtina;
- Better quality infrastructure of Prishtina than elsewhere;
- Public and private property usurpation - a part of the population in the absence of their houses (which were destroyed during the war by Serbian police and army) led them to come in the city and usurp flats, business premises and public / private property (temporarily) thus using the lack of legal institutions. Hence, benefiting materially from such actions, and thus slowly becoming permanent residents of Prishtina;
- Better living conditions (education, employment, health, infrastructure, etc.).

4.2 Causes of spatial growth of the city

- Prishtina lacked a municipal / urban development plan - until 2004. It did not have municipal development plan till 2013, even though, after this period it developed an urban development plan (2004), it still did not work, due to the domination of clan groupings, nepotism, political influence, etc., that led to an unplanned area;
- Lack of strategy and residential policies in the country - not knowning housing requirements to the appropriate extent and defining urban construction standards, urban growth expanded in an unplanned manner, taking the whole area of agricultural land and causing inadequate access to infrastructure, and
- Increasing number of unplanned businesses along the roads, etc.

These are the assumed to be the main and the most important reasons that have led to such demographic growth and expansion of Prishtina city, but never end up with that, there are other especially individual reasons which require certain analysis and studies.

5 Conclusions

In the second half of the XX century, the urban population had a large increase towards a positive trend until the early ‘90s. Therafter, growth of urban population stagnated by mechanical components due to political reasons. During this period, public institutions including universities, schools, factories, etc. have been closed and the majority of Albanians have been fired of their jobs. The emigration of Albanians intensly occurred during ‘90s, when many families migrated in order to provide their own

living (Europe and wider). Urbanization and urban life in Kosovo is relatively new, even though some Kosovo towns have inherited old civilization. Until the second half of the last century (XX), only regional centres such as Prishtina, Prizren, Gjilan, Gjakova, Mitrovica, Ferizaj, and Peja were urbanized, but through later expansion of the municipal system, more central position settlements received city status. Thus, until the late '80s, the number of towns increased to around 30 ones including mixed towns (neither town nor village). The overall urban population of Kosovo was about 10% in the '50s, but it marked an increase until the end of the XX century of about 35% urban population.

Prishtina was the city that had mostly immigration of population marking an urban increase. The highest number of urban popullation has been in the period 1960 - 1970; to continue with slower increase until 1990. Thus, according to 1991 estimate, Prishtina had about 75% of urban population. Construction of modern housing and infrastructure had also started. Economic activities such as handicrafts, trade, agriculture, gradually advancing to other economic activities dominated up to '60s.

Large population immigration or "Demographic boom" known as demographic concept took place in Prishtina in 1999 and onwards, for reasons mentioned above. At this time, public institutions were not prepared to design adequate plans and urbanism strategies as well as good management of urban spaces. In terms of institutional gap and other reasons, people built houses, business premises and other facilities without respecting the construction standards, thus bringing Prishtina to an urban collapse. In just a decade urban territory expanded rapidly with about 200%. Even though most of the buildings were built of a hard (solid) material, the problem is that they have (mostly) been constructed without permission urban (plans), but they were imposed and unplanned.

Among the main reasons of the fast demographic - urban growth is certainly immigration, because the main country's institutions were located in Prishtina, such as public and private universities, public administration, major business centers, international headquarters, etc. all these elements created favorable conditions and new jobs, and certainly better life conditions, which enabled Prishtina to be very attractive place of working and living.

Challenges faced by citizens and urban areas of Prishtina are numerous including illegal constructions which day by day makes urban life harder, traffic jam, lack of green spaces, lack of parkings, noise, environmental pollution from vehicles, lack of adequate infrastructure, etc.

Finally, to stop the urban chaos, Prishtina needs to have a special status (law) and a special budget, start the implementation of urban and municipal development plan, design and implement regulatory plans for specific neighborhoods; announce international competition on the design and planning (neighborhoods, streets, squares, parking etc.), establish an Urban Planning Institute which among others will deal with monitoring of implementation of such plans etc., otherwise everything will be too late.

References

1. Giddens, A. (2002). Sociology, Tirana: SOROS.
2. Gollopeni, B. (2008). Spatial Planing Proces, Year I. no. 1, Magazine Environment, Prishtina: MESP, fq.17.
3. Gollopeni, B. (2012). Urbanization and urban planning challenges in Kosovo, European Magazine, no. 6., Prishtina: SOROS, fq. 6-8.
4. Gollopeni, B. (2013). Shortcomings of spatial/urban planing in Suhareka, Readings in Population, Environment and Spatial Planning, Edited by: K.D. Sharma, H.S. Mangat and K. Surijit Singh, ISPER, Panchkula / INDI, fq. 355-364.
5. Islami, H., (2008). Demographic Studies, 100 years of demographic development of Kosovo, Prishtina: ASAK.
6. Muicipal Asamble of Prishtina, (2008). Medium-term development strategy of Prishtina, 2008 - 2011, Prishtina: MAP.
7. Mulla, Gj. (2000). Urban sociology, Prishtina: University of Prishtina.

Urban Land Management Policy For The Central And Localgovernment In Albania

Gjergj THOMAI [1], Daniel GURALUMI [2], Iva MEZEZI
[1,2,3] Albanian University,
Tirana Albania,
gjergjthomai@yahoo.com, guralumi@wind.it, imezezi@yahoo.com

Abstract. The peculiar character of urban land influences the urban land market: (i) Land is physically undepreciable and is not influenced by time. (ii) Land is not transportable, (iii) Land is limited in quantity and its supply cannot be increased, and (iv) Land is used not only for production purposes but also as a long-term investment or as a basis for savings. Urban land management is a complex and highly dynamic situation that requires:

- knowledge and understanding of the dynamics and processes of urban growth in a segmented and unregulated land driven market;
- capacity to formulate strategic approaches to planning and development; and
- legislative authority to implement proactive initiatives.

Now day's respective public institutions are not well positioned to address the broader issues and strategies of urban development, yet their decisions create legal precedent and produce concrete activities, which affect the urban environment.Procedures and planning normative are ineffective and inefficient, standards need to be studied and the most important one the land ownership needs to be clarified.Demographic growth, rural urban migration, the rapid expansion of the urbanized zone, land ownership changes, and change in demand and supply of the land resulted in chaotic development patterns, wasteful of land resources and costly to provide with infrastructure and urban services. With the land transactions and building activity occurring outside the legal framework for development, documenting ownership, registering titles, and recording transaction are becoming extremely complex, that in a way are obstacle the intervention for later improvement. The challenge faced by the government is to introduce a comprehensive land management with a mix of options. The purpose of this paper is to review and assess the central and local government policy on land management and development. At the same time, it will also identify the main problems, strengths as well as weaknesses and the area that needs to be improved.

Keywords: urban, land, management, regularization, market.

1 Introduction

Albania a small country in the East-South Europe, with about 3.2 million inhabitants on its area of 29.000 square km, was basically on agriculture based economy with a low industrial-technological development. Based on the socialism principles, the country is highly centralized, and for 50 years, it developed in such a way that it separated itself from other countries without communication, cooperation and collaboration which resulted to low-productivity and –efficiency and low economic growth. Private properties and initiatives did not exist. Land was the property of the state. Development was projected, financed and implemented from the central government. The land management (administration and use of the land) was the task of the state and the system was functioning in a hierarchic direction from up to bottom. Planners were free to decide on the land use (based on the agriculture land preservation principle)

After year 1990, economic opportunities emerged in the cities. Demand for land (especially serviced urban land) changed as a result of the following major factors:

- Recent economic and political changes in Albania;

- The combination of cramped housing conditions and individual household investment strategies that view housing as both shelter and financial security; and
- The rapid growth of the population in Tirana and Durres areas.

Consequently rural-urban migration ratio quickly has been changed. In this framework, the population of the Tirana-Durres Area has been growing at the alarming rate up to 7 per cent per annum since 1990 (especially Tirana City). Tirana-Durres area population is estimated more than 850 000 inhabitants; more than 60 % are living in urban areas. The built environment of Tirana now occupies more than 2.500 hectares as compared to the 1.600 hectares in 1990. The vast majority of this development has been constructed by the informal sector. The growth has occurred around the city and has expanded over the municipal boundaries. The newly urbanized areas, lacking basic infrastructure, are generally being constructed without any permits and often without title to the land. The government was not prepared and did not react to improve the situation; agencies responsible for the provision of basic infrastructure have not been prepared to respond to this sudden growth. The passive policy of the state during this time created many problems and private activities created many externalities that both of them need to be solved.

2 The Urban Land Market And Its Peculiar Nature

The forces of supply and demand govern urban land market, like any other market. These forces determine the dynamics of urban land market operations and thus affect adjustments to land prices. Unlike other markets, however, land is not a homogenous product. Each plot is unique, with a particular set of location and physical attributes, and actors in the urban land market are diverse and often have conflicting agendas. (Farvacque and McAuslan, 1991).11

An urban land market is a set of activities, which, through exchange of value, transfers rights (formal or informal). Urban land is supplied by different actors, and is demanded by others; matching supply and demands results in prices. An efficient urban land market has a good interplay between demand and supply. The demand for land is determined by the product or service produced on the land, in other words, by the use of the land. This characteristic, in itself represents a fundamental difference between land and other commodities. Demand is affected by demographic and economic pressures such as rate of household's formation, the level of household's income, the capacity of mobilizing household savings and access to credit. (Farvacque and McAuslan, 1991). On the supply side, the quantity and price of land are affected by the spatial pattern of infrastructure (the constraints on infrastructure capacity frequently impede land development): the topography, which determines the extent to which the land can be developed physically: the willingness of landowners to make urban land available on the market; and by the government's restrictions on the use of land. (Farvacque and McAuslan, 1991). Land prices in the market, as the other goods, are influenced by many factors. One set of factors concern the changes in the urban economy and society itself, and another set relates to macro-economic factors, principally economic growth and its side effects. An understanding how these factors are interrelated and the role each plays in determining land prices are important to understanding the functioning of the urban land market. As the basis for a land value is its accessibility (which includes the effects of transportation and the distance to city functions that means land location), environmental features (which includes both the social and physical environment). (Darin–Drabkin, 1977). 12

The peculiar character of urban land influences the urban land market. That is, the general law of supply and demand does not influence the urban land market in the same way as it does other commodities. The demand for and the supply of land are always related to the characteristics of specific locations, dependent from the land use, as well. Some of the unique qualities, which distinguish it from other goods, are:

- -Land is physically undepreciable and is not influenced by time. Here should be distinguished raw land from built land. The structures built on land are depreciable, but the land on which this development occurs is undepreciable. The depreciation of a structure sometimes may increase the value of the land because of an expected change in use, and from here, an expected change in income generated by land. (Doebele, 1978). 13

- -Land is not transportable. It means that the forces of demand and supply in certain areas fix the price of land, not by the availability and demand in the entire city, region or country. Thus, it is hardly possible to talk of a national market for land in the same way for different goods. (Darin-Drabkin, 1997). 14
- -Land is limited in quantity and its supply cannot be increased. These unique characteristic of urban land, the fact that the amount of land in the desired place is inherently limited, and the fact that land cannot be used for production purposes with relatively little penalty (taxes), may lead to a permanent disequilibrium in the land market between supply and demand. However, the intensity of land use may be increased. (Darin-Drabkin, 1997).
- Land is used not only for production purposes but also as a long-term investment or as a basis for savings. As demand for land increases, its price rises, but paradoxically, this higher demand does not necessarily always increase the supply, but may reduce it as the landowners expect future development and higher profit from their land. The scarcity of land and the physically undepreciable character of land make it profitable. (Darin-Drabkin, 1997).

3 The Functioning Of The Urban Land Market And The Role Of The Government

Unlike other markets however, ease of entry or exit is closely controlled by local and national government policies. Well-functioning urban land market can therefore be characterized by the level of ease of entry into the system and of carrying out land markets transactions, both of which depend on the availability of adequate land information, secure tenure arrangements, and appropriate registration/recording mechanism. On the other hand, non-performing urban land markets are plagued with a number of problems easily recognizable and commonly found such as (a) over centralization of management and administration; (b) inappropriate, over detailed, and inflexible regulatory and legal frameworks; (c) lack or inappropriate use of resources and political will to tackle the problems; (d) administrative systems lacking in efficiency, equity, accountability, and probity; (e) a failure or reluctance to encourage participation from the urban poor.(Farvacque and McAuslan, 1991).

The price of land will increase not only in an expected area, which will be affected by developments, but will increase the land price over an area, which is not developed. Therefore, will affect negatively the public budget for the future public investments. (the compensation cost for expropriation purposes will increase). Because the landowner behavior s produce the same results as a monopoly, higher prices and reduced supply, the role of public authorities, their policies and instruments apply to land market become crucial. (Darin-Drabkin, 1977)

According to Dowall and Clarke (1991), 15 there are three justifications for the government involvement in the urban land market.

- -Elimination of market imperfections and failures to increase operating efficiencies.
- -Remove the externalities, based on the its intervention by laws, regulations and norms so that the social cost of land market outcomes correspond more closely to private costs.
- -Redistribute society's scarce resources so that disadvantaged groups can share in society's output (Moore 1978)

The institutions and instruments which between them provide for the management and operation of urban land markets should be based on the principles of equity, efficiency, flexibility, and participation with the overall aim of facilitating increased access by all citizens, and especially the urban poor, to affordable and appropriately located land with adequate security of title and occupation and adequate development rights (Farvacque, McAuslan 1991)

According to Dowall, (1991), there are many points that can impede goals of achieving efficiency and equity allocation of land.

- -shortage in public financial resources for all types of investments, related to annual output per capita, and to high inflation.

- -externalities generates by the design standards, which hamper the ability of most target people to pay.
- -weak capital market, due to the economic features.

To remove these constraints it is necessary to identify where distortions are occurring, and where the policies and regulations that contributes to distortions. Beside that it is necessarily to improve the institutions and instruments due to the land issues, to support the effective operations of urban land market, and to improve governance of land, such as institutional, technical, cultural, financial, environmental, and political forces affect decisions making in urban land market and land management.

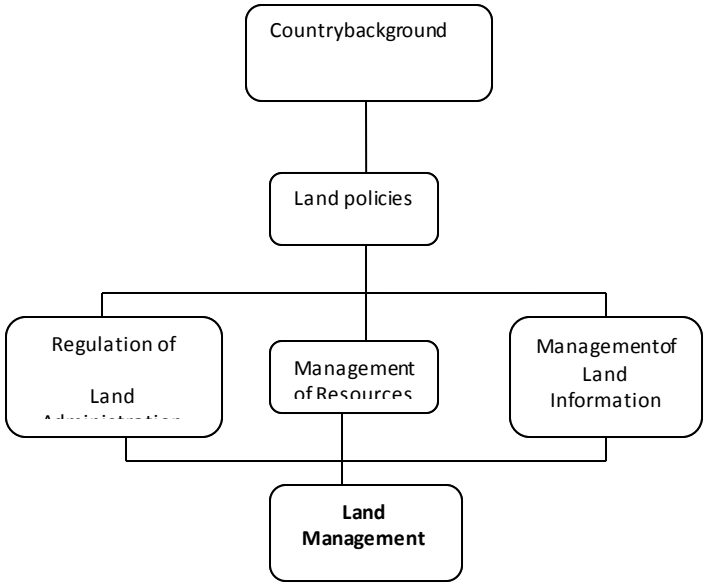


Fig. 1: Regularization of Land Management

4 Existing-Main Problems

At the given situation the main common problems faced by the government and cities are:

- Lack of strategic plan for development and its non implementation, lack of territory planning strategy regarding the balance of land use (urban, rural,) where the development will be spread out;
- Lack of land supply, especially serviced land;
- High cost of existing and available urban land;
- High cost of construction;
- Increased of unemployment;
- Delay in restitution and compensation of the land to the ex-owners;
- Inability of the public and private sector to service land;
- Shift of the responsibilities from the central government agencies to the local government agencies (not clear responsibilities);
- Lack of planned intervention for the development;
- Lack of financial resources;
- Uncertain planning and norms adequate to the situation;
- Lack of skill and capacity;
- Improving financial structure and management;
- Providing shelter, basic urban services and infrastructure;

- Improving urban information systems;
- Strengthening the role of the urban informal sector
- Strengthening urban institutional capacities, including the role of municipal governments;
- Increasing the ability of the government to coordinate the delivery of trunk and secondary infrastructure among its agencies and local authorities.

Based on the problems emerged in the cities the government supported by foreign aid introduced basic approaches in order to improve that situation.

- **Site and Services approach**

Stressing on the situation and the problems, The Ministry of Public Works, the National Planning Institute, the District of Tirana and the Municipality of Tirana have been working together on formulating strategies for meeting the demand for serviced land. A Land Management Task Force (LMTF) has been established to formulate these strategies with foreign technical assistance. Critical areas requiring attention include:

- Planning and prioritizing land development;
- Trunk urban infrastructure development, especially access infrastructure, such as water supply, sewerage, and roads;
- Municipal, land, and infrastructure finance;
- Institutional coordination and capacity building associated with the delivery of serviced land and trunk infrastructure, and
- Legislative reform to remove bottlenecks in the delivery and finance of the infrastructure for urban land.

As means of identifying practical strategies, the LMTF has initiated the development a pilot site with full cost recovery from the purchasers for the land and infrastructure. The site was vacant and the government still holds the title of the land. The strategy identified for the development of the site was the involvement of selling parcels of land to the private sector, including larger developers, small and medium contractors, and individuals. Private developers were responsible for the construction of the on-site infrastructure, and a Project Implementation Unit for the off-site one. The project failed as a result of:

- The government was not able to receive the full value of the land, which would allow them to provide infrastructure on a cost-recovery basis;
- There were no clearly defined institution or coordination of the activities of several institutions to oversee the selling and servicing of the land;
- There was no coordination and integration of the implementation of both the off-site and on-site infrastructure among the institutions involved in its delivery;
- As a result the project was delayed and the land (high demand for land and housing, and migration) was invaded.

But the vast majority of housing is being provided by the informal sector in Greater Tirana and is being built by the small-scale builders and the individual owners. Illegal settlements are characterized by land ownership and occupancy rights that cannot be easily substantiated and by planning approvals and buildings permits that have not been obtained (although residents have obtained connections to public utilities). Site chosen include areas that lack access to infrastructure –low land prices. As mentioned above these areas are not environmentally and healthy assured and they create problems to the whole city.

The problems with the site and services approach were:

- The cost of the project was high making houses no longer affordable;
- People did not take part in the project (although the project did not start at the time as a matter of affordability too);
- Special agencies were created to run the site and services projects but still it created other problems and delayed the project (not a complete structure of the new agencies);

- The level of projected infrastructure was too high stimulating people and private sector to stay far from the project;
- The project was not seen as a policy to solve the problem and did not take into consideration the characteristics of the country, mentality of the people, political support, and institutional capability.
- Neighborhood Improvement and Infrastructure Upgrading Program approach

After the Site and Services approach failure, the Ministry of Public Works, in cooperation with the Municipality of Tirana and the District of Tirana developed an infrastructure program to improve services in residential zones.

The Tirana Neighborhood Improvement and Infrastructure-Upgrading Program was based on the desire of residents to improve environmental conditions in their neighborhoods. It also addresses the role central and local government can play in planning, regulating and funding infrastructure improvements and joint-infrastructure investments between residents and local government.

Land Management Task Force was responsible to initiate and develop this program in cooperation with Neighborhood Initiatives Groups within the local government, in order to provide a flexible structure to develop land management strategies and direct capital investments at both Tirana-Metropolitan level and within neighborhoods.

The urban upgrading program seeks to implement an immediate action, in order to upgrade obsolete infrastructure and extent services to under-serviced neighborhoods, informally developed zones and, when appropriate, adjacent vacant land that requires off-site services.

The Residential Upgrading Program was based on a partnership approach that will bring central and local governments together with the residents' priorities and willingness to participate in joint-infrastructure programs. Infrastructure projects for upgrading include secondary on-site, off-site and primary systems that respond to new planning and environmental initiatives prepared by Land Management Task Force. The objectives include:

- Upgrading and extending of primary and secondary infrastructure to service residential zones, improve the quality of services and guide new patterns of urbanization in Greater Tirana;
- Regularizing informal urban settlements and establishing pragmatic and workable controls over the land development process;
- Coordinating and rationalizing inter-governmental transfers for infrastructure investments, including cost sharing principles between local government and residents, and creating the regulatory framework for private sector provision and maintenance of infrastructure;
- Developing a framework for participatory planning, communities outreach and use of community-based organizations and initiatives;
- Institutionalizing a strategy and inter-jurisdictional structure to undertake Land Management and Neighborhood Upgrading projects in Tirana and other cities.

The problems with the Neighborhood Improvement and Infrastructure Upgrading Program approach were:

- It should be based on the legal framework;
- It needs political support, willingness, taking the responsibility at the given situation and political agreement in order to keep the project far from the political campaign;
- It should include planning framework in order to support the project;
- It needs a well fixed strategy on the employment (result of this chaos), income generation in order to make the project implementation easier;
- It should start with community creation groups (desire of the people to improve the situation does not come from the central government from up to bottom approach);
- At the moment the existing bank system is not able to support the credit objectives of the project. It is needed another solution for it;
- Land restitution and compensation;

- Capability of the local government and its independence from the central government;
- Cooperation with NGO's and CBO's as well.

Legalization-urbanization approach

The major initiative to address the problem of illegal settlements has been the adoption of Law "On Legalization and Urban Planning of Informal Zones". This law provides the procedure by which the informally settled areas can be re-designated as urban zones, thus allowing the persons who have constructed housing and other trade and service buildings to legalize them. The law, therefore, envisions a procedure with three parallel elements:

- re-planning of the informal zone to insure its proper functioning as an urban district, with necessary infrastructure;
- bringing the existing buildings into compliance with construction and land use standards and legalizing them under the administrative law; and
- settling the rights of the persons occupying the land and buildings so that they achieve compliance with the civil law.

The law outlines a procedure in which municipal and state agencies must take actions, simultaneously with actions of the private parties, in order to bring about all three elements of legalization.

It must be recognized that the law "On Legalization and Urban Planning of Informal Zones" does not deal directly with the problems of inadequate infrastructure and integration of these informal zones into the urban system. It only provides that an urban planning study will be carried out and that, upon its completion, the municipal government will take the necessary actions to remove buildings and structures in the way of public facilities. This is a significant weakness in the process because the obsolete methodologies of urban planning address spatial issues and provide no mechanisms for financial and capital planning related to infrastructure.

No urban planning studies or regularizing studies have been conducted previously. They will be part of the legalization and urbanization process, and consequently, will need ample time to be prepared, which will noticeably make difficult the timely and qualitative implementation of the law.

Meanwhile, the current experience in Albania has repeatedly shown that the timely and correct implementation of laws has been the weakest component of the state administration activity.

What would be the prognosis of the implement ability of this law? This remains a very difficult answer.

5 Legal, Financial And Institutional Issues

Legal and Administrative Constraints Impeding the Development of the Functional Land Markets

- **Security of Property Rights Through Reforms**

It is very important to understand property rights security. For that the most important is the finalization successfully the reforms as mentioned below. At the same time it requires the introduction of new other reforms related to land administration.

- The reforms on the agriculture land to be finalized
- The problems of ownership on the touristic land to be resolved
- Land restitution and compensation process to be finished
- There are too many process on the property conflicts in the courts;
- The registration process to be finished.
- Land Valuation and Sales Prices

In Albania, the emerging land markets suffer from imbalances and dysfunction that tend to segment the market, distort prices, and affect relatives' rates of appreciation.

The base price designated in the law does not reflect current values. These prices are given only for the land within the municipal boundary, ranged from the periphery to center, from residential zones to commercial ones. Fixed prices failed to reflect the relative advantage of each parcel in terms of location, access, service, size and shape, as well as the desirability of the area from the social and environmental viewpoints.

In Albania, the land became the most rapidly appreciating commodity, driven by the infusion of capital from remittances and local and private savings. Uncontrolled growth patterns led to dramatic changes in land values over very short periods of time as a result of infrastructure projects, remittances, expectations regarding exchange rates, inflation and alternative investment opportunities.

(Note: There are improvements of law on of property evaluation methods but still there is high informality in transaction).

- **The Transfer and Disposition of State-Owned Land**

To overcome this constraint, public authorities have resorted to leasing land to developers who undertake the steps to subdivide and valorize the land. Individuals who purchase finished houses can register the property in their own name and pay the fixed price of land to the local authorities. This procedure is highly unsatisfactory. It allows to the private developer to collect the high value of serviced land, a public asset they do not own, through the price of the newly built houses. It deprives the public authorities from recovering the real value of their assets. It erodes the capacity of the government to finance infrastructure projects.

- **Unregulated Development and Informal Settlements**

Approaches to regularization should be based on the following.

- Recognizing the official document establishing property rights pending the registration. — These rights are transferable even if properties have to be legally kept under joint/shared ownership rather that subdivided among the holders of various rights. Transfers of the property rights will continue to be transacted freely on the informal market. The problem is that successive undocumented transaction lead to confused situations that can be further complicated by conflicting claims and restitution.
- Establishing simple and expeditious procedures to record occupancy rights. —Settlers typically access land in one of two ways: they acquire property rights from presumed holders who parcel off the land and sell building plots; or they buy occupancy rights from the previous settlers who subdivide and sell part of their parcels. These unregistered transactions are usually documented between the two parties by a bill of sale, which is sometimes attested to by witnesses and notarized. Registration procedures stipulated in the law on the registration of real estate require holders of undocumented property rights to obtain a notarized declaration from the neighbors and witnesses, supporting the validity of the ownership claim and the occupancy of the boundaries. The process can be cumbersome, but it also helps defuse conflicts and avoids having the ownership status of land tied in endless litigation. Alternatively, settlers could document their rights by obtaining a certification from local councils verifying their claims. The former procedure is slower; the latter is more politicized. So recommendation to map buildings in informal settlements and record existing buildings without recording the surrounding land greatly diminishes the usefulness of the record. For the land management purposes, the boundaries of the land claimed is more important than the footprint of a building, which may be expanded horizontally as well as vertically

Financial Issues

- **Fiscal Administration**

Last year's there are positive developments regarding this process. But still the capacity of Local Governments regarding the property tax collection is low.

The delegation of local urban public services to the municipal and district level is, very comprehensive. However, it occurs within an administrative framework where local governments have no legal or

financial autonomy. Local governments are executing programs developed by the central ministries, which formulate and allocate budgetary funding for the services at the local level.

There are a number of taxes collected directly by the local government units, which they are allowed to spend more at their own discretion. These local taxes are used for supplementing centrally funded expenditures. Local financial officials are concerned with the recording and reporting of financial information. What are lacking are the tools for financial analysis and a municipal management system that demands financial planning to guide investment decisions.

- **Financial Performance**

A large proportion of local expenditure is directed at social services, rather than infrastructure with education and health services particularly emphasized. These social services are "operational"-driven, rather than "maintenance"-driven. This is reflected in poorly functioning water supply, sewerage, drainage, and solid waste services.

The competition for the available limited funding results in inadequate financial resources for capital investment into both rehabilitation and new facilities to serve the expansion needs of the city.

It is unlikely that these low levels of funding will continue given that the government budget is under pressure because of fiscal deficits. Only a small portion of this deficit represent capital investment that in the best circumstances could justify public borrowing.

Institutional Issues

The Ministry of Public Works and Transport leads the current organizational structure among central and local government, in the field of urban land management. At the given moment there is a lack of coordination between central and local government priorities and implementation capabilities. The costs of infrastructure improvement are high as a result of uncoordinated use of local and outside funding sources. The land use planning is not coordinated with the infrastructure provision.

The majority of new informal settlements and land available for development is located on or in close proximity to the existing municipal/district boundary. To plan and service these areas with infrastructure, cooperation is required among central government, two or more local government jurisdictions, and several sectoral agencies. Additionally, major infrastructure investments and environmentally sensitive projects require coordination on a metropolitan level.

(Note: There are 30 000 ha of informal building over the country that creates difficulties in the land management process).

The need to upgrade the housing and infrastructure of the existing urban and fringe areas of Tirana is a critical point to achieve sustainable and equitable development in the city. For high- and middle – income groups, the main issue is to provide serviced land and housing and to improve the trunk and immediate access infrastructure. For low-income groups the need to provide infrastructure and serviced land is complicated by the social conditions, cultural perspectives and financial limitations of these groups. Regard to this, there is a need to assess the extent, ability and willingness of these groups to contribute toward their own development. This will involve a community-managed approach to the provision of infrastructure and other services.

Strengths/Weaknesses

- Presence of laws concerned to land management;
- Increased number of agencies responsible to land management;
- Growing interest about land management;
- Growing number of trained professionals to provide assistance of plan preparation intervention and implementation;
- Increased power and authority to local government in formulation of their plans;
- Increased concern of the community for intervention and upgrading.
- Lack of a national strategy on land administration and information unification;

- Rules and responsibilities of the institutions responsible are not clearly defined;
- Policies, strategies and objectives are not clearly defined;
- People involved in urban land management lack the technical capabilities and they have negative attitude towards land management;
- Plans are not subjected for consultation and public hearing;
- Participation from the private sector and community is not encouraged;
- Data/information are lacking which leads to non-transparency (and not complete);
- Personnel are not motivated because of lack of incentives for other remuneration;
- There is no close monitoring of programs-projects implementation;
- Inadequate financial support;
- The credibility of the government is already deteriorated;
- Lack the vision of the sustainable development;
- Lack of technically capable professionals;
- Highly centralized plan approval process;
- No vertical and horizontal integration among institutions, agencies and communities;
- No strongly political support.

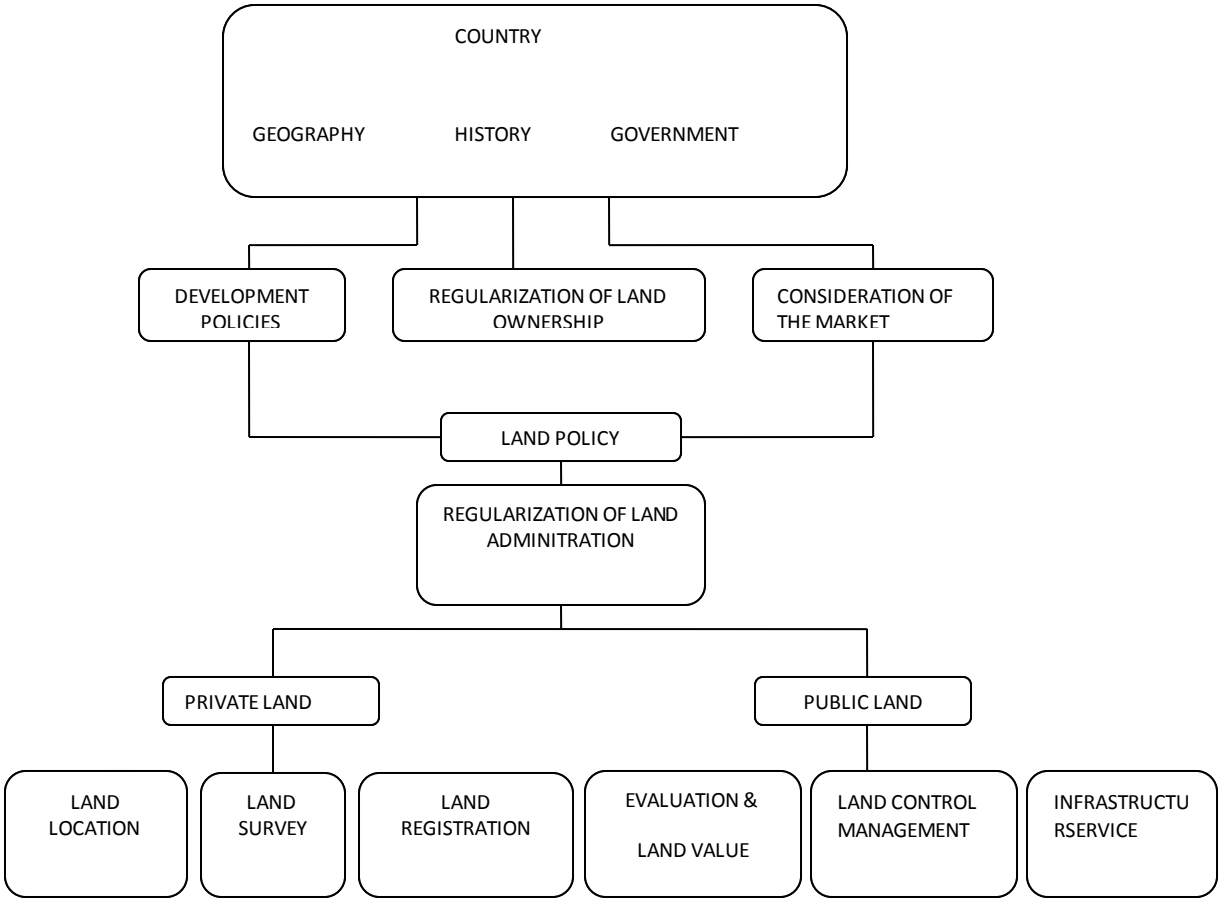


Fig. 2: Regularization of Land Administration

5 Areas For Further Improvement

Legal Area

One of the most important areas for improvement is the legal one.

- Transparent procedures of public participation on decision-making process;
- Continue the work of setting criteria and qualifications for licensing of real estate appraisers;
- Improving procedures for registration and licensing have certified appraisers;
- Compiling an atlas of appraised land values in different sectors of Tirana as a first step in the creation of a database for land management;
- Computerizing and linking cadastral maps, ownership records, and assessed valuations;
- Sell serviced land and un-serviced land by public auction;
- Negotiate with the potential developers and investors of larger projects to seek the most advantageous package from the viewpoint of the public sector;
- Improvement of regularization procedures in order to avoid embroiling urban planning and management agencies in legal issues of property rights and tenure;
- Improving registration procedures in defining the boundaries of the land plot claimed by each settler and their characteristics.

Financial Area

There will be little funding available from local sources in order to support development of land, given the tremendous needs for it. Selling serviced and un-serviced land is promising source in supporting development. The present administrative framework limits the opportunity to generate funds from the sale of serviced and un-serviced land. To undertake this process, there are steps that should be taken:

- Strengthen the capability of local government to plan, budget and implement programs;
- Develop a system of property tax;
- Restructure regulations, which not allow the sale of land;
- Allow the local government to raise profits from the land sale that should be channeled into off-site access infrastructure-use of the benefits from tax collection clearly and for the same direction.

Institutional Area

At the given situation, under an integral approach, local governments should establish priorities with central government and non-governmental (NGO) and community based organizations (CBO) in order to identify needs and priorities by area and sector, investments, operation and funding plans, options for public and private sector participation. A structure can be established that:

- Empower of land administration structures (i) organization of cadastres of urban land, agriculture land, forest, etc; (ii) establishment of fiscal cadastre (iii) empowerment of legal cadastre (registration system);
- Encourages planning, programming, and identification of investment priorities by all levels of government through a decentralized and integrated approach;
- Strengthens local government's capability for resource mobilization for urban infrastructure;
- Strengthens the institutional capability to local government to plan, budget, and implement programs. This will require training staff and technical guidance;
- Coordinate development services, activities and investments affecting local government jurisdiction;
- Develop policies and strategies for land management;
- Providing assistance in identifying and resolving legal, financial and administrative impediments to the achievement of its objectives;
- Encourage relations with NGO's and CBO's as they play a strong role in the activities with low-income groups and as intermediator between public authorities and residents;
- Using CBO's and adopting a participatory approach;
- Focusing on building self-help approach among target groups;
- Operating small credit schemes for employment generation and home improvement;
- Acceptance and understanding in government agencies of the important role NGO's play in the development process, allowance of the government to contract NGO's to perform development and upgrading work.

6 Conclusions

Legal System

"A good law being one that guarantees and facilitates the efficiency of the economic and social activities it regulates and a bad law, one that disrupts or totally prevents it" (de Soto 1989):

- The published laws are deficient in a number of respects; from the form they are published, to the way in which they define the fundamental nature of the power relationship between the state and its citizens. The laws many times are not published at all and they are not available to the public. Many laws are published in a language not familiar to the citizens;
- Draft and publish land laws in forms that will make them easily available to the public;
- It should be created or revive specialized mechanisms for land involving formal courts, traditional and local community mechanisms;
- Training of professionals to lead the system and to fulfill this task;
- Law on Land Administration including (i) unify the information for land (ii) land value (iii) land use and other attributes.
- Institutional System

Decentralization of the land registration, allocation of the publicly controlled land and all permits and approval needed to undertake development of land via a "one-stop shop".

- Shift of the responsibilities from central government to local government and local communities or traditional bodies to undertake local land management tasks;
- Develop transparent, simple and fair administrative processes and procedures to handle land issues and to involve private sector actors in the process;
- Train local officials and private actors to undertake tasks in the administrative environment;
- Develop incentive-based systems of personnel management in relation to public agencies concerned with land management;
- Establish a monitoring mechanism (public-private) to keep under review the operation of the decentralized system of land management and to further the progressive involvement of private sector professionals and NGO's in land management tasks;
- Reorganization of the institution responsible for land management based on policy and law of land administration.
- The government should operate and support these strategies and land development through land policies:

- Policies to affect ownership----where government affect the market through pricing, expropriation etc in order to make land available for itself or for the lower-income groups;
- Policies to affect land prices----where government intervenes through firstly taxation, land banking, regulation of building, secondly increase of land supply through servicing land and thirdly through vacant land taxes;
- Policies to affect use----where government intervenes through firstly land use regulations and secondly through investment in facilities;
- Policies to obtain revenues----where government intervenes through taxation and sale of the land.

The reform of urban land policies should be introduced in:

- Land Market Assessment of the operation of the land market (prices, supply, new projects) in order to assure the all data of land transaction and reduce informality;
- Decentralize Land Management Authority;
- Deregulate (simplifies control, approval and match demand with supply);
- Curtail Public Land Development Agencies (performance assessments);
- Improve Efficiency of Land Market Operations (title registration, transaction, and cadastre);
- Provide the Financial, Institutional and Spatial Structure for Installing Infrastructure Networks.

Application of the recommendations above mentioned and reforming urban policies will strongly depend on the political willingness and central and local government commitment.

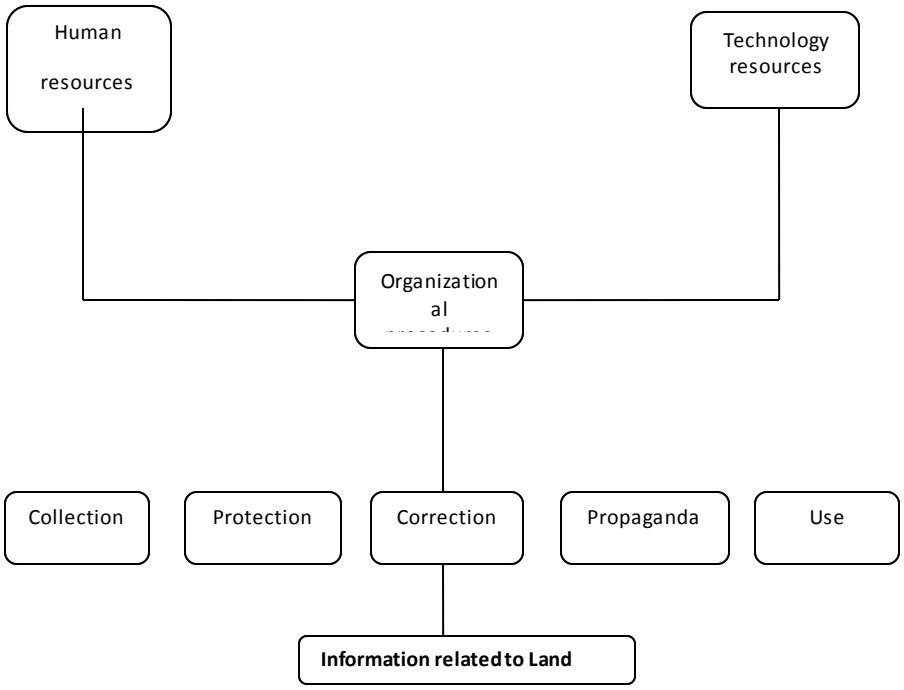


Fig 3: Land information systems

References

1. Land Management Task Force, Land Development Pilot Project in Western Tirana, 1995;
2. Land Management Task Force, Tirana Land Management Program, 1995;
3. Land Management Task Force, Tirana Neighborhood Improvement and Infrastructure Upgrading Program, 1996;
4. Albanian Gov't, Collection of Albanian Laws, 1992-1997;
5. M.P. van Dijk, Employment in World Bank Urban Development Projects in Africa, 1990;
6. M.P. van Dijk, Changing perspectives on urban law income housing in developing countries, an incident in a slum improvement project, 1997;
7. Farvacque. C, McAuslan. P, Reforming Urban Land Policies and Institutions in Developing Countries, 1991;
8. Nientied. P, Aliaj.B, Managing Tirana's Rapid Growth (Outcomes of the Workshop and Executive Seminar), 1997;
9. Nientied. P, The Question of Town and Regional Planning in Albania, 1997;
10. Maas. B, Nientied. P, Municipal Property Management in Transitional Economies: The Case of Bratislava, Slovak Republic. IHS Rotterdam, 1996;
11. IHS Rotterdam, Szczecin, The Management of Municipal Real Estates: (the typology, use, review, development, maintenance and disposal of local authority property), 1997;
12. IHS Rotterdam, Szczecin, Banking on Cities: (the use of municipal assets for urban development finance), 1997;

13. UN, "On the Establishment of Land Administration Systems in the Eastern European Countries" Guideline of Economic Commission of UN (Geneva), 1996;
14. World Bank Discussion Papers, Cities without Land Markets Alain Bertaud, Bertrand Renaud, 1994;
15. UNCHS, Land, Land Markets and Settlement Planning, 1996;
16. Dowall, David, and Clarke, Giles, A Framework for Reforming Urban Land Policies in Developing Countries, 1991;
17. PADCO, Strategic Plan for Greater Tirana, 2002;
18. Landell Mills, Sustainable & Integrated Development Tirana-Durres Region, 2007;
19. World Bank, Status of Land Reform and Real Property Markets in Albania, 2006.

Interpretation of 3D city models for Sustainable Urban Development

Hebib Alili, Fadil Shehu
[1]University for Business and Technology,
Prishtina, Kosova
E-mail: hebib.alili@ubt-uni.net

Abstract. Many urban or environmental models are determined with the objective to help practitioners and stakeholders in the processes of decision making. The models represented in 3D dimensional geometry are elements of a city and are called 3D models cities. In a wide range, these models are more and more being used for different cities and countries, for purposes beyond simple visualization. Possibility of using of this kind of models, in introducing semantics as geometric aspects, leads into enriching the semantics of 3D city models. Furthermore, in the perspective of sustainable development, cities should be studied in thorough and comprehensive way, taking into account inter relation of many different questions and problematic issues that are related to the future development of urban areas. This can be achieved through the identification and utilization of knowledge about the data and the models, too. The use of ontology is a powerful way to reach the semantic enrichment of 3D city models and also their interoperability with other urban models, so that they become an effective matrix of urban knowledge with a perspective of sustainability.
This action will enable:
Integrative platform based on semantics enrichment of 3D city models,
Use of ontological methodology that can be reused,
Evaluating the usability of integrative platform for planning and decision making.

Key words: 3D model, 3D object, DMR, DTM, TIN, Vectorization, Kosovaref01.

1 Introduction

This topic has the task to illustrate the creation of 3D models of terrain and 3D objects based on existing (collected geodetic data) or measurement of factual situation of terrain, for one part of the city Mitrovica. The purpose of this project was generating design of regulatory plan, as inevitable basis for the management of urban plan for the city Mitrovica.
Works for the purpose of recording and collecting of these data, carried out in period on between 2010 and 2011. Contractors of the project for doing the surveying and modeling works, were two private surveying company "GeoInfo" in Pristina and "Geo - Consulting", also based in Pristina.
The main company, that was responsible for making a design of regulatory urban plan, was the company "Linproject" based in Mitrovica. The investor of the project is the Municipal Assembly of Mitrovica.
Furthermore, this seminar will mainly deal with the problem which describing the works, that directly touch the collection of geodetic data and the creation of such 3D models for spatial planning. Other actions, such as urban solutions or regulatory plan solutions, will not be the focus in this area of activity.

2 Preparation of data prior to the process of surveying a terrain with its associated facilities

Beside the geodetic source data measurements, there also were used the existing urban maps of the scale 1:1000, which were produced on 1987. Initially the maps were scanned and georeferenced, according to the administrative guideline 2005/08 for scanning and dereferencing maps. The following process is transformation of these data, from the old system named Fryref30 (Gauss-Krüger) to the new state

coordinate system named Kosovaref01. The above mentioned derived data records, are very important, and this data shall be used at further process for new measurements, which will be carried on the field. Transformation, of the old coordinate system Fryref30 to the new Kosovare01 system, is based on the principles of affine data transformation of the triangles elements (triangles network), well known method in the geodesy.

The principle of this transformation is as follows:

- Definition of triangles: required points (triangulation points - reference network points) of order I, II or III and existing trigonometric points measured in both systems.
- All points within the triangle are transformed with the same set of transformation. Coordinates of points are required in both geodetic reference systems.
- Points are primarily those of the network order I and II, and if is a need will be added some additional measured points.
- It is important to be used points which did not changed since of their definition from original adjustment.
- If it is possible to be used stable points, as basic point of transformation and to be used the suitable points for GPS (Global Position System) measurements.

The density of points under the transformation depends on the quality of data from Fryref30 system and the level of tolerance. Hereinafter the local transformation is used the Helmert transformation for the entire surface of the country. In this transformation will be included, the transformation of base points and the checkpoints. The guideline No. 2005/9 outlines the steps for working with vectorization data as part of using data model for Kosovo, while for quality control for the vectorized data, is used the guideline No. 2005/11, as well as proper application of Kosovo Cadastral Land Information System in (KCLIS).

2.1 Surveying of the detail of terrain

At first stage is planned the reconciliation of reference network points of III order, and then from these reference points, will be taken in action the process of the measuring of detail requested from the project. Instruction on reconciliation of the III reference network is outlined in guideline No. 2005/ 04.

- Measurements of reference network points of third (III) order are made in two ways:
- TPS (Total - positioning station)
- GPS (RTK - Real Time Kinematics)
- Measurements of detail on the ground and facilities on surface are carried out under the guideline No. 2005/ 06 on detailed measurements.
- Measurements were performed with the combined method of measuring by using: measurements of advanced GPS technology (GPS 1201and 530) and total station measurements (Flex line TS09 total station, TCR 1200 and 1103).

3 Methodology for surveying of facilities for creating of 3D facility objects

Geodetic measurements were carried out through the polar geodetic method, well known method in geodesy, from where are derived the coordinates (x, y, z) of each measured points of the DTM (Digital Terrain Model). All footprints of facilities on the ground are measured from the same principle of polar method of measurements.

Presentation of the third dimension of facilities is done interactively, by using the combined methods: measuring of heights of facilities from instruments (total stations) and by classic measuring of heights of facility. Because of the density of buildings and neighborhoods close, it was a very high cost from investor for doing of such a measuring facilities heights from the instruments, by other hand using the classical methods of measuring of the heights of facilities meet this criterion and has been sufficient accuracy to which it has seeking investor. Therefore, for this reason, the majority of measurements of

facilities heights are being made by this classical method. With this classical method, the principle of measuring of these heights is done in such a way, that first is measured the height of a floor and also the height of between the ground and that measured floor, after then calculated of thus cumulative partial floor height and by this principle is derived the height of the site of facility.

3.1 Surveying and prescription of note-marks of the heights of objects (facilities) in the operational terrain sketch map

a). For optimal flatten terrain: determination of heights of buildings is done as followed: operator during the site visits on the field; he measured the height of one site of object (facility), and then this data height recorded in his operational sketch. Operators (surveyor, technician) have made measurements of the heights of objects, during the field campaign measurements, or even later after processing the DTM data.

b). For none flatten terrains: is used an appropriate method, known as rapid measurement of heights of facilities. It has been measured the height of the site of object (facility), where the facility best feet with terrain. Through this principle operator or expert, has measured the heights of all these facilities, based on his position of view to the facility and according to the position of the terrain. By this method operator decide that to which side of facility should be measured the height of the facility. After reading of floor height of facility, the operators also marked these data heights in the operational terrain sketch.

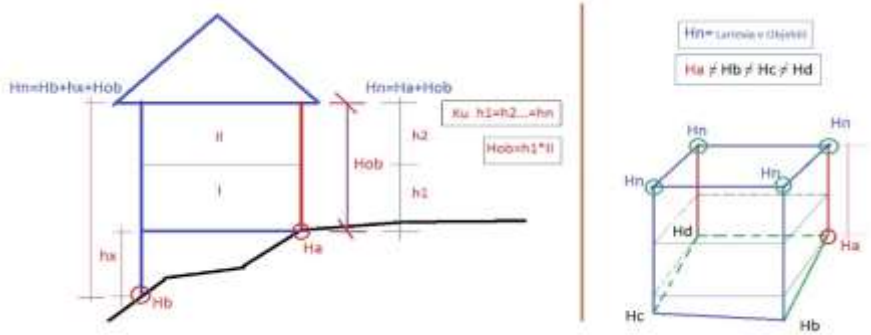


Fig. 1. Measuring the height of the object (facility), determination of the peak point of 3D object.

3.2 Processing of the recorded detail of the terrain and data processing of elevation of facilities

The collected data on measurements of factual situation of terrain and heights of all buildings ends up on the further processing in the office. The continuity of data processing has progressed in such way, that the majority of the measurements of data is actually in advance independently analyzed and processed. Later on follows the process of the independently connection of details, from the prepared sketches derived from the field measurements, where this will be further manually processed by the operators in the office. After the connection of details (2D situation plan) form the operators in the office, the other team that was responsible only for measuring the heights of facilities (they initially measured height of each facility), later on this team independently reprocessed collected height data and adopted these data for the prepared 2D situation plan. This process was conducted in the following way: firstly processed each measured partial height (from their own sketches prepared during the height measurements) then calculated the respective heights of each facility, as result of multiplication between partial heights and the number of facility floors. By calculating the cumulative amount of highest peak for each facility, will result on getting the final altitude peak of each respective facility. For the field work have been used pre processed sketches of 2D situational plans, along with the orthophoto. The entire work should be done in the way, that all forthcoming data processing and these data preparations have to be well prepared in advance and also well designed for data formats, for further automatic data processing in creation of real 3D model (3D modeling). It is required a well pre-planned connectivity elements of details. Such preparation or designed plan for this purpose, has to be used according to the rules based on: setting of each element of details and then after to be prepared and utilized for the

following steps into the process of modeling of terrain, i.e. creating DTM and creating 3D facilities (modeling of objects).

Fig. 2. Excerpt of height data presentation, sketch of the 2D situational plan (URL7).

3.3 Processing of measured data for creating of DTM

In order to prepare and create DTM, initially is constructed the DMR from the measured terrain elevation data. Later to repair this DMR model in order to adopt to the reality of the terrain (the DTM), the DMR has to be prepared for further processing steps: the elimination an correction due to the wrong connectivity of triangles in the TIN network, the correction due to vegetation and steepness of certain characteristic terrain or facilities.

Facilities with all the characteristic elements, as well as those parts of the field which in one or another way have a specific form, or by themselves may contain different types of penetration such as various types of channels, streams, water, roads, rivers, bridges, garages, etc. All mentioned penetrations should be recognizable through site visit, due to the measurements on the field, or can be seen through the data analysis at the steps when 2D situation plan was created, or on process of creation of DMR. Today's software's applications that contain in themselves the module for creating of TIN models, their principles are based on a mathematical principle for creating triangulation model. In other words these modules are functioning due to the logic of connecting the nearest neighboring points of the circle domain and in this way is created a network of TIN triangles.

In other words such triangles are represented in themselves as triangle points, or exist as form of triangle block in the triangular network TIN. Other form of TIN creation is known as foursquare DIN network. In most cases we are facing with the characteristic shapes of the terrain, and because of their specific, with such distinctive objects (objects that penetrate) it is impossible to properly make adequate connection of triangle points without our manual intervention. Without our intervention on parts of triangles can not be created real its TIN network and consequently it would not really fit the facts on the ground, neither can be formed the shapes of early mentioned characteristic objects.

For all of the above facts, with a large degree of certainty we can say that, the creation of more accurate forms of bounds, and also making shapes of these kind of characteristic objects, is simply impossible creation of model without our manual intervention on the stage of automatic creation of model. That is, our intervention is based on 2D plans and specific reconnaissance field trips, and also by adding the newest measured points or reconstructed ones on the DMR model, with the purpose of achieving a precise DTM.

In some cases, even with our detailed intervention in these characteristic parts of the terrain or the characteristic shapes of objects, our efforts would be in vain before the automated process will create TIN. It is impossible to create these types of characteristic structures through automated tools for the creation of certain TIN. We encounter with these cases when it comes to specific objects such as bridges, tunnels, underpasses, etc. Therefore, it is of utmost importance planning in advance which objects we leave for creation through the automatic processing a TIN and which one to be treated or created outside

of the automatic process. This can be achieved through other processes or by other graphical tools for creating of models of these objects, and then inclusion of these models to our finalized model of DTM. Therefore, for some processes within the TIN processing and in the case of our additional interventions it is quite often needed to be added a new geometric elements. For those actions outside of the domain of processing of DTM creation and processing of these data we need in advance to design the structure with ready-made prepared steps. We need to be able to really think it through and make a decision on which way we will create characteristic shapes of the terrain or objects. For example, the issue of bridges, initially we only consider the ground under the bridge as DTM process. In order to facilitate processing of the 3D bridge model, this has to be done outside of DTM process and the data will be prepared for 3D creation of the bridge, through other graphical tools and such 3D finalized format will be added to the DTM.
In this case, the geometric shapes of such objects are independently processed as 3D objects, and these data shall never be treated in automatic process in creating TIN model.
Having in mind, all these so far mentioned actions among the various processing and a variety of methods for creating of these typical forms of terrain or buildings. properly prepared well handled processing of data, the stage of 2D situational plan (but always based on the facts and realities on the ground), we can always achieve the goal of creating a more accurate DTM, as well as the approximate precision of creating realistic 3D objects characteristic , along with their factual situation on the ground .

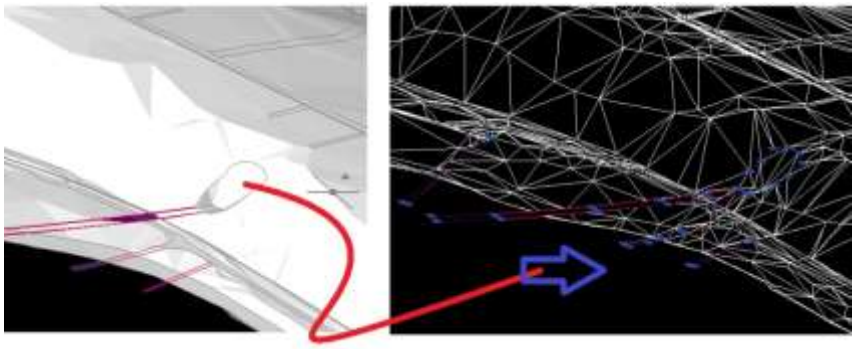


Fig. 3. Bridge at the tunnel; as characteristic geometry of DTM, which is modeled outside off processing the TIN (URL 7).

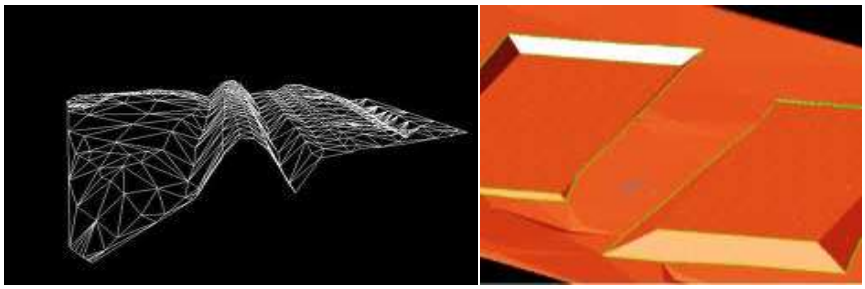


Fig. 4. View on characteristic geometrical feature of DTM (URL 7).

3.4 Processing of DMR and creation of DTM

In the initial stages in creating of DMR, prior to any specific interventions in DMR shall be conducted roughly processing of data model. After this procedure takes place follows the analysis and comparison of the results obtained by TIN (by automatic processing of the software application itself). These obtained results will be analyzed in detail such as: analyzing wrong connecting elements on TIN and subsequently prepare the way that these data will be formulated till its finalization from outside domain of automatic processing of DTM. Our interventions should serve for as accurate and as precise assessment based on factual situation, whilst the reprocessing (removing the wrong connections in TIN) this could further enhance and improve modification of the DMR, and finally create the DTM. In making

decisions we need to be very careful and, if possible, to be able to immediately recognize mistakes on connections in the TIN model, and also be able to recognize the real geometry shapes of characteristic structures of their forms, as well as characteristic parts of the terrain itself .

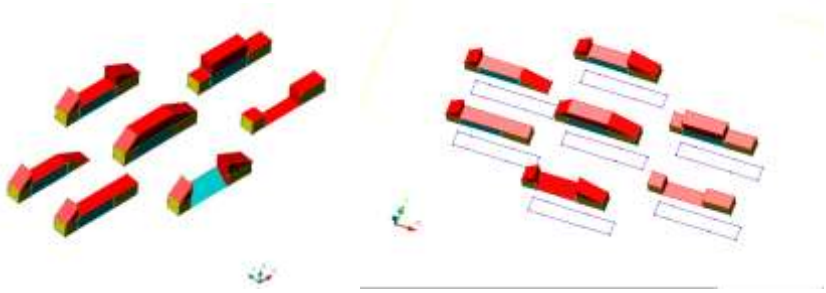


Fig. 5. Example of possible combinations and interpretation of possible connections triangle, with characteristic geometric objects or characters in the process of creating of DTM (URL 7).

For this reason, we have to prepare additional information of geometric elements, such as:

- new points
- 2D lines or 2D polylines
- 3D polylines

These data should be prepared independently. By adding these new geometric elements actually creating such a modality that through incremental elements make certain interventions on the model, we consider the ultimate vision of the modeling of the real situation of these geometric shapes.
These elements will be manually added or redrawn within the 2D situational plan or through connecting 3D points by 3D polylines (2D detail is represented as a 2D situational plan within the details of 3D points). After correcting, by adding of these additional geometric elements to the DMR model and it's redrawing (connecting the points by these new elements) can create more accurate DTM, which has to represent its factual reality in the field, and also the characteristic shape on the ground.
By completion of above-mentioned steps, it is already finished work on the automatic processing of getting the TIN, as well as getting the DTM. Finalization of such DTM model is ready to be used for the next phases or other actions for urban design planning.

3.3.2 Preparation of the final DTM, for a different kind of interpretation.

When DTM is created, the new layer will be formed for creation of contour lines. Created contour lines will be represented as 2D polylines and 3D polylines also and by equidistance unit (requested in advance by the investor). They will be created automatically, via tools for creating contour lines from the already created DTM, and that is DTM surface. Contour lines will be presented as 3D polylines object. The explosion of the 3D polylines object will result the 2D polylines which at the same time represent requested contour lines in 2D situational plan. Another additional layer at this stage will be created, to represent the 2D contour lines and also another layer which will represent a shaded surface of model of terrain.

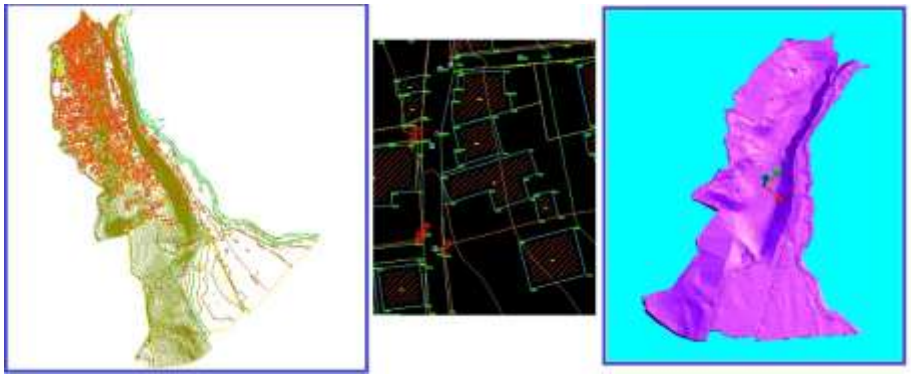


Fig. 6. 2D Situational plan with contour lines and 3D Mesh Surface DTM (URL 7).

4 Preparing data processing to create objects in the third dimension (3D objects).

Measured data of the fields and objects in 2D layout are represented in the dimension of Xi and Yi, while Zi is presented as textual information (interpretation of the terrain elevation) and it provides information on absolute elevation at each vertex point of 2D polylines footprint of objects. Thus, within the 2D situational plan, Hi variable of objects will represent (or display) the penetration between the building footprint and the ground of its terrain. Presenting the real geometrical forms of 3D object shall be done through an independent process, which will be displayed over the measured heights data of objects. For this reason it is necessary to prepare the additional elements of the measured and calculated data on the heights and information on number of floor for facilities. The process itself will go through certain phases or by default steps. 4.1. First phase: calculation of elevation peaks of objects (facilities) and setting of this information to the 2D situation plan of the terrain. At this stage, should approach calculating of elevation peaks of each facility. The finalized peak of elevation will be achieved by calculating the terrain quota of footprint of facility (absolute height level above the sea) with the height of sides of the object, this derived heights will be denoted as Hn (object absolute height level above the sea). Calculated elevations Hn for each facility will be represented as textual data and will be placed in the interior of a closed 2D polylines and will represent the database objects in 2D situational plan. This procedure is carried out for the reason that in the process of programmed automatic processing through the VBA module, where this shall automatically be able to recognize that this text quota (elevation) belongs to that specific building. The module is programmed in VBA for CAD application. It works in a way that seeks a text attribute (as text element in the CAD application) inside 2D polylines, and later converting 2D polylines element in the " region " (as the region element in the CAD application), The "region" will raise from zero plan elevation on plan height Hn elevation as 3D volumetric object (volumetric stuffed body), or 3D solid element in the CAD application.

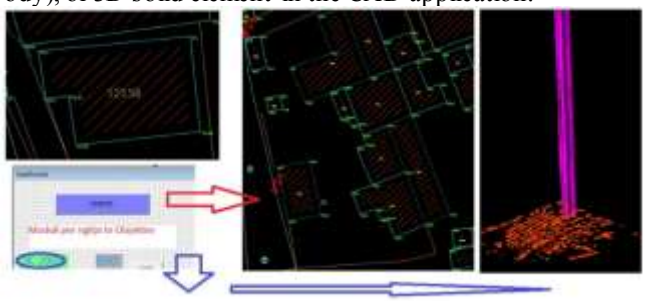


Fig. 7. Module for lifting of each object (2D closed polylines) from zero height level at 2D situation plan, to the tops (peak) of the object to be get 3D objects (URL 7).

4.1. Second phase: creation of new layer with a closed polylines for each object

Since in CAD (Computer Added Design) the only 2D closed polylines (objects as 2D polylines) are capable to be converted into the region element and by other hand by using of the regions we are capable to create such a volumetric objects. At this stage we again approach by drawing the objects with 2D polylines, if previously we did not redraw the objects at the detail of the 2D situational plan. The only condition is that the 2D polyline in 2D situation plan must be enclosed for each of our object. But this is not just about raising the third dimension of objects such as, for example, houses, buildings, or other related facilities. The 2D polylines elements of geometry in CAD applications are representing: the line segments and the curve CAD elements. The similar characteristics features for doing of 3D solid objects in CAD have also the circle CAD element. The module programmed for our case is constructed to be work through closed 2D polylines elements. 4.3. Third phase: Automatic lifting of 2D object from zero planes (plane of the base object with zero elevation) up to the height of the peaks of each of the objects This whole process is based on the idea of transforming the 2D geometry in 3D geometric mathematical bodies, i.e. filled (closed) volumetric bodies (solid volumetric object-the body stuffed by material) or

opened (not filled-not closed) volumetric geometric body (body without materials or empty body). In our case it is desirable to create a filled volumetric geometric body, because it will be required for the process in the next stage (4th phase), in a way to have opportunities for calculation of the volume of objects. 4.4. Forth phase: Creating surfaces (CAD surface) - DTM as a closed body or geometric closed body (volumetric body)
When using this method, the volumetric size of the terrain must be of imaginary nature, because the irregular volumetric body can make penetration with all other 3D object volumetric bodies that are created in the process of rising of 2D polylines made in the 3rd phase. The resulting surface DTM is shown as "3D Mesh " area. To convert this to an imaginary surface volumetric body was used CAD "Lisp script" module, where by this theory will be convert a TIN network to the volumetric body. By other words from each 3D Mesh triangle of DTM will be creates a single 3D Solid body. Finally from amalgamation of each individual volumetric bodies will be created a single volumetric body and by these we created a DTM volumetric body.

4.2 Fifth phase: Creation - penetration volumetric DMT with volumetric 3D object bodies.

In order to create a realistic 3D object above the surface of DMT, we have to use an idea for separation of between of two volumetric bodies. Described in detail, it would mean, separating of volumetric DTM body from each 3D model volumetric objects. Using of this methodology ultimately will be results of real 3D objects in the field. These 3D objects are now ready to be set up on the surface of DTM. This separation of body's was carried out through a manual process.

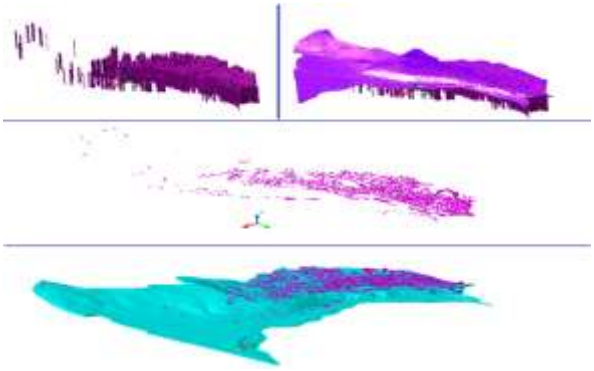


Fig. 8. Scheme of data processing through phases III, IV and V (URL 7).

4.3. Sixth phase: Displaying of 3D objects on the surface of the DTM

Within the software 3D Civil Design (version 2009) and by using the application "Raster Design" will be entered the orthophotos (with the grid of the state coordinate system Kosovaref01) for this part of the terrain. From chosen certain options, from the package "Civil design" will be processed the overlapping of ortophotos on the DTM. After this result will be entered also the 3D objects and now we begin to get a realistic view of DTM with 3D objects and overlapped orthophoto on DTM.

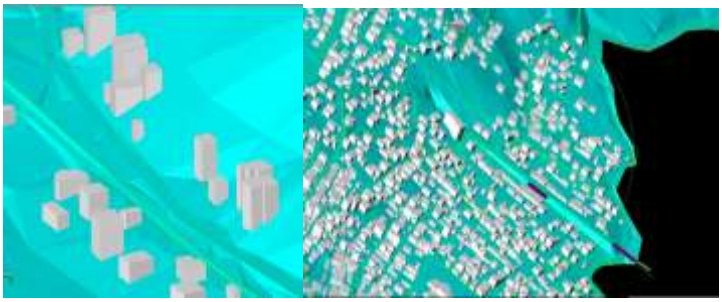


Fig. 9. Picture view of DTM with 3D objects (URL 7).

5 Visualization

Through rotation movements of positions of DTM with 3D objects at the application Civil Design can be realized the visualization of our finalized model of the city. On the visualization we can do also a classic print screens for further presentation of our city model. This method of visualization is only a primitive form of presenting of real DTM model with 3D objects.

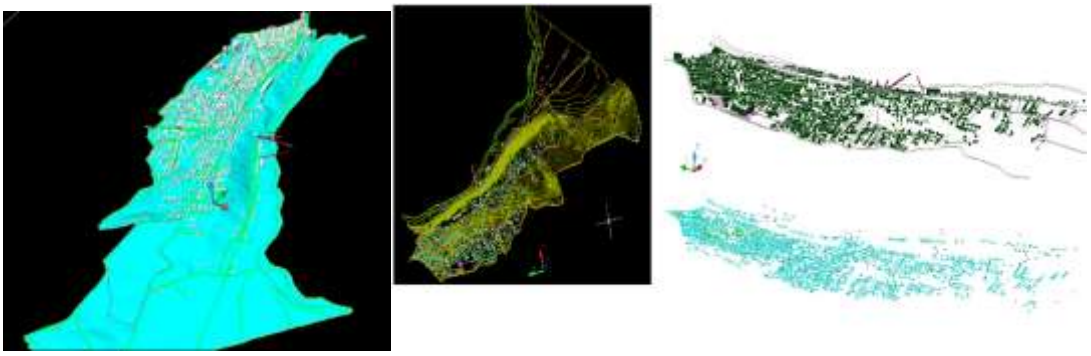


Fig. 10. Interpretation of 2D situation plan and DTM with 3D objects in the visualization (URL 7).

6 Processing of data for future preparation for the interactive 3D visualization

3D objects are presented in the form as "3ds" file format. From the CAD application, the surface of DTM will also be transferred as “3D Face Surface“, in the same format as "3ds". In order to reach the final solution for the interactive visualization, work has been carried out by using the modalities and working principles of the different tools (today available tools or software’s for visualizations). Visualization can be done by using the primitive tools which by themselves somehow can do the creation of such interactive visualization, or by those tools that are high sophisticated and aimed to do precisely visualization and interactive interpretation of complicated models. To reach the final idea, was to do a number of test combinations, by using of such existed today’s tools and applications, as the only way, to be able to make an interactive visualization of complicated models, as it is our city model. For using of each of these tools and also for a priory chosen applications, it is necessary that our DTM has to be also prepared for acceptable formats of these tools or application. Every application itself has some basic integration by which it operates, and the principles from which it works. The most appropriate and the only ones, who can do our best work, are the tools that operate on the principle of perfect graphic, and their primary purpose is aimed to do the computer games. Applications or tools as beta test which has enabled us to do this kind of interactive visualization of our city model (DTM with 3D objects), was an application called “3DRad”. This application by itself contains the integrated module for reading of the imaginaries terrains and his aim is for gamming purpose. The “3Drad” by its modules is constructed for doing the dynamically interactive interpretation and visualization of 3D objects within the terrain (only for simple imaginary terrain for games). In the cases with realistic created terrains and built from the TIN principle, it is particularly very difficult to create a real terrain data model and to be acceptable for reading by terrain module of 3Drad. At the very beginning it was very difficult how to come up with the solutions in manner that our real DTM to be read from 3DRad terrain tool. Terrain file format of 3D Rad is created based on the mathematical principle for creation of the matrix vector. Because of this reason, every mathematical triangle will be running as vector format performed from the basic mathematic functions of the plane. Applications created, with such a principle, are mostly dedicated for creation of computer games, as it, also the 3DRad aims to be for these purpose. Because of this situation, we came up with another solution, by preparing of our DTM for another file format and then to be read interactively from the other tool readers within the 3Drad. The required data format

for reading of our DTM into the 3DRad was the "X" gamming standard file format. By converting of TIN (original DTM) shaped “3D Face“ to "X" file format , via the so-called "Blender" applications, we managed to create our DTM for use as terrain model of 3DRad. Using the same principles for creating of data in such a file format and also by using of other tools like “Google Sketchup”, we then also converted our 3D models of objects for the same "X" file format. At the end, entering the created DTM and the 3D object in acceptable file format to be read in 3DRad, began the operating of the first version of an interactive visualization of our city model. This would mean that over the 3DRad is much easier and simpler way can be achieved, that our model (DTM with 3D objects) will be represented as a kind of computer game. Designing of this kind of models of the cities, it is much more appropriate and easiest way for observers, citizens and investors to have better view on it and also to make analyses and for experts to brining better decision for further design implementation on urban planning.

Fig. 11. Interactive visualization of DTM with 3D objects and orthophoto through 3DRad applications (URL 7).

References

1. I. Šainovic and D.Medak: GEOVRML OF BAKAR BAY - VISUALIZATION OF ECOLOGICAL HAZARD (2012)
2. C. Métrala, G. Falqueta A.F. Cutting-Decelleb: TOWARDS SEMANTICALLY ENRICHED 3D CITY MODELS: AN ONTOLOGY-BASED APPROACH; (http://www.isprs.org/proceedings/XXXVIII/), (2012)
3. URL1: http://www.geoinfo.geof.hr/
4. URL2: http://www.geof.unizg.hr/
5. URL3: http://www.3drad.com/
6. URL4: http://www.blender.org/
7. URL5: http://www.sketchup.com/
8. URL6: http://www.leica-geosystems.com/
9. URL7: http://www.geoinfo@pr.com/
10. URL8: http://usa.autodesk.com/

Fausto Di Florestano - The Genesis Of New Architectural Forms In Albania

Armand Vokshi , Florian Nepravishta
Faculty of Architecture and Urbanism, Politecnic University ,
Albania
armandvokshi@gmail.com,f_nepravishta@yahoo.com

Abstract. This research on the Florestano Di Faustos architecture seek to highlight the evident facts which are fairly present in the context of Albanian cities, but little-known in the academic and professional field . Di Fausto, the Italian architect who worked on the second regulatory plan of Tirana, designed personally also the new core of the Albanian capital, Skanderbeg Square altogether with the ensemble of ministries and the administrative buildings. The materials found in various archives in Italy and Albania reflects clearly the high capacity of architect's creativity, who worked at the same time for the construction of the city where Mussolini was born, Predapio, in Rhodes, Greece and in Tirana. Working in different contexts, with his architecture, to fulfill the complex requirements that come from these countries, every time he strove to make architecture which will be plugged with "the legend, myth and history of the location, leaving a space into free interpretation of tradition in a new vision of the most modern architecture". This paper will present the typical and original elements elaborated by Di Fausto in Albania, with a deep respect of existing city. Important parts of Di Faustos' ideas are showing for the first time.

Keywords: Florestano Di Fauso, italian architect, italian architecture in Albania, Skanderbeg Square, Royal Palace

1 Introduction

In 1927-28 for the proposals made to the new plan, King Zog asked to the Italian government the intervention of another Italian architect who will contribute to the Regulatory Plan of Tirana, especially in the architectural parte of the governmental objects with significant impact. This time Mussolini proposed Florestano Di Faustos, another architect from Rome very appreciated by him, especially for the work done in Predapio, hometown of Duce.

Fig. 1. Florestano Di Fausto (Archiv of Florestano Di Fausto)

2 Format Guidelines

Di Fausto was borne in Rocca Canterano (Rome) in 16 July 1890 from Demetrio and Bernardina Picconi. Its formation was conducted entirely in Rome where hi studied for architecture at the Academy of Arts and then in 1922 he was graduated in Civil Engineering.
Di Fausto [1], with its interventions in the Italian North African colonies, is considered also to day as one of the main architects of "Overseas Architecture" for that period. Thanks to a considerable preparation, Di Fausto [2], [3], [4] is an almost overwhelming pattern of a professional architect who was able to master and use regardless of geographic context ,

Fig. 2. Predapio Center designed by Di Fausto, Italy

Fig. 3. The building designed by Di Fausto in the center of Predapio, Italy (A.Vokshi)

all styles, from "moresk" to "Venetian Gothic", the "Renaissance" to "Novecento", following up and rationalistic architectural language to another "modern style". Out of prejudice to the formal results achieved what is important to say, is a special report analyzing the view that this category of architects manages to transform the architecture in relation with the place where will be built and with the function that will perform.

Fig. 4. Royal villas in Durres, 1928 (Archiv of Florestano Di Fausto)

After his arrival in Albania, Di Fausto took an important task from King Zog, to design the ensemble of ministries and administrative and cultural buildings in Skanderbeg Square. In addition, King Zog did requests the design of the Royal Palace in Durres (1928-1930), originally designed by Brazini, re-proposed and built by the Albanian architect Christos Sotiris, design and construction of the Royal Villa in Shiroke [5], the

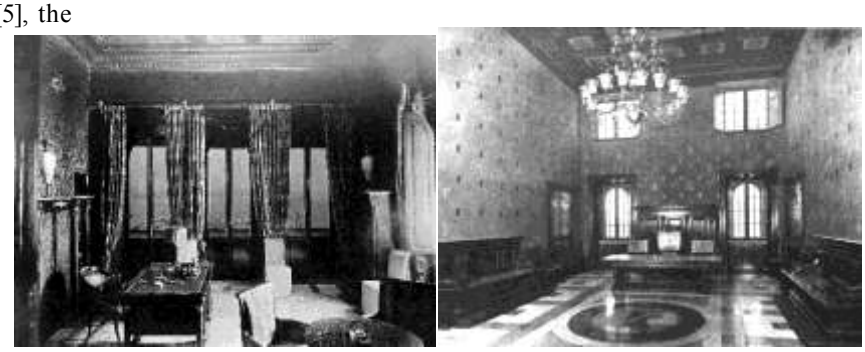


Fig. 5. Interior of the royal villa in Durres, 1928 (Archiv of Florestano Di Fausto)

Fig. 6. The hall of the royal villa in Durres, 1928 (Archiv of Florestano Di Fausto)

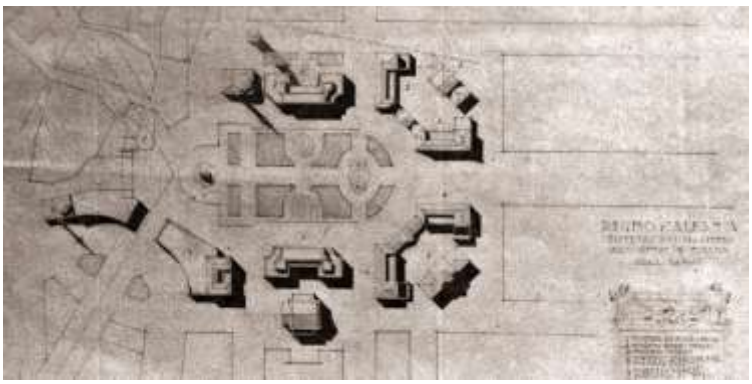


Fig. 7. Skenderbeg square, the second variant designed by Di Fausto, 1928 (Archiv of Florestano Di Fausto) building of the Italian Industrial School in Shkodra and in 1935 to designed the Royal Palace in Tirana. [6]

Naturally, the most important part of his work was the government buildings in Tirana. On 20 January 1929, the king made the decision to trust Di Fausto the project for these important public buildings. By replacing Brazini, Di Fausto worked alongside with the Austrian architect Koler and Albanian engineer will deal with the design of the main square and the boulevard in some parts of it.

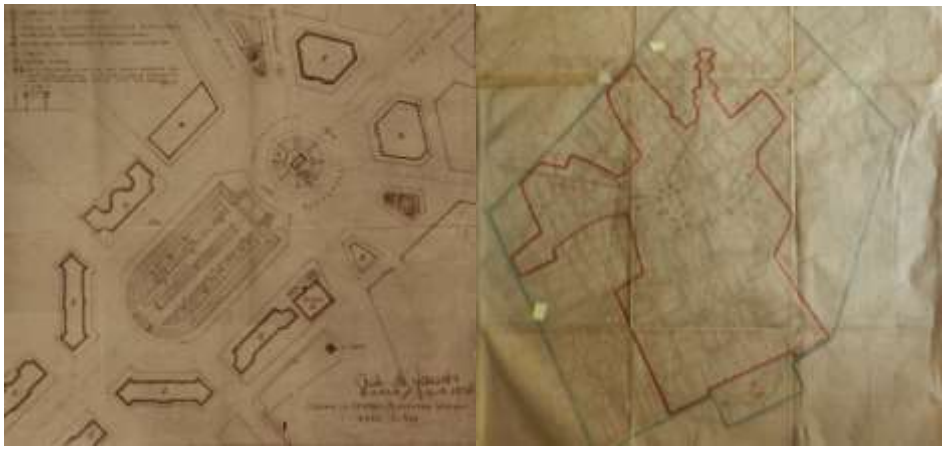


Fig. 8. Skenderbeg square, last variant designed by Di Fausto, 1936 (Central Technical Archive of Construction, Tirana)
Fig. 9. Tirana plan, 1930 (Central Technical Archive of Construction, Tirana)

Florestano Di Fausto [7] in cooperation with the governor and ambassador Mario Lago since 1923 did built in Rodi and other centers of Greek Dodecanese island a large number of objects for government institutions and after the instructions from King Zog he began with the design and implementation of the ministerial buildings.

Fig. 20. Skenderbeg square, 1936 (Archive of Marubi)

Fig. 31. Skenderbeg square, 1936 (Archive of Marubi)

As evidenced in the legend in one of the papers of the Regulatory Plan, which is available in the central Technical Archives Building in Tirana, where are clearly specified the areas in which worked each of the three projectors. The new Skanderbeg Square together with ministries was entirely conceived by architect Florestano Di Fausto. The Square were re-proposed again, after a host attempts, in an eclipse form, different from the one proposed by Brazini. This time perfectly integrated with the existing nucleus of the Old Bazaar above all in complete sync with the presence of the Ethem Bey Mosque, important religious building in the historical memory of the peoples and certainly with great religious value and of particular oriental architectural although in modest dimensions.

Fig. 42. Tirana Municipality Building, 1928-30 (Archive of Marubi)

At all stages of the project, in terms of Skanderbeg Square, Di Fausto take care to confirms the monumental atmosphere for the public space and the existing context as basic elements for the elaboration of the project. The plan initially proposed center presence of eleven ministerial and municipal facilities, located in complete symmetry on both sides of the square.

Fig. 53. Ministerial building,1928-30 ((A.Vokshi)
Fig. 64. Ministerial building,1928-30 (A.Vokshi)

Fig. 75. Skenderbeg square, 1936 (Archive of IGM, Firenze)

With great skill Di Fausto managed to create a strong relationship between the new vision of space and the existing city, above all from Ethem Bey Mosque and the parliament buildings (today Puppet Theatre), defining ministerial complex in terms of volumes. Heights of buildings contained lines that derive from the mosque where the volume view levels can distinguish clear correspondence between layers and the volume between the dome and pull of the upper ministries. Maybe even for economic reasons, the buildings were designed with modest height and thus not bring a sudden change of scale between new and complex fabric of the existing city. This care was well combined with already consolidated image of the mosque, the old bazaar and the City itself, although the eclectic architecture proposed did produced later the new monumental urban characters, quite different from the context of strong Oriental character. [8]

Fig. 86. Skenderbeg square, 1930 (Archiv of Florestano Di Fausto)

Fig. 97. Ministerial building in Skanderbeg square, 1930 (Archiv of Florestano Di Fausto)

In this monumental plant were present some citations from the Predapios and Rhodes plan and many points in the same linguistic and architectural in which Di Fausto was working simultaneously. By drawing an urban sign of the eclectic matrix, chasing through centuries in the Italian history of architecture, ranging from Roman architecture, continuing through the Renaissance, in a context of dialogues already seen, the landscape background communicate with the built environment as in Predapio. New expressive Centre of Tirana become the new square surrounded by institutional buildings type, which put on the organization of ministries of infinite boulevard in a refined game of territory control. This organization, which was visual and spatial wanted to make the politico-administrative difference initially from the urban point of view with this new plan.

As another reference, even without renouncing from the local tradition, Di Fausto renominates in his quest of new Albanian capital project very eclectic architectural theme of his architecture in Rodi and North African colonies. Bandages and pilasters, tympanum, architrave bands so often with a plastic drawn out of scale were essential for providing contrast to linear objects.

Just seven of the eleven buildings projected by his were realized, while we can find in archives various projects completed and unrealized. Since the ministry compound was pure symmetry, in reality there are five types of buildings which are reflected in parallel, organized in such a way considering Ethem Bey Mosque as a focal point from which all the system generated.

The intervention of the park between the buildings will then projected by Giulio Bert. This park goes down to a depth of two meters from street level looking to enhance in the eyes of citizens the dimension and monumentality of low ministries buildings surrounding.

A year later, King Zog wanted to be assisted by Di Fausto for the expansion of his Villa, after seeing the sketches for the administrative center of Tirana. On arrival in Albania in mid-August 1928, Di Fausto, was also involved in the project for expansion of the Villa in Durres according to the request of the King Zog.

The King, once ascended to the throne, ask also to cover the balls decoration of the salon, the decoration of which will be faced by the Italian government entirely as a sign of

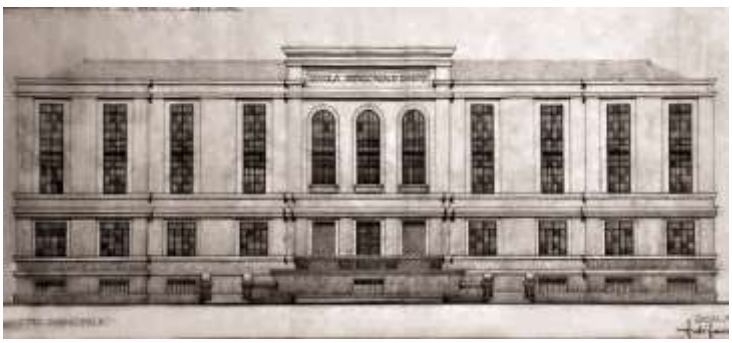


Fig. 108. Industrial School, Shkoder (Archiv of Florestano Di Fausto)

Fig. 119. Industrial School, Shkoder (A.Vokshi)

gratitude. Di Fausto conceived the outside of the villa with a quite different style from the previous architects, transforming the fighter image in an eclecticism simplified and almost devoid of decorations. Construction defects, evidenced by the 1927 earthquake had damaged the central tower, revealed the lack of proper foundations of the building, which stood on a clay soil with high risk of sliding in the sea direction. In fact, the tower changed its appearance on the Di Fausto draft, becoming a central element in almost complete with a three window lintel and a small balcony. The basis part of this, the language of firing openings with round arches as in previous projects. [9]
In fact, the central tower changed the appearance with the Di Fausto project , becoming a central element almost complete with the mullioned architrave and a small balcony. The basement, part of the expansion, regained the openings language with round arches as in previous projects.

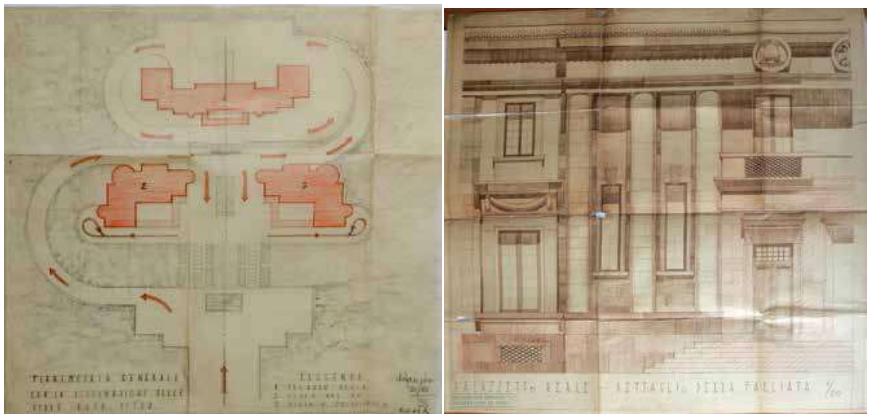


Fig. 20. Royal complex (Archiv of Florestano Di Fausto)
Fig. 212. Facade of Royal palace (Archiv of Florestano Di Fausto)

The interior part did conserve anyway the French taste as previously and on 23 April 1929 did finished the ceilings of the Villa, where sumptuous decoration with metallic gold will transform the hall very suggestive.
On 21 February 1930 Di Fausto was the victim of a serious accident crash that twelve hour stay in the Tyrrhenian was saved along with the crew of the ship "Città di Tripoli" and rescuers commander with much is he will publish his work which illustrates, published in Geneva in 1932.
Fausto Di died in Rome on January 11, 1965.

3 Conclusions

Florestano Di Fausto was the most important colonial architect to the fascist regime. In his confrontation in different countries that he went to work, showed the constant need of direct connection with the context as in an article which claimed his relationship with " genius loci " he would write : " No stone was set by me without previously filled with the spirit of the country until he become mine " Thinking of the urban and social contrast in Albania at the time he come to realize its architecture and satisfy the complex requirements for the creation of a new urban center the core of a capital. As he declared that as in any project create a relation " to the legend , the myth and the history of the country , connecting in this way the free interpretation of tradition with the new vision of last architecture " .
As you can also see his architectural solutions were for the first time in the history of architecture in Albania , the result of an interesting mix of original and traditional local architecture with the modern architecture , but also adding some Italian doses . This led to a higher and real stage of altering architectural language.
Di Fausto was an architect who moved in an area bordered by the remote extremes of eclecticism and the new language of architecture. Although using traditional and eclectic architecture, he mixed theme in a sophisticated language of modern architecture, adapted to urban situations .

Fig. 22. Di Fausto buildings in our days. (A.Vokshi)

With the poetic imagination which he form heterogeneous motives , as we saw in the intervention on Skenderbeu Square, where the Oriental, clean and geometric architectural value of Ethem Bey Mosque will articulates in a general framework of values with lyrical and harmonic treatment of eclectic and Renaissance - medieval architecture, brought us a unique cohabitation of Oriental with western values.

The interventions in Tirana makes Di Fausto precedes the rationalism architecture that will later prevailed in Albanian cities , but we can say that fundamentally changes the willingness and the conception of connection so delicate with the typical local territory . Although the style that he used was old , his architecture is fresh and new also today.

References

1 1 M.Giacomelli, A. Vokshi (a cura di), Architetti e ingegneri italiani in Albania, Edifir, Firenze, p 29-35
2 Vittorio Santoianni, “Il Razionalismo nelle colonie italiane 1928-1943. La "nuova architettura" delle Terre d’Oltremare” (Ph.D. Thesis, Universita degli Studi di Napoli “Federico II”, 2008), 93.
3 M.A. Giusti, Albania, Architettura e Città, Maschietto Editore, Firenze, p 20
4 E.Godoli, M.Giacomelli (a cura di),Architetti e ingegneri italiani in Egitto dal dicianovesimo a ventesimo secolo, Maschietto Editore, Firenze, p 124
5 M.Giacomelli, E.Godoli, A.Kassou (a cura di), Gli architetti italiani in Marocco dall'inizio del protettoratofrancese ad oggi, Maschietto Editore, Firenze, p 53
6 E.Godoli,S.Finzi, M.Giacomelli, A.Saadaoui (a cura di),Architecures et architectes italiens in Maghreb, Editzioni Polistampa, Firenze,
7 M.Giacomelli, A. Vokshi (a cura di), Architetti e ingegneri italiani in Albania, Edifir, Firenze, p 35-39
8 P. Sica, Storia dell’urbanistica, il novecento,, Editori Laterza, Bari, p 328
9 M.Giacomelli, A. Vokshi (a cura di), Architetti e ingegneri italiani in Albania, Edifir, Firenze, p 29-33

Development Of Cost Model For Construction Projects In Albania

Valdete Ballhysa [1]
[1] Specialist,General directorate of Water Supply and Sewerage,
Tirane, Albania

Abstract : Project cost is one of the most important criteria of success of project and is of high concern to those who are involved in the construction industry. As the construction industry is encouraged to adopt innovation in its trade, project cost came to the industry players to review the prevalent method of cost estimation for cost planning and control of projects. Drawing from that, and appreciating the need to reform the construction industry's practices, it was conceived that reviewing the existent construction cost modeling used in the preparation of cost planning and control for projects would be the most expedient and vital. Studies show that rarely projects are complete within stipulated budget. The objective of this paper is, to review the current status of design cost modeling in terms of the techniques used, their accuracy and levels of usage. Types of construction cost modeling are identified through literature review and interviews. This paper presents the results of a questionnaire survey conducted among contractors, designer and project managers. Data was analyzed with PASW statistical program, version18.This paper concluded that the traditional type of cost estimation models continue to be in widespread use irrespective of organizational type and size.

Keywords: Cost Modeling, Cost Estimate, Construct

1 Introduction

Project cost is one of the most important criteria of success of project and is of high concern to those who are involved in the construction industry.
According to the American Association of Cost Engineers, (AACE) cost engineering is defined as that area of engineering practice where engineering judgment and experience are utilized in the application of scientific principles and techniques to the problem of cost estimation, cost control and profitability.
In Albania like other countries construction industry is one of major industry contributing significantly in the growth of socio-economic development. Achieving project completion on time and within budget at specified quality standards is major criterion of success of project (NEDO, 1988).Studies show that rarely projects are completed within stipulated budget.
Although in Albania a lot of money has been spent in construction, the industry is facing a lot of challenges such as the expenditure exceeding the budget, delay to complete the project in time, the building defects
Aim and Objectives of the study was to asses, indentify and classify current forecasting techniques in terms of the techniques used, their accuracy, levels of usage and deficiencies used in several construstion projects in Albania and collecting information about the impact and efficiency of these models and cost-influecing in Albanian construction industry.

2 Literature Review

For use of cost modeling techniques in the Design Stage of the Development Process (Fortune and Lees,1996) surveyed cost modeling technique usage during "early cost advice" by "organizations" in Northern England and Wales. Consulting quantity surveying firms made up 62.6% of the sample frame in this study, the remainder comprising project management, contracting and multidisciplinary organizations local and regional authorities. Later studies were conducted by Fortune and Hinks into

the use of cost modeling techniques by consultant quantity surveyors in the provision of "early cost advice" throughout the whole of England (Fortune and Hinks, 1998). The results of these studies are shown in Table 1.
The result of these surveyors indicate that traditional cost modeling have the highest relative incidence of model usage and resource and process based cost modeling the lowest incidence in usage (product based cost modeling refer traditional cost modeling, while resource based modeling techniques refer non –traditional cost modeling).

Table 1 –Use of various cost modeling techniques by Northern England (Organizations"(1996)and all England Quantity Surveyors (1998)—(Source: Fortune and Lees, 1996, Fortune and Hinks,1998).

Model	Incidence in use (% of Respondents Fortune and Lees)1996	Incidence in use (% of Respondents Fortune and Lees)1998
Judgement	85.80	82.96
Functional unit	75.50	69.74
Cost per m2(superficial)	97.30	96.98
Principal Items	47.30	39.57
Interpolation	87.00	84.13
Elemental Analysis	88.70	88.05
Significant Items	73.70	69.83
Approximate quantities	96.20	93.34
Detailed Quantities	68.70	63.66
Resourse Based	50.40	46.23
Process Based	31.80	26.35

- Studies by Bowen and Edwards, investigating cost modeling techniques employed amongst South African quantity surveying practices, revealed that traditional cost modeling techniques such as elemental analysis and approximate quantities are the most popular method employed (Bowen and Edwards,1998). Additionally, the superficial method and bills of quantities are also employed at particular stages of the design process; i.e. the brief and documentation stages respectively this study revealed that a large proportion (83%) of respondents "seldom, if ever, utilize (resource based cost models such as) critical path methods or activity bills of quantities in the preparation of price forecasts".
- Studies by Azmi Ahmad Bari exploring the types of construction cost modeling indicate that the traditional types of cost modeling were, in general still widely used and the newer (non-traditional),only the value of cost model, resource based model and lifecycle cost model being general use. The traditional types of cost estimation models continue to be in widespread use irrespective of organizational type and size (Bari, 2000).
- Studies by Lawther and Edwards indicate that consultant quantity surveyors generally utilize traditional design cost modeling techniques; such techniques reflecting the design information upon which they are based. These techniques do achieve a tolerable level of accuracy. However, they are deficient in terms of lacking an explicit relationship with the construction process they are purporting to model, and by using distorted cost data to support them. Whilst non-traditional cost modeling techniques have been developed, the traditional product based cost models retain greater favor with consultant quantity surveyors. Reasons proffered for lack of use of resource based cost modeling techniques by consultant quantity surveyors include lack of data, lack of understanding of construction processes and time constraints. These restrictions emanate from the traditional method of building procurement which distinctly separates the design and construction processes and thus militates against the easy transfer of data between the actors engaged in them (Lawther & Edwards, 2011).

2.1 Types of cost model techniques

From studies and literature review exist two distinct of cost modeling techniques:
Product based – where the completed building is modeled which are identified "Traditional cost modeling techniques).
Process based – where the construction production process is modeled which are identified as non-traditional (Skitmore & Marston, 1999).To ensure that the reproduction of your illustrations is of a reasonable quality, we advise against the use of shading. The contrast should be as pronounced as possible.
If screenshots are necessary, please make sure that you are happy with the print quality before you send the files.

2.2 Traditional model

From studies and literature review the traditional modeling represent picture time and costs and they were based cost modeling techniques model the completed building. The traditional or product based cost modeling techniques identified from the literature are summarized:

1. Conference,
2. Financial method,
3. Functional unit,
4. Superficial,
5. Superficial -perimeter,
6. Cube,
7. Storey enclosure,
8. Approximate quantity,
9. Bill of quantities

2.3 Non -traditional model

Non-traditional model or process based focus on cross-function activities. These cross-functional activities have increased severely in number and importance due to the growth of complexity and dependencies. The non-traditional cost modeling techniques identified from the literature are summarized:

1. Statistical / Econometric model (Regression analysis and Causal model),
2. Risk / Simulation model (Monte Carlo simulation and Value management),
3. Knowledge based model
4. Resource based model
5. Life cycle model

2.4 New wave model

These models are often referred as a way of "reasoning with uncertainty" and provide a well defined mechanism to deal uncertain an incompletely defined data, so they can make precise deductions from imprecise data. They represent local linear input-output relations of a nonlinear system (Takagi & Sugeno, 1985).

1. Artificial intelligent system (Neural network and Fuzzy logic),
2. Other models (Environmentally and Sustainable development).

2.5 Concluding remarks

The result of these surveyors indicate that traditional cost modeling have the highest relative incidence of model usage non-traditional cost modeling the lowest incidence in usage. The traditional types of cost estimation models continue to be in widespread use irrespective of organizational type and size.

These are considered useful on the basis of their ease of application, familiarity and speed and a tolerable level of accuracy (Ashworth, 1995).

However, the same models have also being criticized on the basis that:

- They are not (explicitly) founded upon construction production criteria as the generator of cost (Brandon, 1982; Morton, 1995).
- They do not fully represent the relationship between design decisions and the resulting construction processes (Bowen, 1993).
- They fail to consider the uncertainties of the construction process (Bowen, 1987).
- The cost data used to support such models is often taken from previous projects, previous bills of quantities, price books etc and does not represent cost as a function of resource usage, but rather as a function of the completed building product (Raftery, 1984; Morton, 1995).

Thus the criticisms of traditional product based cost modeling techniques are focused upon two main concerns:

- Firstly, the lack of an explicit relationship between the cost modeling techniques and the construction process.
- Secondly, the use of distorted cost data to support such cost modeling techniques.

All non-traditional cost modeling techniques share a common theme of utilizing the contractor's resource based data during the design process. However despite their potential, the literature contains no reported cases of the use of such resource based cost modeling techniques. Therefore their effectiveness remains a matter of academic conjecture and the question arises as to the extent of use of cost modeling techniques in the design stage of the development process.

3 Research Methodology

A questionnaire methodology was adopted to appreciate, to determine and indentify the current cost model techniques. Survey and interviews were distributed among contractor, firms, engineers and project management consultants. It focused in design projects, control projects, methods of building procurement, construction site and included almost all types of projects. Data collected through questionnaire survey was analyzed with PASW statistics program, version 18.

A questionnaire methodology was adopted to appreciate, to determine and indentify the current cost model techniques. Survey and interviews were distributed among contractor, firms, engineers and project management consultants. It focused in design projects, control projects, methods of building procurement, construction site and included almost all types of projects. Data collected through questionnaire survey was analyzed with PASW statistics program, version 18.

2.3 Questionnaire designs

The questionnaire consisted of two parts – A and B.

2.3.1 Part A-Identification and classification the most widespread or preferred cost estimate models used in construction projects (traditional cost model and non-traditional cost model).

Part A is divided in 3 sections:

- Section A -general information and demography

- Section B -indentification and classification the most widespread or prefered cost estimate models used in construstion projects(traditional cost model and non-traditional cost model)
- Section C- The impact and efficiency of these models in construction industry

2.4 Conducting questionnaire survey through postal mail and personal interviews

Questionnaire survey and interviews were distributed among contractor, firms, engineers and project management consultants through postal mail and personal interviews. It focused in design projects, control projects, methods of building procurement, construction site and included almost all types of projects in construction. A total of 150 questionnaires were distributed out of which 28 with a percentage 18.7% were received.

2.5 Assessment of feedback from questionnaire survey

For assessing the degree of accurate and importance of cost model in the part A of questionare a scale is used as follows:

- Not at all
- Some
- Very important

4 Cost Modeling Process

This chapter is dedicated to the processes are involved in cost estimating model, choices of estimation models, descriptions of cost model, stages of cost estimates in construction industry and cost estimating from the engineering perspective and the role of the engineers in the cost estimating process.

4.1 The processes are involved in cost estimating model

Based on Part 1 of the British Standard BS 6143 (BSI, 1992), a generic process cost model for a construction process is presented in Figure 1. Process approach is one of the eight quality management principles incorporated in the ISO 9000:2000 quality standard. The Standard also emphasizes the importance of continual improvement of processes.

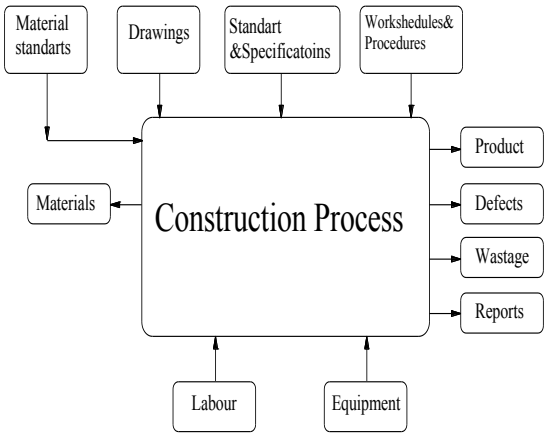


Figure.1. Typical Construction Process Cost Model

Cost estimating is one of the most important steps in project management. A cost estimate establishes the base line of the project cost at different stages of development of the project. A cost estimate at a

given stage of project development represents a prediction provided by the cost engineer or estimator on the basis of available data. More specifically, the management decisions supported by cost models include:

- Forecasting the total cost of construction
- Comparing design alternatives
- Forecasting the economic effects upon society of changes to design codes and regulations

4.2 Factors influencing the choice of cost model

Many factors influence of cost model. Some of them are mention below:

- Information and time available;
- Experience of the estimator /quantity surveyor;
- The amount and the form of cost data;
- Purpose of the estimates;
- Techniques to be adopted ;

Cost estimate can be done in any stage of the project. A construction project is considered in 6 different stages:

- Feasibility stage
- Conceptual stage
- Design stage
- Procurement
- Construction
- Turnover

Conceptual cost estimation is performed in conceptual stage detailed design is completed. In conceptual stage, the preliminary design of the project has been finished. Preliminary drawings and specifications are the only sources that can be used in conceptual cost estimation. At the early stages of a construction project the design information and scope definitions are very limited, hence achieving high accuracy is very difficult.

The accuracy of cost estimating increases due to the finalized drawing and specifications and specifications from feasibility to turnover stage. All parties involved in a project need to know about the cost of the project from the first stage (from feasibility stage) to last stage (turnover stage).Virtually all cost estimation is performed according to one or some combination of the following basic approaches.

Conceptual cost estimating methods are:

- Unit cost model
- Factor cost model
- Probabilistic Modeling & Simulation

3.3 Cost model method descriptions

- Conference,
- Financial method,
- Functional unit,
- Superficial,

- Superficial -perimeter,
- Cube,
- Storey enclosure,
- Approximate quantity,
- Bill of quantities
- Statistical / Econometric model (Regression analysis and Causal model),
- Risk / Simulation model (Monte Carlo simulation and Value management),
- Knowledge based model
- Resource based model
- Life cycle model

3.3.1 Conference method

a) Estimates cost functions on the basis of analysis and opinions about costs and their drivers gathered from various departments of a company;
b) Pools expert knowledge;
Reliance on opinions still makes this method subjective.

4.3.2 Financial methods

This method is used to determine cost limits or the building costs in a developer's budget.

4.3.3 Functional unit

A monetary rate or amount applied to a unit commensurate with the function of the building. Applicable to projects having standard units of accommodation. Often used to fix cost limits for public sector building projects.

4.3.4 Superficial

A single rate applied to the floor area of a building e.g. $/m2.Still widely used, and the most popular method of approximate estimating can be applied to virtually all types of buildings.

4.3.5 Superficial perimeter(Ashworth ,1995)

As well as taking the floor area of a building into account, the length of building perimeter is also included in an endeavor to increase accuracy. Never used in practice.

4.3.6 Cube(Smith,1998)

A single cost rate applied to the internal volume of building. Used mainly by architects, but now in disuse.

4.3.7 Storey enclosure

Measurement and evaluation of any area within a building. Unusable in practice.

4.3.8 Approximate quantities

Measurement and the price of small items grouped. This method is still a popular method on difficult and award contracts and where time permits.

4.3.9 Resource analysis

Used mainly by contractors for contract estimating and tendering and tendering purposes.

4.3.10 Regression analysis

Regression analysis is a statistical method that measures the average amount of change in the dependent variable associated with a unit change in one or more independent variables.

Types of regression

a) Simple – estimates the relationship between the dependent variable and one independent variable;
b) Multiple – estimates the relationship between the dependent variable and two or more independent variable;

Therefore, all methods, techniques or procedures used by quantity surveyors for cost estimation or cost forecast may be termed as cost models quantity.

5 Results And Analysis

This chapter is dedicated to the results and analysis of data collected. It consists in analysis of respondent profile, advantages and disadvantages of the cost modeling techniques.

5.1 Respondent Profile

The results indicates the majority (almost 100%) possess a high level of academic qualification; i.e. degree holders. Majority covers a spectrum of high ranking personnel in which (81%) of the respondents belong to the top management level, such as director, principal, managing here director, etc. Therefore, the information provided by the respondents can be considered as reliable and authoritative. Majority of terms involved in questionnaire are described as below:

5.1.1 The job position.

Distribution of respondents in terms of job position is shown in tab.2. The majority of respondents are classified as below:

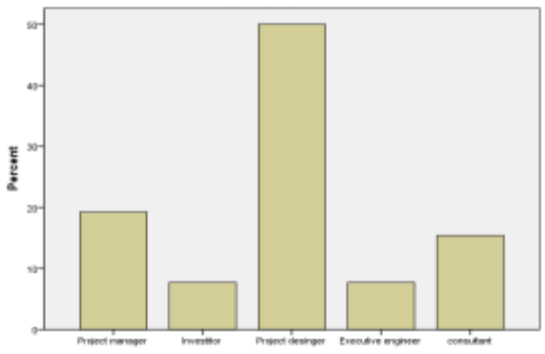


Fig..3. Bar chart of job position

5.1.2 Practical experience working in constructions projects.

Distribution of respondents in terms experience working is shown in table 3 indicates that majority of respondent's i.e. 51.9 % were experienced less than 5 years and 22.2 % had experience between 11-15 years.

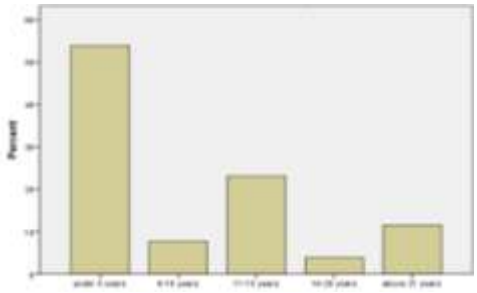


Fig.4. Bar chart frequency of experience working in constructions projects

5.1.3 Types of projects

Distribution of respondents in term "type's projects" is shown in table 4 indicates that majority of respondent's i.e. 46.2 % were experienced in industrial construction.

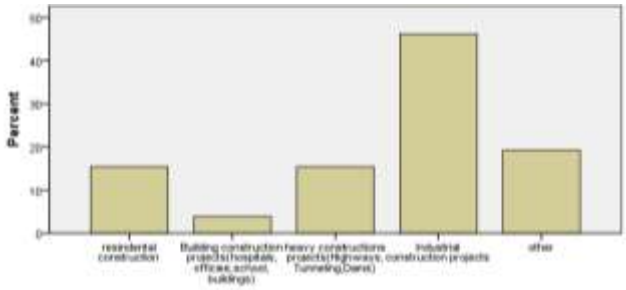


Fig.5. Bar chart the types of projects

Data collected

Identification and classification cost estimate models used in construction projects
The results of these surveys indicate that traditional cost modeling techniques such as bill quantities the most popular methods employed. Additionally approximate quantities, the superficial method and financial method are also employed at particular stages of the design process;

Frequency of models the company currently-used is shown in table 5. The results indicate that 100 % of respondent's used traditional cost model.

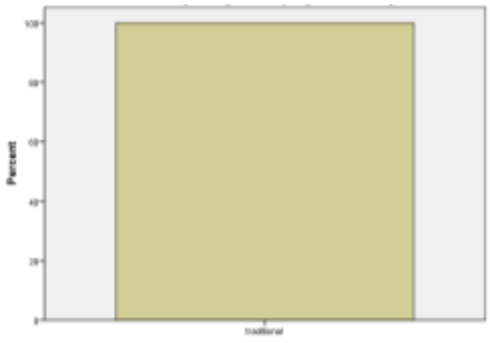


Fig..6..Bar chart of models currently -used

Frequency of types for traditional models

Distribution of respondents in term of "Which type of traditional models you often use?" is shown in table 6. The results indicate that 92.6 % of respondent's use "Bill quantities and 3.7 % "Financial Method" traditional cost model.

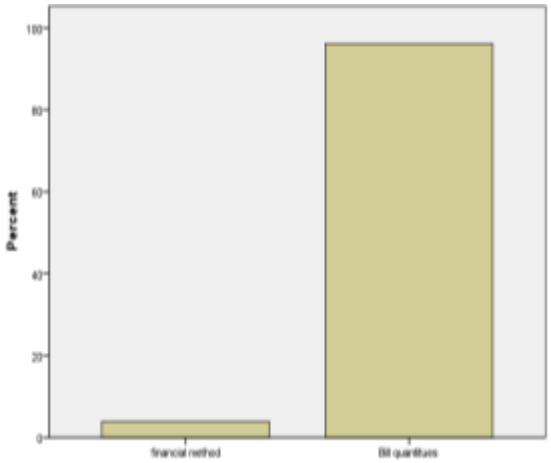


Fig.7. Bar chart of types for traditional models

Accuracy Cost Modeling Techniques

Distribution of respondents in term of ""Accurate "cost modeling is fundamental to the efficiency of construction? " is shown in table 7. The results indicate that 85.2 % the "Accurate "cost modeling is very important in fundamental to the efficiency of construction.

- Highlight the items with most effect on the project cost;
- It determines clearly and accurately the cost of a project and minimizes it;
- Make possible the use of method cost can be done even the verification comparison with the bidders and subcontractors for their enterprising according to the activities cm/unit;
- Indentification the real cost of project;

Disadvantages of traditional cost modeling techniques

The resultants indicate the same models have also being criticized on the basis that:

- Cost as usual is recalculated because there are always delays in procurement and the time of drafting the project until the beginning of its implementation;
- The prices refer book price are different to the market and are delayed updated in terms of a variety of materials and new inputs coming from outside;
- They do not fully represent the relationship between design decisions and the resulting construction processes;

Newer cost modeling techniques

Distribution of respondents in term of "Which one of nontraditional models you know" is shown in figure 10. The results indicate that 88.9 % didn't know these models.

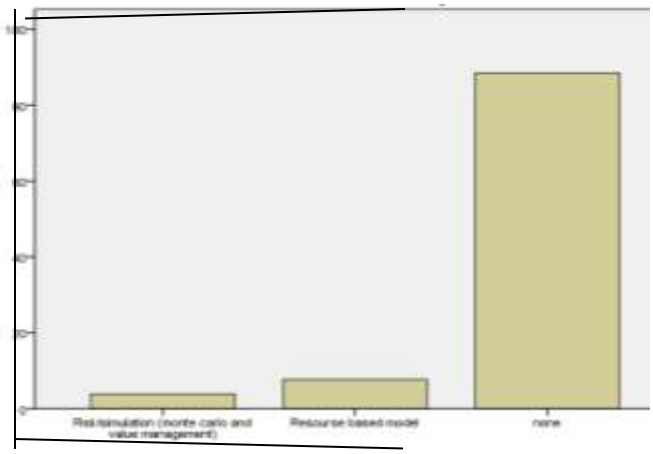


Fig.10.Bar chart of non-traditional cost model

Reliability of newer techniques of cost estimate model

Distribution of respondents in term of "Which one of nontraditional models you know" is shown in table 9. The results indicate that 88.9% indicate that" newer techniques model" are reliable

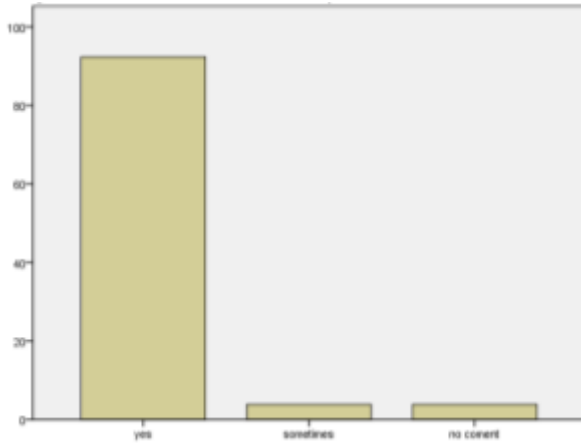


Fig.11.Bar chart for reliable the newer techniques of cost estimate model

Deficiencies of newer techniques of cost estimate model

The respondents classified some deficiencies, which are presented as below:

- Lack of familiarity with the newer techniques;
- Lack of knowledge to evaluate the risk ;
- Financial constrains;
- Lack of knowledge management techniques;
- Doubts whether these techniques are applicable to other projects;
- Most construction projects are not large enough to warrant the use of these techniques or research into them;
- New's techniques needs training on software investment;
- Not everyone in the bussines can understand;
- Requires more proffesional expertise on learning and operating model costs of the projects;
- Difficult to adopt with the national experience and standards;

- Require trained people on working and operating with them;
- Require highly qualified and well-known, be simple and easily integrated in the company who want to make part of their own

6 Conclusions

The result of this paper indicate that traditional cost modeling have the highest relative incidence of model usage and non-traditional cost modeling the lowest incidence in usage. The traditional types of cost estimation models continue to be in widespread use irrespective of organizational type and size.The traditional cost model are considered useful on the basis that:

- Understandable, the experience of these models and doesn‘t need training;
- Applied by the legal structure having no risk for the application;
- The construction carry out with optimal wastage (expense) achiving the objectives of contractor;
- More adaptable;
- Estimates the cost of the projects in a short time and following the well-known international standarts;
- Highlight the items with most effect on the project cost;
- It determines clearly and accurately the cost of a project and minimizes it;
- Make possible the use of method cost can be done even the verification comparison with the bidders and subcontractors for their enterprising according to the activities cm/unit;
- Indentification the real cost of project;

Desipte their avantages, are being criticized on the basis of their recalculating because there are always delays in procurement and the time of drafting the project until the beginning of its implementation, prices refer book price are different to the market and are delayed updated in terms of a variety of materials and new inputs coming from outside, do not fully represent the relationship between design decisions and the resulting construction processes.

The newer cost model techniques, remain only in information phase and not seen the trend in their usege. The disavantages of the newer cost model are considered**:**

- Lack of familiarity with the newer techniques;
- Lack of knowledge to evaluate the risk ;
- Financial constrains;
- Lack of knowledge management techniques;
- Doubts whether these techniques are replicable to other projects;
- Most construction projects are not large enough to warrant the use of these techniques or research into them;
- New‘s techniques needs training on software investment;
- Not everyone in the bussines can understand;
- Requires more proffesional expertise on learning and operating model costs of the projects;
- Difficult to adopt with the national experience and standards;
- Require trained people on working and operating with them;
- Require highly qualified and well-known be simple and easily integrated in the company who want to make part of their own.

References

1. Ashworth, A. (1995) Cost Studies of Buildings. 2nd Edition. Longman Group, London.
2. Ashworth, A. and Skitmore, R.M. (1983) Accuracy in estimating. Occasional Paper No. 27. Chartered Institute of Building. United Kingdom.

3. Bowen, P.A. and Edwards, P.J. (1998) Building Cost Planning and Cost Information Management in South Africa, Journal of Construction Procurement, Vol.4, No.1, pp16-26. The International Procurement Research Group. Glamorgan University, United Kingdom.
4. Bowen, P.A. (1993) A communication based approach to price modeling and price forecasting in the design phase of the traditional building procurement process in South Africa. Unpublished PhD thesis, University of Port Elizabeth, South Africa.
5. Bowen, P.A, Wolvaardt, and J.S, Taylor, R.G. (1987) Cost modeling: a process modeling approach. In
6. Building Cost Modeling and Computers, Brandon, P.(ed). E&FN Spon, London.
7. Design cost modeling – A way forward (Peter M Lawther and Peter J Edwards Department of Building and Construction Economics Royal Melbourne University of Technology University, Australia).
8. Exploring the types of construction cost modeling for industrialized building system(IBS)project in Malaysia ---Nor Azmi Ahmad Bari)University Putra Malaysia.
9. Fortune, C. and Lees, M. (1996) the relative performance of new and traditional cost models in strategic advice for clients. RICS Research Paper Series, Vol.2, No.2, March. Royal Institution Chartered Surveyors, London.
10. Fortune, C. and Hinks, J. (1998) Strategic building project price forecasting models in use paradigm shift postponed. Journal of Financial Management of Property and Construction.
11. Appendix 1
12. The Questionnaire –Part I
13. The Questionnaire –Consisted Of Two Parts – I And Ii.
14. Part I Is Divided In 3 Sections
15. The Section A Consisted Of:
16. General Information And Demography (E.G. Work Experience, Position In Company)
17. The Section B Consisted Of:
18. Indentification And Classification The Most Widespread Or Prefered Cost Estimate Models Used In Construstion Projects (Traditional Cost Model And Non-Traditional Cost Model)
19. Section A – General Information And Demography

Tirana, Between East And The West In The Focus Of The Urban Texture

Armand Vokshi[1], Ani Tola (Panariti)[1],
[1] Faculty of Architecture and Urbanism, Politecnic University, Albania
armandvokshi@gmail.com
ani.panariti@fau.edu.al

Abstract. This research tries to synthesize the urban development of Tirana, especially in the historical part of it, at different times. The evolution of the city of Tirana is a typical evolution for Albanian cities with an urban structure, which was born in the Ottoman period. The chaotic urban structure shaped spontaneously in recent centuries, in Bosios plan during 1940, was thought to be treated as a "garden city", well integrated with the new form of the city, preserving at the same time his physiognomy. Unfortunately this project has not been taken into consideration during the years of socialist realism, while in urban level there was no clear space developments in these parts. The situation in our time appears tragic with the destruction of the old urban structure but not in favor of a clear urban regulation for the city. The result of this paper is to identify and to dismantle the aggravated problems of urban structure in the capital and show effectively intervenes in special cases.
Keywords: urban design, Tirana, Bosio, urban plan, urban texture

1 Introduction

In January 1920 at Lushnja congress in a compromise between the north and south of the country was decided the formation of a provisional (technical) government, which decreed Tirana as the temporary capital of Albania. After climbing to the top of the Albanian government in 1925, Ahmet Zogu decide to confirm Tirana as the new capital of Albanian state. At this point the challenges were enormous, needs to designed almost from scratch over existing tracks a typical oriental town, a capital-city with lear urban structure and equipped with a suitable network infrastructure.

Fig. 1. Tirana plan, in 1917(Central Technical Archive of Construction, Tirana)

With a perfect geographical position, on a national road junction north-south, not far from the port of Durres in the west, the landscape of the Dajti Mount dominant east, Tirana was for the moment the most appropriate place to accommodate the governmental structures

Fig. 2. Ethem Bey Mosque in 1921 (Archive of Marubi)

of the new state. According to various demographic data, the estimated population was of 12 000 inhabitants in 1920, after migrations towards the new capital was increased by 30 000 inhabitants in the census of 1930 and was estimated in 1945 about 60 000 inhabitants. According to historians, the city was founded in 1614 by Sulejman Bargjini who built a mosque, a hammam and an inn, creating the first urban nucleus of Tirana. In subsequent years, around the complex, the city began to spread spontaneously by principles of muslim Ottoman cities.

Fig. 3. Tirana plan in 1921 (Central Technical Archive of Construction, Tirana)

2 Paper Preparation

Observed from above, the city looked like an agglomeration of steep roofs and adobe walls painted in white. The repeating Game of these roofs change with the presence of religious public facilities like Islamic or Catholic-Orthodox. Ethem Bey Mosque and the Clock Tower as a complex was very important for the city, which in urban interventions for the development of the capital Tirana, will become part of the existing urban connectors and determining new shape.
Urban development of trade and craft part of the Old Bazaar, close to the t Ethem Bey Mosque and the Clock Tower complex, divided Tirana into two parts: in the north and east part of the housing consists

of simple constructions, in most with adobe and south-west it's trade and craft production, where streets and squares system was an integral part of the city with a vernacular character.
So, the moment of naming the capital, Tirana represent a typical oriental structure, where the existing urban texture, regarded by many as the "garden city", should quickly vacate space for the structures of the state government, non-existent at that time.

Fig. 4. Tirana Bazaar in 1921

Fig. 5. The aerial view of Tirana in 1925

At the same time, should face the inevitable growth and expansion of the city, as a result of demographic population setbacks. The new state bureaucrats, various traders and workers were directed to Tirana with the hope of a better life, for this situation were urgently required new space for residential and commercial environments.
After all those centuries under Ottoman occupation, economic and cultural projection of the future, for the Albanian leadership class was natyrally oriented westward. For this reason, their demands were clear in the political and economic, but also in urban and architectural view of the territory. Ahmet Zog, Albania's prime minister at 1925, in a delicate political situation, while in Italy was consolidated fascist regime, was forced to practice a policy more favorable to the Italian State and the Italian capital. [1] Where would require to Mussolini parallel professional help for engineers, architects and urbanists of

"high level" to develop a regulatory plan refined and competent for the new capital and with significant interference in Albanian territory.
This negotiation process allowed the creation of the Albanian National Bank, as well as creation of Svea (Albanian Economic Development Society) which would ensure that funds lent by Italy will be spent in public works and for the implementation of the regulatory plan of Tirana which will projected by the Roman architect Armando Brazini [2].
Brazini embodies a classic architect who brought from his homeland an architectural language inspired by the monumental tradition of Roman baroque, which were transplanted without any change in Tirana, in a very different context from both Italian and the European one.

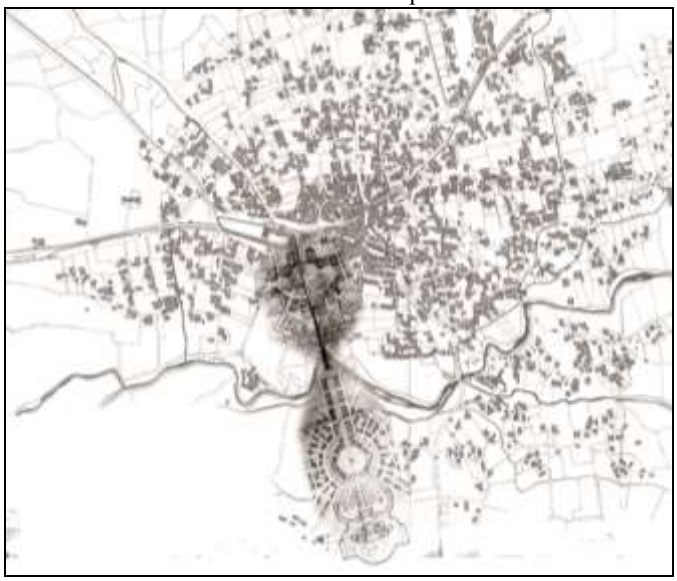


Fig. 6. The montage of Brazini plan in 1925

Brazini [3] idea for the new center of the Albanian capital, where taste and oriental presence was strong enough, it was a considerable axial radical intervention on the urban texture and that would mean a strong linear cracks that would serve as monumental boulevard of the main city's. The orientation of this avenue should be according to the axis north - south, interventions characteristic of the ancient Romans in their colonies performed according to the principle "cardo maximus", shifted light from the west. In fact, a good part of boulevard will developed on an agrarian territory, fragmented by Lana river, part of which was proposed by Ahmet Zog as suitable area for the urban expansion to the new capital. [4]
This boulevard is a coordinator axis for urban development and a capacitor for the new centralization, with varying degrees. The prospects for the new squares were attached to the regulatory plan, it's monumental central of ministries, the Skanderbeg Square and final the Presidential Palace. Boulevard trail enters to the city through an important point that is Skanderbeg Square, which was transformed in the main axis of the new urban image. Major breakdowns required to implement the new axis should leave the space of a monumental axis defined as the "heart" of the city lacked up to that time. The idea of the monumental central square derivative of colonial roman traditions had originated as "forum". In Roman cities, users generally found the angled intersection of "cardo maximus" with "decumanus maximus", in the east - west axis, where in the specific case of Tirana, decumanus forum is missing and at the intersection of cardos with radial roads coming from other cities.

Fig. 7. The aerial perspective of Brasini plan (Archive of Brasini, Roma)

With this urban scenery, Tirana would have totally changed the image with strong architectural language consequence of ancient Roman culture, in stark contrast with the existing city. The idea of large urban transformation, according to Brazini, also clarified in the demolition project regardless of existing buildings, replaced with the new government headquarters, administrative, cultural, characterized by a clear ornaments of Roman monumentality. [5] Major monumental axis was introduced as a way of broad and straight, almost entirely with portico and Doric columns, being updated with new items that came up or replace the existing part of the Ottoman city. These interventions organize open and collective space in the new axis and disposing on a monumental way the square near the mosque of Ethem Bey with the positioning of ministries. With the realization of a typical French geometric park on the easy slope to be extended at the entrance of the Presidential Palace will organized a panoramic area at the entrance of the city. Not so far from the Presidential Palace, Brazini projects a square surrounded by Administrative buildings organized by the planimetric view with a strong radial system and concentric circles. The aggravated report between Brazini 8 and Ahmet Zogu, probably due to project delays or different requirements from our part, resulted in the cancellation of the contract by Ahmet Zog. The project for the center of Tirana was not realized and Brazinit ideas were left on one side. After termination report with the Roman architect Armando Brasini, Ahmet Zogu, who then, in September 1928 will be elected king, to continue with the transformation work for the new Albanian capital, initially commissioned Austrian architect Hans Köhler and Albanian engineer Skender Frashëri to deal with the new regulatory plan. 1 Later on to this group will join the Italian architect Florestano Di Fausto. This delicate issue should certainly be continued where Brazini had left it.

Fig. 8. Tirana plan in 1928-1930 (Central Technical Archive of Construction, Tirana)

The plan of 1928, after several options made earlier from those three, appeared as the first ever regulatory plan of Tirana. The main goal was the design and implementation of a superb infrastructural network, necessary to support expansion

and construction to the south west of the city. This area will serve as a territory reserve able to cope with demographic growth that the plan is required to precede, aiming in the future the population of the new capital will be doubled or trebled. [6]

Fig. 9. The project for boulevard and Skanderbeg Square in 1928 (Archive of Florestano Di Fausto, Roma)

This plan, in its interventions, guarded and re-proposed Boulevard idea proposed by Brazini with newness the extension of the major axis to the north and also the central leveling therefore central ministries plaza already slightly redesigned. At the extremes of the boulevard were respectively large monumental squares. This intervention required major breach in the existing radical character of the city.
Strolling towards the main square was reserved for three typical French dressing parks, with 300 and 200 meters, which did configured geometrically in full symmetry by the main axis of the boulevard. On the opposite side of the royal palace, in the north of the boulevard was supposed to be established the city stadium, after the clear split that the radical axis make to the existing Ottoman city.

Fig. 10. Aerial photo of the main square in 1936 (Archive of IGM, Firenze)

The plan proposed nearly a quadratic road system for the entire city and somehow respected major introductory axes derive from other cities to reaching the center, the new Skanderbeg Square.

Fig. 11. Aerial photo of Skenderbej square, in 1936 (Archive of IGM, Firenze)

Very important was the provision make by the plan for the city in the south-west with the new quarter 'Tirana e Re', whose territories were taken from the disposition thought that would be made to the Lana River and from agricultural territories. To the symmetric rectangular scheme of this new urban part was put in a large park as well symmetrical as the axis of Tellini Boulevard, parallel to the major boulevard. Fascist military intervention in 1939 finds the city which extended more and more like an oil slick, where new buildings are occupied the place of the old ones, or very old buildings adapted rapidly, barracks and buildings looked everywhere.

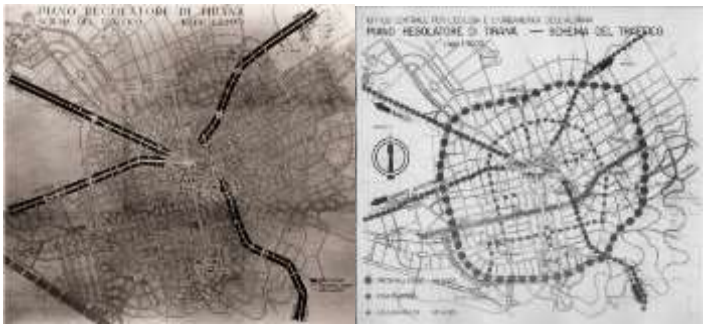


Fig. 12. Scheme of the radial roads on the regulatory plan in 1939 (Archive of Bosio)

Fig. 13. Scheme of the ring roads on the regulatory plan in 1939 (Archive of Bosio)

With the major demographic movements, lack of housing and commercial space and insufficient road system caused a major urban crisis. To overcome this problem, it was designed a radial road network which converged in Skanderbeg Square, which the ministries houses were almost fully realized. More than any other city in Albania, Tirana needed a really Regulatory Plan.

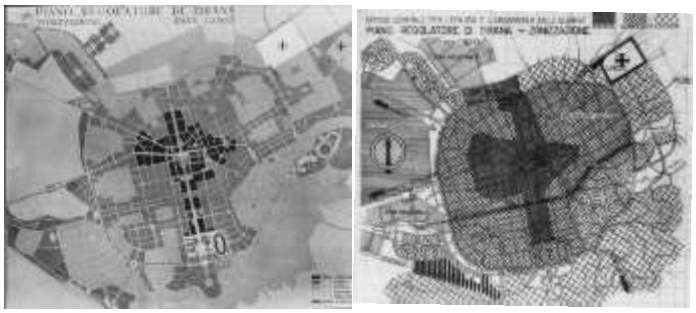


Fig. 14. Regulatory plan in 1939 (Archive of Bosio)

Fig. 15. Zoning of the regulatory plan in 1939 (Archive of Bosio)

Fascist government sends in Tirana a group of young architects led by Gherardo Bozio, which will deal with the Regulatory Plan of Tirana. Studies for the plan began in September 1939 with the design and later the realization of the square and the boulevard of the fascist ideology. In October of the same year, the work began for the plan idea of the regulatory plan which ended with a project plan approved by Law 71, on 7 March 1940.

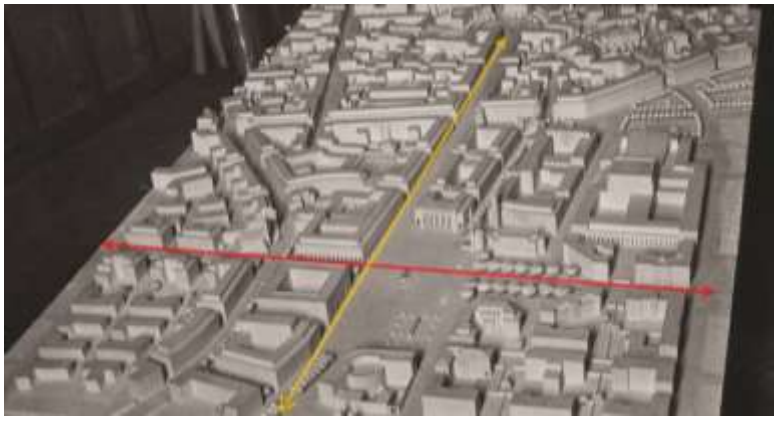


Fig. 16. The project's of the main square and old bazaar (Archive of Bosio)

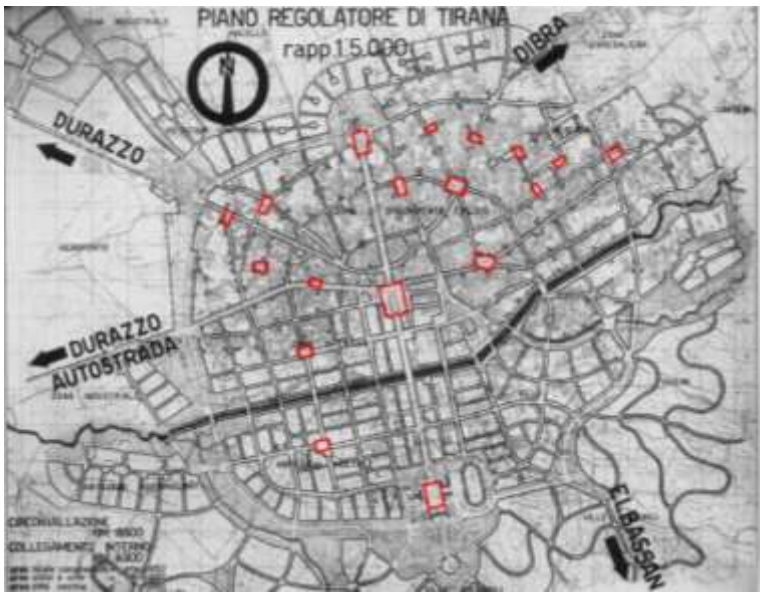


Fig. 17. Squares scheme, in 1939 (Archive of Bosio)

In 1938 began the studies on network road and urban and above all, also began the studies for the limited plan in the area between the street "Vittorio Emanuele III" (today "Zogu I") and the old road to Shkodra. A specific plan with some organic unity was prepared for the area called "Tirana e Re", which were included the Lana River to the south and the hill where today is the artificial lake and on the east from Elbasani road.

In appearance all buildings were irregular and varied as the derivative of rapid urban development.

Constructive and architectural features of buildings in the center were mainly oriental, with almost most of the buildings with only one floor and build in rammed earth (qerpic) and crashed with few modern villas built up to that moment. According to Bosio private gardens gave the positive and picturesque notes, often very large, which presented through the narrow streets.

Tirana compared with other Albanians centers had no history of environmental characteristics of great importance to protect and preserve. Mosque of Ethem Bey, Old Mosque and the Bazaar was a valuable architectures that had such an interest to be considered important in determining the new plan.

In this plan Bosio interferes with caution, but with determination where compelling reasons of public interest, traffic, construction, hygiene and aesthetic element asked for. He was alert to the majority of existing buildings while maintaining a good portion of them, considering them almost entirely, without

losing the idea that those objects which can then be presented discrete interest and texture to their decoration , can looked miserable when one day will be displayed in front of buildings that arise in the future, with great length and height to four, built according to the most modern and hygienic time.

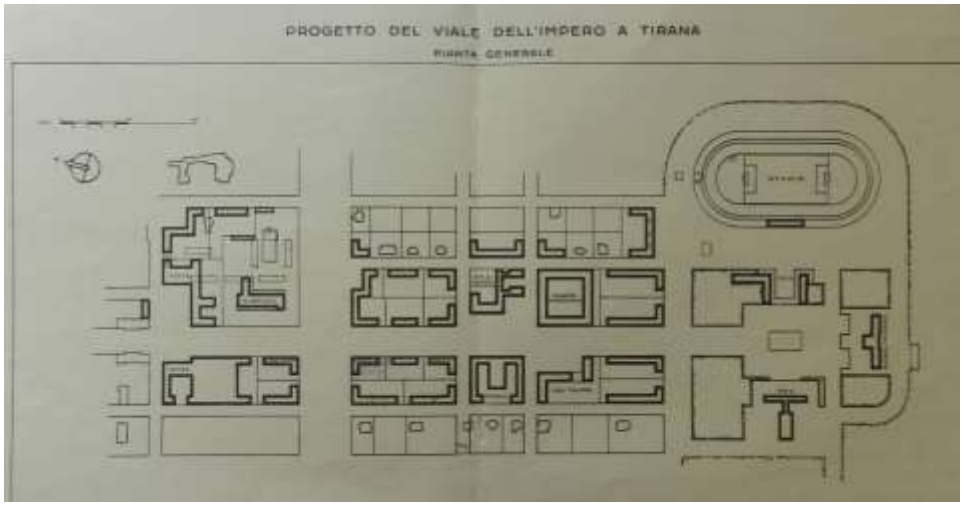


Fig. 18. Boulevard project, in 1939 (Archive of Bosio)

Many roads may seem sufficient for pedestrian and vehicle traffic at the time, was expanded and in some cases shifted when clearly seen that would have been totally inadequate for the heavy traffic that will created by the expansion of the city in the future, as well as introducing new ways of public and private transport. Regulatory plan foresaw the distribution of transit traffic outside the urban core, collecting from the directions of Durres, Shkodra, Elbasan and Dibra at the entrance of the city. With a total length of 8.111 kilometers, ring-shaped trajectory, consisting of two types of road structures: the tract stretching north-west and north-east, with a total width of 33 meters, the two roads form a central garden and were joined by wide sidewalks; the tract in south and south-west, with a total width of 42 meters, with a single central road accompanied by extensive gardens and a road for side service. In the period of communism, the following plans made from Italian like a detailed studies on the vision of the city, were not considered. Plans from 1957 to 1989 will be rerun with small parts of the Bosio plan.

Fig. 19. The aerial view of Skanderbeg Square. (A.Vokshi)

Fig. 20. Aerial view of Mother Teresa Square (A.Vokshi)

3 Conclusions

The intervention that Bosio provides for the existing old part of Tirana derive from some evidence that the architect himself will announce in it relation of the Regulatory Plan. This space considered by him as the "garden city", which had to canned in an integral way, first, as mentioned above, is the aesthetic factor and architectural forms with strong local scenic environment. Acording to him these forms should be canned as well as a memory of the old city of Tirana and the old Ottoman texture should be integrated with the new primary road system and the logic of mini-centers small quarters with the corresponding squares evenly distributed in the territory. Bosio second argument in favor of their conservation is the relationship that citizens of Tirana had with their houses and a special way of life, seeing the whole problem also by the social view. It would be difficult according to him for the citizens to adapt quickly to the new conditions. Another essential element considered by the architect is the economic factor needed to transform large parts of the city already consolidated. Parts of the city look like that formally are consolidated; in reality they continue to follow their oriental and chaotic character, a part of to problems like marginalization and isolation of residents inside, and urban degradation of buildings. Even today seems that spatial quality worsened with the individual interventions around the objects which are performed at different times. Two perspectives can be addressed in project operations; the money is intended that part of public interventions can play a key role in the activation of the regeneration processes on based sectors of the contemporary city. This will normally be made in relations with existing urban value, infrastructure networks and "urban porosity" necessary for recreational spaces.

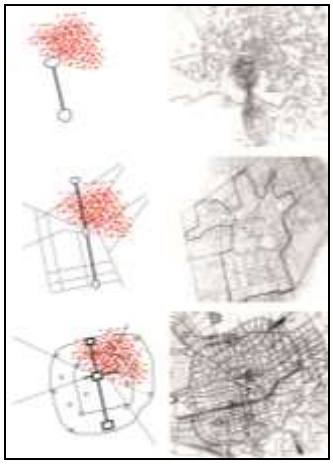


Fig 21 – schemes of three major plans in relation with the existing city of Tirana (A.Vokshi)

References

1 Antonello BIAGGINI, Storia dell,Albania contemporanea, Milano, pp 63-81
2 F. Jocomoni Di San Savino, La politica dell'Italia in Albania nelle testimonianze del Luogotenente del Re, Cappelli Editore, p 25-37
3 M.A. Giusti, Albania, Architettura e Città, Maschietto Editore, Firenze, p 20
4 M.Giacomelli, A. Vokshi (a cura di), Architetti e ingegneri italiani in Albania, Edifir, Firenze, 2012
5 G. Gresleri, Albania: una dimensione sospesa tra opere pubbliche e rifondazione della città, in Architettura italiana d'oltremare Atalante Iconografico- a c. di G. Gresleri, P.G.
6 Massaretti, Bologna, Bolonia University Press, 2008, pp. 433-468.
7 M.A. Giusti, Albania, Architettura e Città, Maschietto Editore, Firenze, p 60

Improving Energy Efficiency in Buildings in Republic of Kosovo

Ferhat Bejtullahu
University for Business and Technology Republic of Kosovo
E-mail: ferhatbej@gmail.com

Abstract. The building sector is responsible for a substantial part of energy use in Europe and Kosovo. Buildings in Kosovo account for 40 % of the total energy demand, but the building sector pays little or no attention to energy efficiency. The most relevant laws (Energy Efficiency law is in force since July 2011), administrative instructions, regulations and strategic documents in field of energy efficiency are almost completed but implementation and enforcement is still very weak.
Despite all this laws, new regulations and other measures that regulates technical requirements for thermal energy saving and thermal protection, application and management faces difficulties especially in planning and implementing energy efficiency in new buildings according to "ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE 2010/31/EU" The paper will identify barriers and recommend appropriate methods and tools for improving energy efficiency in buildings through implementation of initiatives as efficiency labeling or certification that will raise buildings energy efficiency (EE) beyond minimum requirement and social, spatial and environmental measures for improving EE in buildings. The study concludes that most important factor for EE in buildings is reduction in energy demand in existing and new designed buildings. Best solution to achieve thesis creating a Building Model for Energy Evaluation

Key Words Kosovo, energy efficiency in buildings, improving

1 Introduction

Low awareness about economic and environmental EE measures is perhaps the most important form of investment inefficiency that could cause an absence of EE in buildings. There are two models of the lack of awareness concerning this issue. In the first model, consumers and firms may not have sufficient information about tools for improving EE buildings. Whilst in the second model, consumers and firms may be unaware of potential instruments and investments funds offered for improving EE. For example, homeowners may not know how poorly insulated their home is and may not be aware of opportunities of energy conservation. Similarly, designers may not know about a new type of software's that evaluates energy performance of buildings and calculates exact investment recovery cost.
An alternative model resembles Akerlof's (1970) [1] "lemons" model. Buyers know that different products, such as apartments, commercial buildings, or factory equipment, have different levels of energy efficiency, but these differences are costly to observe. Thus, they are not willing to pay more for goods that in fact insure more energy efficiency. For example, a renter evaluating a set of different apartments may be aware that there is a distribution of wall insulation quality and thus of resulting heating costs, but the renter will not be willing to pay more for a well-insulated heating costs, but the renter will not be willing to pay more for a well-insulated apartment without taking the time to inspect the insulation.
Regulations are perhaps the most effective policy instrument, as they mandate specific behaviors. However, as Scott (2001)[4] stresses, making the rules are not enough: monitoring adherence, and the use of sanctions if they are not followed, is also important element. Building regulations are the most important regulations that affect energy performance. They have primarily affected energy demand, as there are no requirements as to choose of heating system or energy carrier.

The appliances that Davis (2010) [2] considers make up only one-quarter of residential energy use. Heating and cooling represent close to one-half, meaning that insulation is perhaps a more important investment that could be subject to the landlord–tenant agency problem.

1.1 Research question

The objective of this research is to identify the actual factors that have important impact in process of improving energy efficiency of buildings in Kosovo. The study focuses on the period of last decade, as this allows us to compare achievements s of contemporary events in region that are in process. By focusing on a period near in time, the study also allows the exploration of driving forces and barriers that may still be important. Attention and concern for climate change has increased in recent years, and is one of the factors that will be explored in this report as a possible driving force that makes pressure in all relevant factors in Kosovo for improving energy efficiency of buildings.
How the adequate methods and tools impact effectiveness of measures taken from all relevant factors in process of improving energy efficiency of buildings in Kosovo?

1.2 Methodology

Yin (2003) [5] stresses the importance of the research questions posed in deciding what methodology to use. When the research questions are how and why and the focus is on contemporary events, case studies may be the preferred methodology. The research questions of this paper require a methodology that can allow going in depth and studying energy use in buildings in relation to several factors. The objective is to analyze how the energy efficiency of buildings has developed after year 1999 and why it has developed in this way. A comparing methodology is used to identify development of energy performance of buildings and how changes have developed in Kosovo compared with states in region. However, it is not the best methodology when the aim is to explore the factors that have promoted or prevented improved energy efficiency of Kosovo buildings. This requires a methodology that allows us to study and understand complex phenomena. One central element in the case-study research design is data triangulation. Analyzing and comparing multiple sources of evidence, documents, interviews and observations and a mix of quantitative and qualitative data, will increase the validity and reliability of this research. According to Yin (2003) [5] a case study is especially appropriate when studying contextual conditions '...where the boundaries between phenomenon and context are not clearly evident...' (Yin 2003:13). This is also the case in the field of energy use in buildings in Kosovo. It is not possible to understand and explain the development of energy performance here without including this context as an important factor. Therefore, the case-study approach would appear to be an appropriate methodology for this study. However, the objective of this report is not to uncover causal relationship, but explore driving forces and barriers.

1.3 Background and context

The current level of energy efficiency in Kosovo is low, and it is entirely realistic to aim an increase of 20% in EE by 2020. The highest potential for EE improvement is in heating and electricity generation, where the current use efficiency is much under that determined by EU relevant directive and current technological standards in the EU on furnaces and small heating equipment.
Heating Strategy of the Republic of Kosovo 2011-2018
As signatory parties of the Energy Community Treaty (ECT), Kosovo is member of the En CT Task Force on Energy Efficiency (TF EE). Under guidance of TF EE, Ministry of Economic Development (MED) has developed the First National Energy Efficiency Action Plan (NEEAP) 2010-2018
NEEAP outlines the national targets on energy savings for the period 2010-2018. Earlier, in2007, Ministry of Energy and Mining (MEM) had developed the Kosovo three-year program for Energy Efficiency and Renewable Energy Sources. A number of projects of this program are under implementation.

As in Table 1 presented the residential sector (buildings) with EE measures will be reduced in % through years and by the end of year 2018 will participate with 3.6% less.
The objective of Kosovo is to achieve the set target of 9% energy saving by end of 2018.
In its First National Energy Efficiency Action Plan (NEEAP) Kosovo 2010-2012 has adopted an intermediate target on energy saving.
NEEAP 2010-2018 sets EE long term targets for the period 2010-2018 and intermediate targets for 2010-2012. In determining the medium term targets, NEEAP has considered:
Lack of a Functional Energy Efficiency Agency and non-existence of Regional Energy Offices
Lack of a Fund for Energy Efficiency
Lack of a labeling system for Energy in Buildings
Lack of legal procedure mandating procurement of EE equipment for public entities
Lack of energy service companies
Delayed introduction of Labeling of Household Electric Appliances
Lack of complete data from accurate survey in the public sector regarding EE
Lack of decision to mandate public sector entities to undertake EE measures
Table 1 Participation of each Energy Sector with EE measures in % through years
Source: Kosovo Energy Efficiency Plan 2010-2018, as approved by the Minister of Economic Development on 30 September 2011.
The Law on Energy Efficiency, No. 04/L-016, 22.07.2011, provides for the creation of the Energy Efficiency Agency. Establishment of the EE Agency and EE Fund will significantly contribute to the implementation of the NEEAP. This national target is allocated among sectors, including household, service, industry, transport, and agriculture. Household anticipated energy savings amount to 40% of the overall target to be saved during 2010-2012.
Kosovo's electricity tariffs are among the lowest in the region. Despite the low prices, the main issue in the sector is non-payment of energy bills. Similar to many other countries, district heating billing is based on the surface area of consumer dwellings, not metered consumption. In Prishtina, district heating serves about 20% of the population.
Kosovo haze partially adopted methodology for calculating energy performance of buildings.
Figure1. Progress in implementation of EPBD *(source: 16th Energy Efficiency Task Force Meeting - 10/11/2012 Vienna)*
Source: Kosovo Energy Efficiency Agency - UPDATE ON KOSOVO's NEEAP
As reported at 16th Energy Efficiency Task Force Meeting - 10/11/2012 in Vienna (Figure 1), Kosovo has partially adopted methodology for calculating energy performance of buildings but founds and building code are missing in process. Without founds and building code there is no continuity in procedure of adopting the standards necessary for the transposition of EU directive.
According to a World Bank study, the application of insulation materials and double glassed windows would bring a reduction of energy consumption for heating up to an estimated 35% in individual households. Kosovo wide, this would bring potential savings of heating to 500-600 GWh/year, around 12 - 14% of the current demand for heating.
With support from the donor community, including EC, GIZ, etc., GoK has implemented a number of energy efficiency measures in the public sector buildings and facilities like schools, hospitals and government building. Efficient lighting of buildings and streets and thermal insulation are among the key interventions. On the other hand, campaigns to raise consumer awareness, seeking to effectuate behavioral change in the residential sector, have been an important component of Kosovo energy efficiency plans.

1.4 Barriers to energy efficiency in buildings

Since EE is a cross-cutting issue covering several policy areas, competencies and technologies, barriers exist in all principal elements of the institutional framework:

- Legal and regulatory frameworks are inadequate. A clear legal and regulatory framework is a prerequisite for EE investments. Basic EE legal framework exists but more progress needs to be made on the effective implementation of these frameworks.

- Training and know-how are scarce. Despite good education systems, professional skills, knowledge, and expertise for technology distribution are scarce. Few architects, engineers, plumbers, and installers have the technical skills or knowledge to exploit energy savings potential. EE training is not included in most course curriculums. Also, without adequate systems and skills to reliably measure and verify energy savings EE measures will not be implemented on a enough large scale.
- Modern building codes and EE standards are not introduced and enforced. Such building codes must be introduced based on the European Building Directive, while appliance and other equipment standards should seek to meet EU standards as well. There is no sustained public information campaigns and national level control mechanism.
- One of the biggest barriers is the lack of EE funds. Many EE measures require investments with a payback period that is longer than many consumers find acceptable. EE funds could provide subsidies for implementing EE investments, shortening the payback periods, and help provide access to below-market rate financing where necessary.
- Targeted information campaigns should be launched to raise awareness of the benefits of EE among investors and consumers. Consumers at all levels lack information to support EE behavior changes. For example, consumers often lack meters or heat cost allocators for district heating and billing information (all forms of energy) that would make them aware of their patterns of energy consumption. As a result, they have no idea how their consumption compares to that of their peers, how their consumption could be reduced, or what the benefits of reduced consumption are.
- Energy prices are low and cross-subsidized, while non-payment is a significant issue. Energy tariffs are low and cross-subsidized; this does not encourage energy efficiency investments, especially since the upfront cost of these investments is often quite high, because it does not help save consumers the full cost of energy avoided. In cases where consumers steal or otherwise don't pay for their energy consumption, strong incentives to undertake energy efficiency measures are lacking, except as a by-product of measures to enhance comfort in the buildings.
- Municipalities do not have appropriate structure to deal with EE measures in local level. Kosovo is delaying in establishing energy offices at the municipal level.

2 Suggestions

Complete legal and regulatory framework. Kosovo needs to continue completing the legal and regulatory framework in the area of energy efficiency as it is required under the Treaty establishing Energy Community (EnC). NEEAP provides details in this regard.
Develop institution to promote and monitor energy efficiency. Kosovo needs to functionalize the EE Agency as provided for in the Law on Energy Efficiency, No. 04/L-016, 22.07.2011. Clear role and responsibilities of this Agency are described also in the Ministry of Economic Development (MED) Regulation No.08/2011 "On Internal Organization of the Kosovo Agency for Energy Efficiency". Although the Law on Energy Efficiency does not provide for the creation of an Energy Efficiency Fund (EE Fund), the Kosovo Government needs to consult the donor community on this matter and decide appropriately. Annex 8 provides information on the legal and institutional arrangements in the area of energy efficiency in several EU and Balkan countries. On the other hand, it is appropriate to establish energy offices at the municipal level. All municipalities in Kosovo have departments dedicated to local development issues, including local infrastructures. Mandated responsibility for dealing with energy issues is missing in all of these departments. Law on Energy provides for the possibility of establishing of energy offices at the communal level. MED is prepared to provide training and other institutional development support so that these offices get up and running within a reasonable period of time. Several donors, such as European Commission Liaison Office (ECLO) and GIZ of Germany, have funded in the past energy training activities to communal officials. Annex 7 provides further reasons on the need to establish communal energy offices.

2.1 Institutional framework

Comprehensive and continued sustainable development and retention of qualified staff at all levels of government is a major challenge for the Kosovo energy sector institutions.
Further support to comprehensive development of the energy auditing institutions and infrastructure as well as to establishment of ESCO businesses should be part of the comprehensive institutional development in the area of energy efficiency in Kosovo. Respective actions anticipated in the NEEAP need to be undertaken.
Develop comprehensive energy data systems. Setting up energy data gathering and reporting systems consistent with those of EUROSTAT is an EU accession requirement. EU, through EnC, has engaged its relevant agencies in providing substantial technical support on setting up adequate energy statistic systems in the Western Balkans countries, so that useful energy efficiency indicators can be developed and monitoring of progress can be performed.
Incentives can help to overcome barriers to entering the market, for example, through special programs offering financial or technical support, or even temporary exemptions from standard administrative procedures. Incentives should be both of the demand-pull as well as the supply-push variety. Examples of important demand-pull incentives are introducing codes and standards, creating end-user awareness, and making concessionary financing available. Supply side measures involve actions such as providing tax incentives and financing for enterprises, easing import restrictions and duties on importing energy efficient equipment, training of auditors, architects and contractors, etc.
Remove barriers. As identified by the World Bank, major barriers include: (i) inadequate legal and regulatory frameworks, (ii) lack of incentives of all kinds, (iii) training and know-how are scarce, (iv) high investment costs for energy efficiency technology, (v) modern building codes and EE standards for appliances and equipment should be introduced and enforced, (vi) energy efficiency funds should be created, (vii) targeted information campaigns should be launched, and (viii) energy prices are low and cross-subsidized, while non-payment is a significant issue. A World Bank summary of barriers to enhancing energy efficiency in Western Balkans is presented in Annex 8.
Continue leading by example and enhancing public awareness on energy efficiency. Even without immediate improvements to data systems, tariff structures, and tariff levels, much can and should be done to increase EE. First, the public sector should continue leading the way by introducing EE demand-side measures in all its buildings, facilities, and rolling stock. Campaigns to raise consumer awareness and seek to effectuate behavioral change in the residential sectors (housing and transport) should continue. The efforts must be accompanied by firm commitment and actions to eliminate energy price distortions and gradually raise energy prices to cost-recovery levels to enable rational consumer choices among energy efficiency investment options. Explore alternative models to funding of EE measures in public sector. Large energy-saving potential exists in the public sector, necessitating a substantial amount of public sector borrowing, if targets are to be met. The majority of funds currently available are targeted at private sector borrowing with a major emphasis on household and SMEs. This implies that funds and other mechanisms must be increasingly targeted at municipal services and public buildings. The borrowing capacity of the public sector at communal and national level is very limited and hence efforts will be required to find alternative models that allow funding to be made available to the public sector. Consider a state-level Public Building Rehabilitation Program. Many administration, health, and educational buildings are under state control and could be used to showcase EE improvements and provide the basis for a local service industry that performs energy audits and implements projects, perhaps supported by grants and IFI loans. This measure/program could be coupled very well along with development of public procurement policies that facilitate energy services. The Government, with donor assistance, should consider modifying its national public procurement policy to enable energy services contracting.

2.2 Use of technology for evaluating EE of buildings

The most important design decisions influencing a building's energy efficiency are made by the architect in the early phases of design. Introducing applications in evaluation of buildings energy efficiency is easiest way to set new standards in sustainable design. An application allows architects to perform reliable energy evaluation of their virtual buildings, relying on building geometric analysis and

accurate hour-by-hour weather data of the project location. This process requires relatively few physical material properties that can be provided with simple and straightforward user input. A reliable, certified calculation engine performs dynamic building energy evaluation and provides information on physical performance of the project's applied constructions, yearly energy consumption, carbon footprint and monthly energy balance. This simple yet effective workflow makes energy evaluation just as easy to perform as generating a section or a 3D view from the virtual building model. To enable this real-time model energy analysis, the volume of input data has been reduced to a minimum: as a result, Software's is not designed to produce accredited energy analysis output suitable for official documentation according to local codes and code ratings. If applied in a professional manner, however, Software's are capable of producing results matching the accuracy of high-end energy calculation software. These techniques enable users to get the most out of the calculations.

Using much software, architects can easily analyze their design, at an early stage, for energy efficiency. Providing invaluable feedback on the building's energy performance means the architect can make better decisions on how to conform to regulations and satisfy the interests of the client and the operator of the building. Many design software's have energy evaluation tool for architects application – which aims to provide information about a building's energy performance at the early design phases giving fast feedback for architects on the energy efficiency and sustainability of certain design alternatives. Architects can get results about the energy consumption, carbon footprint and the monthly energy balance easy. Data input: specifying physical properties of the already modeled building envelope using the default values set for different type of building parts or entering custom data, setting up location, weather data, building type and HVAC systems for the project. Evaluation: software passes the data to calculation engine, which performs a dynamic analysis.

Results: report sheets shows the results of the evaluation of the building shell, the energy consumption and cost values, the carbon footprint and the monthly energy balance. Applications perform a screening Life Cycle Analysis (LCA) in the early stages of product design. This allows a Product Engineer or Designer to quickly understand the environmental impact of the product they are designing. As an assembly or part is being designed, the designer can check the environmental impact of different design variations, decisions and scenarios. The design variations could include choice of material, manufacturing process or even the impact of buying parts and transporting it from different sources/locations.

Applications use well known impact assessment methods, indicators and life cycle inventory data that are recognized all round the world. Reduction in energy demand may be achieved by both changes at system level and component level. Components like energy efficient windows and insulation will reduce the energy demand to some degree, while system changes by applying passive house principles will give significantly better improvement. However, changes at system level are perceived as more fundamental and are more difficult to implement according to Unruh (2002) [3]This is in line with the empirical findings as there has not been a conversion from electrical heating to thermal energy and only a few passive houses have been constructed from 2000-2006.

For the fulfillment of institutional and legislation framework for Energy Efficiency, Kosovo can use regional states experiences as adjusted model. Success implementation of Energy Efficiency produce the necessity for application of reforms on local authorities in energy policy, effective policy instrument, local capacity building municipal energy planning.

Realization and demonstration of projects in municipalities, is necessary to advance implementation of Energy Efficiency issues. Demonstration for mobilizing political and networking on the international level- Southeast European Cooperation is one of the important factors for successful implementation of Energy Efficiency. Development and application of different programs is necessary for successful implementation of Energy Efficiency.

2.3 Values and Preferences among Building Companies and Consumers

The previous section discussed how evaluation and motivations for energy policy have changed over the years among designers. However, it is also important to explore preferences and perceptions among the building companies and the consumers. Building companies have traditionally shown very little concern about the energy efficiency of buildings. It is mostly the big building companies that have started to focus on energy and climate, while the smaller ones are still mainly occupied with price

considerations. According to several interviewees, the demand for new buildings is high and this leads to less attention to energy performance from the building companies –the buildings will be sold anyway. Some technologies have gained less support than others among building companies. 'Here is skepticism towards passive houses, totally. They don't believe in it, but think that people get sick.'(Interview) However, several elements in passive houses, like thicker insulation and energy efficient windows, are perceived as positive. There are no housing companies that are going to renovate everything to passive house standard; they obviously have energy as a very important focus but no pressure to start. It is their duty and obligation to contribute in this way. Others say that if it gets cheaper they can do it, but take no initiative on their own. (Interview) The time perspective is important for carrying out measures that will improve the energy performance of buildings, as investments may have a long payback time. This is a problem, since building companies operate with a very short time-perspective (interview). However, the building companies want a common standard and method for calculating the lifetime costs of a building. Today everybody does their own calculations and it is difficult to compare. The time-perspective is also important for tenants and the possibilities for implementing measures to improve energy performance in rented dwellings. Many of Kosovo's residential buildings are rented dwellings (interview). A long time-perspective is necessary for undertaking measures to improve energy performance, but it is a challenge to cover the costs without raising the rent too much. And, as one interviewee pointed out, how shall the tenants take long-term responsibility for improving the energy performance of buildings while they have three months' notice?
The demanders, like the municipalities and private companies, have to require buildings with better energy performance (interview). This is not the case today. Especially for non-residential buildings, energy is not considered important at all. Energy has been too cheap, and other issues have been seen as more important, according to several of the interviewees. An important challenge is thus to increase the demand for buildings with good energy performance. Today this is not an important issue when buying and renting buildings, it was stressed.

2.4 Building regulations

Technical regulation No.03/2009 for Thermal Energy Saving and Thermal Protection may be an effective policy instrument for reducing energy demand. There are several steps necessary to implement these regulations. Decision to start developing new minimum energy performance requirements, and necessary resources and funds for its development allocated or secured. Setting of minimum energy performance requirements are incorporated with current Technical regulation on thermal energy savings and thermal protection in building No.03/2009. These regulations are main instrument until Building code comes in place:

- Selection and description of approach to be used for setting of minimum energy performance parameters.
- Derivation of cost - optimal level of energy performance.
- Updating/development of the regulation describing the minimum energy performance requirements.
- Information and training of key stakeholders in the construction industry.
- Updating and development of routines and specifications for documentation and checking of the energy performance requirements.
- Training of national and regional "building inspectorates"

2.5 Taxes and support arrangements

Economic measures have traditionally been the most important policy instrument in developed countries that is necessary to implement in Kosovo. While building regulations are mainly for new buildings, taxes and support arrangements are directed especially towards the existing building stock. Economic measures that are important in connection with the energy performance of buildings include support for specific technologies, and taxes on energy and CO^2 emissions. Such taxes affect the prices of energy

carriers and aim at providing the consumer with incentives for reducing the use of fossil fuels and electrical heating.
There have been several support arrangements for improving the energy performance of buildings during the period. Most of these have been for measures to be employed in existing buildings, except for the support to energy-efficient windows and thermo insulations in new buildings. Other important arrangements include support for installing solar collectors. Some of these arrangements have existed for some time, while others were introduced toward the end of the period under study.
The cultural framework has developed and changed, shaping norms and values. The oil crises, nuclear programs and climate warming have provided important motivations and objectives for policies over the years. These issues are also relevant for understanding the values and preferences among building companies and consumers, and how the various technologies are perceived.
The policy goals have shown ambitious intentions for improving the energy performance of buildings, but no specific targets for conversion from electrical heating to thermal energy. Building regulations are very important instrument for regulating the energy demand of buildings. Despite the widespread belief that building regulations apply to new buildings only, the empirical mapping has revealed that there is a law stating that there also exist requirements for alterations in buildings. Taxes have been an important instrument in modifying the prices of energy carriers, giving incentives to the use of renewable energy sources. We have also noted that Kosovo has a range of support arrangements available for improving the energy performance of buildings. It is widely believed that building regulations apply only to new buildings (interviews). However, there are also requirements for existing buildings, but, according to one interviewee, the law is not followed when doing renovations. The reason is twofold: the law is unclear, and the municipalities do not follow it up. The requirements for energy efficiency can be imposed only on measures that lead to changes in the building, but the current regulations do not specify or define what is considered as a 'change' in a buildings. The possibility for imposing requirements on the existing building stock is available, but it is not practiced. Measures to reduce energy demand in the existing building stock are of great importance; as such structures will constitute the majority Kosovo's building stock well into the future. The need for more accurate definitions is also recognized in the government that is currently working on new building code. Building regulations may have varying formulations for measuring the energy demand of a building.

3 Conclusions

Energy demand models are analytic tools in which mathematical equations are used to estimate how demand might respond to various materials and policy choices. Such models can address a wide range of policy questions and reveal unanticipated effects of policies on other parts of the energy or economic system. When correctly formulated, models can provide necessary checks of consistency with physical and economic constraints that might otherwise be overlooked in policy analysis. But, along with their well-known strengths, social-system models in general have many limitations, as do most traditional energy policy models.
Energy efficiency requirements (Creating a Building Model for Energy Evaluation) in building Code
A regulation for energy efficiency in buildings in developing countries, and especially in rapidly developing countries such as Kosovo, seeks to improve comfort and to reduce the dramatic increase in energy consumption. Insufficient efficiency awareness among consumers, designers and banks
The role of politics, economics and social change upon energy efficiency issues is essential and must be integrated into any sustainable approach to a solution. Examining issues such as energy efficiency results in: most decision makers that take decisions, which can influence the energy efficiency of new buildings such as designers, financers, builders, installers and buyers know very little about energy efficiency of buildings. Lack of knowledge in just one of these chains can block the process of increasing energy efficiency in new buildings in Kosovo.
The need for Energy efficiency of buildings in Kosovo
It is important for Kosovo to start the process of developing its adaptation capacity to implement best approaches in energy efficiency of buildings. This process play a key role in enabling Kosovo to seize this opportunity, and to build a future housing stock which both meets needs and does not harm the

environment. Achieving, assessing the sustainability rating system is another specific objective of this project.
Challenges that will be assessed include: building sector and responsibility for contribution to environmental problems, importance of maintenance to keep buildings from falling down, approach to environmental sustainability, indicator for environmental sustainability, goal and scope of the assessment, definition of the subject of assessment, presentation of the results.

References:

1 Akerlof, George A. 1970 "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism." *Quarterly Journal of Economics* 84(3): 488–500.
2 Davis, Lucas W. 2010. "Evaluating the Slow Adoption of Energy Efficient Investments: Are Renters Less Likely to Have Energy Efficient Appliances?" Energy Institute at Haas Working Paper 205, June
3 Unruh, Gregory C. 2002. Escaping carbon lock-in. Energy Policy 30 (4):317–325
4 Scott, Richard W. 2001. *Institutions and organizations* Thousand Oaks, CA: Sage
5 Yin, Robert K. 2003.Case *study research*. Thousand Oaks, CA: Sage
6 Internet resource
7 Kosovo Energy Efficiency Agency, http://www.wbif.eu/uploads/attached_document/document/996333191/NEEAP_update_KEEA.PDF
8 [Accessed 7.09.2013]

Flexible Use And Aplication Of Energy Efficiency Measures In Existing Multi-Residential Buildings

SadijeKelmendi [1], Vlora Aliu [2]
[1, 2] University for Business and Technology
Department of Architecture and Spatial Planning, Prishtina. Kosovo
e-mail: sadije.kelmendi@ubt-uni.net
e-mail: vlora.aliu@ubt-uni.net

Abstract Recent trends in energy efficiency around the world and implementation of flexible housing are taking a big burst of development. Nanotechnology and thermal insulation materials along with photovoltaic panels will be explored in residential facilities. Needs for higher comfort and the socio-economic situation ask for research, use of eco systems and innovative solutions. The case study will be the collective residential building near the Swiss Diamond Hotel in Mother Teresa Square in Prishtina. Some of the proposed interventions will be manoeuvrings with flexible housing units, intervention on the facade with the nanotechnology insulating material as well as covering one part of the facility with photovoltaic panels. This research is based on analysing the location, facility use, orientation, surrounding site. The proposed concepts are in complete harmony with the reasonabilityof the investment. Applying these measures, besides economic, ecological and comfort benefits will also affect the adaptation of the building with the surrounding buildings.
Keywords: energy efficiency, nanotechnology, photovoltaic panels, flexible housing.

1 Introduction

The road toward the sustainability, as new and essential paradigm of our society, should drive us to a search of the reduction of the energy consumption, as well as the increase of the energy efficiency in our buildings, in combination with the substitution of fossil energy for renewable energy.

Global challenges these days are:

- Half the world's people now live in towns and cities. In little more than a generation, two-thirds of the global population will be urban.
- Rapid urbanization, (XIX cent= 2%, XX cent=10%, XXI cent=50% 2050=70%)

While the same trend continues in Kosovo, too. 39.1 % of Kosovo inhabitants live in urban areas, whereas 61% live in rural ones.

As the proportion of humanity living in the urban environment grows, so too does the need to strengthen the urban focus of our efforts to reduce global poverty and promote sustainable development.

One of the main factors how one can promote sustainable development is to develop new building designs in a sustainable manner. The reasons are listed below:

- Buildings consume more energy than any other sector
- Buildings are the largest contributor to climate change
- The health of the global economy is tied to the building sector

The majority of the building were constructed about 30 years ago and apart from the ageing of the façade, roof and windows, the building standards and material quality regarding energy saving at that time were significantly lower compared to the one today.

1.1 Objective

The aim of this research is to apply and test new and innovative technologies to promote integrated environmental protection in harmony with architectural design.

Main objectives of this study are:

- To demonstrate that flexible, energy-efficient, sustainable residential buildings can meet fully the architectural, functional, visual and thermal comfort, control and safety requirements.
- To provide better conditions in terms of thermal comfort, air quality, day lighting and acoustics. Use healthy, environmentally friendly and renewable materials.

1.2 Existing situation of the facility

The facility is located near Mother Teresa Square and connecting secondary road, has a very good orientation, mainly east, south and west.

Fig.1. Orthophoto of building location and acces to it

1.3 Architectural characteristics of the building

The building is 5 floors high, while the groundfloor for the moment is used for shops and offices and four other floors contain housing. It is visible that all facades are treated after the war, mainly with new windows in residential part while there is no diversity of facade and fits very well with surrounding residential buildings.

Fig.2. View of the existing building

2 Improvements

The reason for intervention - changing the apartments in the flexible ones has derived as a reason to economize and to have a more rational utilization by different ages visitors.

The location of the building with residential units is the key reason for flexible apartments maneuverability.

2.1 Architectural improvements

Due to the constraints such as location, surrounding and road which also seves as access to the prestigious hotel in the city of Pristina, there is no possibility to increase or utilize neighboring parcels and therefore the contours and dimensions of the building are kept.

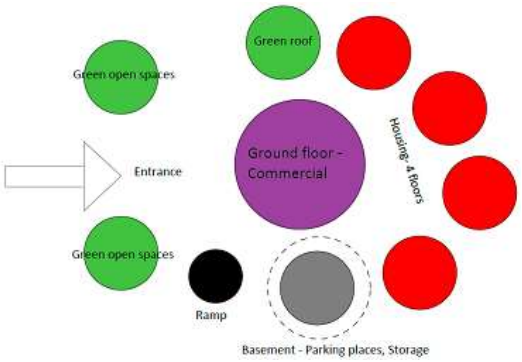


Fig.3. Concept of functions connecting in the building

However, most contents inside the building are changed, starting from building walls, residential rooms, also the floor which is used for shops and offices, as well as basement which is proposed to be used for parking lots and apartments' storages where is designed a ramp for the access to basement which has not previously existed. Due to the vicinity of Swiss Diamond Hotel and ts high cost, it is proposed to convert these flats into more flexible, where the visitor will be able to stay at a lower cost and at the same time to be located at the center of the city of Pristina.

Fig.4. Basement reorganization of functions

In this floor is presented the basement which is completely reorganized in the new feature, in which are proposed storages for each apartment, as well as water containers and heating boilers while not overlooking the parking places for the number of users as well as parking places for people with special needs.

Fig.5. Groundfloor reorganization of functions

In this drawing is presented the ground floor which is modified from the one it was existing. Due to the fact that this building has a good position in the city center, it is proposed to transform the whole groundfloor to shops and offices. What is preserved is the construction systemand sanitary nodes. The main entrance to the building was saved from the existing situation.

Fig.6. First floor proposed reorganization with flexible apartments

The concept of flexible units means that organization and size of apartment units varies in floors, ie all residential floors change as per the function, except the construction, the core, and sanitary nodes, which remain the same.

Fig.7 Second floor proposed reorganization with flexible apartments

So with the new design, the first floor has 4 apartments in total, 2nd floor has 2 apartments, 3rd floor 2 apartments and 4th floor has 4 ones.

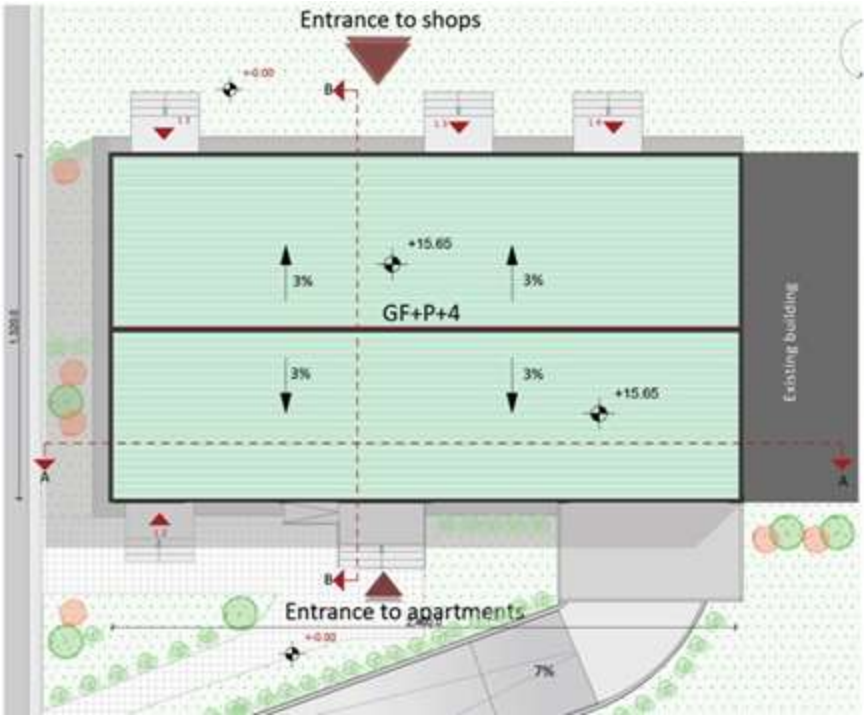


Fig.8. Proposed roof floor plan

2.2 Energy efficiency improvements

First of all, we need to determine on which category is this object going to belong. According to European Standards for overall level of energy outgoing the object can be categorized this way:

- Low Energy House, („Niedrigenergiehaus"): max. 70 kWh/m²a
- Passive House: max. 15 kWh/m²a

- Zero-Energy-House: no energy demand (calculated over the year)
- Plus-Energy-House: produces more energy than it requires (calculated over the year)

The first category (Low Energy House) is the class we are trying to achieve on this object which means that with the improvements and interventions we should reduce the energy outgoing rate in max 70 kWh/m²a

With the aim to reduce the CO2 emission of the building and to minimize the heat losses, it is proposed to close the building envelope.

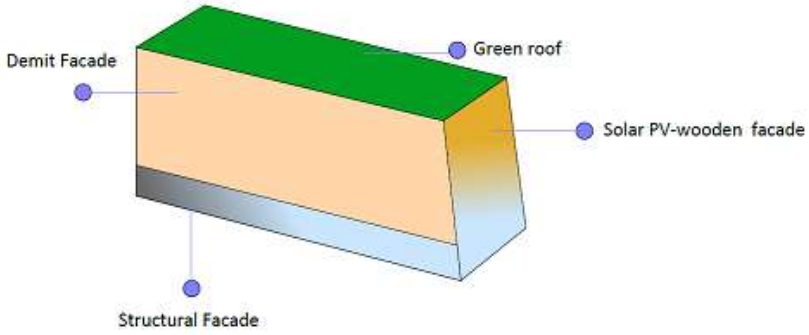


Fig.9. Materials used for building envelope

2.3 Insulation of the walls and roofs

The easiest, fastest and the most effective way to reduce costs of heating – and also of cooling in summer – is to apply a suitable thermal insulating protection. It is proposed to apply insulation and color materials which are environmentally friendly because they will also help to reduce the buildings carbon footprint.

It is proposed to insulate roof and to cover it with layers of green roof, which has many positive attributes and does not burden the weight of the roof construction. Below are some of the green roof layers that are appropriate in residential facilities.

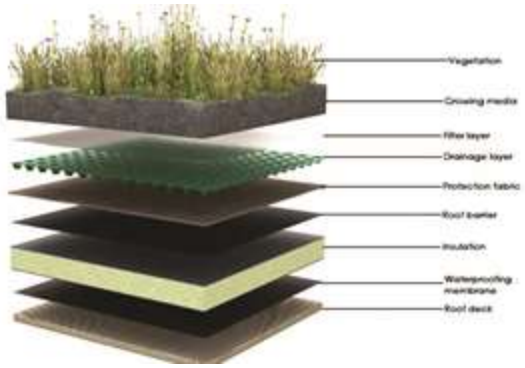


Fig.10. Green roof layers

Existing facade was changed because of the architecture and use of materials with new technologies and adaptation to surrounding objects.

Regarding the facades we have used structural facade on the ground floor where its use is commercial while a the residential floors are proposed to be treated and insulated with nano-technology material for facade.

2.4 Insulation with nano-technology material

Fig.11. Width of nano-technology insulation compared to other insulation materials

This material contains approximately 70% Hydro-NM-Oxide and 30% acrylic resin and performance additive. A liquid applied coating, it dries to a thin layer and provides exceptional insulation, corrosion protection, prevents mold, and prevents rust. Nansulate has proven to provide energy savings in a variety of industrial and residential insulation application.

2.5 PV panels in combination to wooden panels

In order to increase the efficiency of the building, it is proposed to install new photovoltaic panels on the facade.

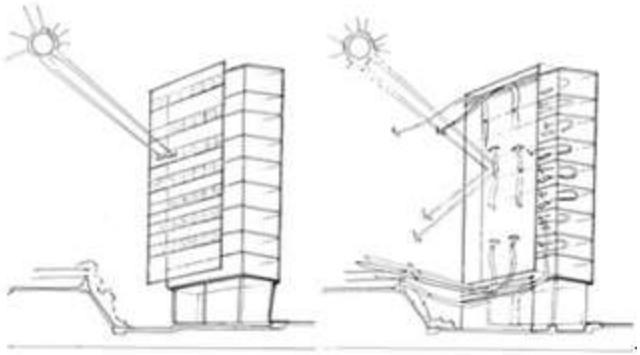


Fig.11 Structural-Double skin facade *(Source: Innovations in Façade Technology-Context in UK)*

Double-skin façade is a system in which two "skins" - two layers of glass - are separated by a significant amount of air space, that is to say, a second glass façade is placed in front of the first. These two sheets of glass act as an insulation between the outside and inside enabling the air to circulate between the cavity of the two facades skin providing good air circulation, thermal and accoustic performance.

Fig.12. Photovoltaic panels

The southern facade is proposed to be covered with solar PV panels (Building Integrated Photovoltaic or BIPV in short) is also off the residence that overlooks the main road and this facade is combined with wood because of the production of electricity from sun and for reasons of architecture. This facade is placed in vertical angle of 15 degrees. Sufficient ventilation space behind array is designed for cooling purposes. Semi-transparent glass/glass Photovoltaic modules were used in balconies. The Photovoltaic

integrated balustrade has enhanced the facade design whilst ensuring safety of the occupants and energy generation. They are also perfect in allowing good visibility whilst protecting privacy.

Fig.15 vizualization of proposed building envelope

2.6 Energy Performance Evaluation

Analysis done to inspect the existing situation is multi-disciplinary. Simulation software used to generate data for U value and energy demand is Ecodesigner, a Graphisoft ArchiCAD add-on. EcoDesigner enables architects to compare energy consumptions, monthly energy balances, operation costs, carbon emissions and other indicators to inform the design process and make the best design choices – regardless of the climate where the building is built or renovated.

Location & Function | Structures | Openings | MEP Systems & Energy | Green Energy

Openings on building shell:

Orientation	Opening type	Area [m²]	Shading dev...	Glass %	U-value[...	TST %	Infiltrati...
North	Window	16	None	80	1	53	1
East	Door	2	None	80	1	53	1
South	Window	49	None	80	1	53	1
East	Window	82	None	80	1	53	1
North	Door	7	None	80	1	53	1
South	Door	14	None	80	1	53	1
West	Window	92	Curtain	75	3	66	4

Figure 16. Data input table in Ecodesigner

From the Ecodesigner graphics below, it can be seen that the proposed interventions would result in energy consumption reduction of 169 kwh/m²a (from 231 to 62), which also influences the CO_2 reduction.

This intervention would bring this building from a conventional building standard to Low-Energy House standard.

Figure 17. Energy evaluation of building model before and after the improvements

3 Conclusions

With the recommended interventions we would achieve:

- Improvements of comfort inside the building for the work staff and visitors.
- The ability of working during the winter which would also increase the number of the visitors
- A good example to rise the public awareness about sustain and ecologic building.
- After compensating the investment value the building would continue to function with minimal operative cost
- The decrease of CO2 level in nature
- The decrease of energy consume
- The accomplishment of the 9% energy threshold determined by PKEE

References

1. Sadije KELMENDI, Sustainable Renovation of public buildings in Kosova-Case Study: Kindergarten Fatosat. *In Proceedings of the International Conference of Architecture and Spatial Planning*, Prishtina, University for Business and Technology, pp. 130-140.
2. Price Myers (2004). *Sustaining tower blocks,* http://singleaspect.org.uk/sustower/SOA-present.htm, [accessed 15.08.2013]
3. Building and construction authority (. *Green handbook-Photovoltaic (PV) systems in buildings,* http://www.bca.gov.sg/GreenMark/others/pv_guide.pdf, [accessed 10.10.2013]
4. The Public Arts Centre, West Bromwich, United Kingdom, *"Energy Efficiency and Sustainability in Retrofitted and New Museum Buildings Handbook"* University College Dublin, 2004, Ireland pp.156.

Effects of Buildings and Environment in Our Everyday Life

Arlinda Sheqiri
University for Business and Technology
Department of Architecture and Spatial Planning, Kosovo
arlinda.sheqiri@ubt-uni.net

Abstract. This article investigates effects of buildings and environment in our everyday life process. A building and its environment will determinate how people lives and how happy they will be. When it comes to a special type of buildings like Kindergarten, Schools this issue becomes even more delicate and complex. The complexity that those types of buildings bear to itself is really national responsibility and should take all attention not only by municipality, governance, politics, but even by society itself. This article will explore the effects of the buildings and environment on children's well being, and education. Schooling has direct effects on children's educational achievement, the quality of education they will get there will influence the society in the future. We have to view learning as a life-long process. The influence that environment and building has on psychological, physical,social and emotional aspects. Education that those children will gain will impact their actions and values on their lives as well as the lives of others, the environment and the world we live in.

Keywords: Building and environment effects, education, wellbeing

1 Building and environment effects

The struggle after 1999 was so visible gap of settling rules and priorities was so difficult, conflict from earliest times has been part of all this process. But even now thirteenth years after it, we see conflicts between greed individuals and suffering society. The specific blend of experiences, abilities, attitudes, and aspirations, that helps to define us, can sit sometimes uncomfortably alongside of our culture and education. My focus was on Primary School, one of several examples that you can see today in Kosovo. The first example is Primary school Naim Frasheri in Podujevo Kosovo. The role of schooling in a society is strength of present and the future of a nation. My research is divided on surrounding environment, building and current situation of offering requirement that a primary school should fulfill. This primary school accommodate 1600 pupils from first grade up to ninth and it has 78 teachers. The facilities of the school are: 17 classrooms, 3 small offices, teachers classroom and 4 sharing toilets for all pupils and teachers.After 1999 the school was damaged from the war and non of mayors that has lead this city till now, didn't take the effort to find a donation to re-built or repair this half destroyed (ghost) building. The pity situation goes far beyond what the words could explain. Starting fromoutside to inside it gives you the feeling of abondance place rather than a school.

1.1 Model and Data (primary school Naim Frasheri)

Fig.1 Exterior view of the building

Photos on figure 1.1 shows the damage of walls to the broken windows, from each part of the building there wasn't a site that wasn't destroyed. The building seems hopeless of possibilities to renovate.

The situation becomes worst during the winter where the cold can come from every damaged site of the building. And the question can be framed; is this Learning Environment?

Fig.2 Classrooms

Classrooms as exterior of the building are in a miserable situation, all the classes were almost in the same condition. As we can see on figure 1.2.

Fig.3 Surrounding environment

Many schools are still nowhere near meeting the goal of universal primary education. Thousands of children who do complete primary school do so with low levels of reading, writing and numeracy due to the poor quality of education they receive. There is much still to be done to ensure every child receives a high quality education and Primary Education. Being in a classroom with a lack of recourses might adversely impact children's mental health because children are frustrated or disheartened by their surroundings. Teachers also may be more discouraged or harsh when they can't teach properly due to the fact that they are missing basic equipments for teaching.

Besides this physical, psychological and emotional effects that those environments cause it will cost with the future of this country. Do their parents really care about their children's mental health- their emotional and behavioral well-being and education on this informal school? And we as society don't tend to focus on that as as important educational outcome nearly as much as much as we talk about and think about academic outcome. If a plant doesn't have root we can't expect for blossoms or long life living.

2 How a Primary School should be

Table. 1. Describe what a primary school should contain and some technical details.

What a primary school should have?
1. Administration (staffroom meeting room plus staff library, office for headteacher, office for deputy head, office, rooms for meeting parents, doubles as sickroom) 2. Class rooms 3. Supplementary classrooms 4. Hall 5. Rest room 6. Lobby 7. Extra-large classroom (history, geography) 8. Science room (for preparation, demonstrations & practicals for physics, chemistry and biology) 9. Classroom for crafts & materials 10. Classroom for music 11. Cloakroom 12. Classroom for art(drawing tables & materials) 13. Library 14. Sport room (for different activities) 15. Toilets 16. Playground 17. Parking for Bicycle and limited number of car park
a. Classrooms: one classroom per class, square if possible, in exceptional cases rectangular, max.32 pupils, min. of 65-70m2 (approx 2.00m2 x 2.20m2 per pupil) if possible daylight on two sides. Furniture either in rows or informally arranged. b. Front of class: chalkboard with sliding planes, projection space, socket for TV, radio, tape recorder, etc., wash-basin near entrance. Provision for hanging maps. Facilities to black out windows. Group rooms divided into separate workspaces to accommodate mixed ability classes only in special cases. c. Alternatives to individual classes and group rooms: 2-3 classrooms joined together to make teaching spaces for discussions between pupils and teachers, or lessons in larger groups; can also be divided by partitions. Draught-excluding lobbies and entrance area also connect to horizontal and vertical circulation (corridors, stairs, ramps) and can be used during breaks (0.50m2). d. Multi-use area for play, exhibitions, or cultural activities. e. Room for teaching materials centrally positioned, part of the staff area or in the multi-purpose room.
f. Cloakroom facilities can be decentralized by allocating space outside of classrooms but directly linked to them.
g. The number of toilets, urinals and wash-basins required based on total number of pupils and separated according to gender.
h. Science rooms includes rooms for teaching of theory and practice, practicals, preparation and collections. Classrooms for biology, physics and chemistry 2.50m2/place. For lectures and demonstration in practical work 4.50m2/place including space-purpose.

Education experts maintain that, during conscious learning, people best retain information that they have obtained themselves, more precisely:

a) 100/0 of what they read;
b) 200/0 of what they hear;
c) 300/0 of what they see;
d) 500/0 of what they hear and see;
e) 700/0 of what they say themselves; and
f) 900/0 of what they do themselves involving their own actions.

2.1 Examples of Primary School

How a primary school should be? Primary school (WIS) in Wroclaw is a good example to explain the requirements that a school should fulfill, photos are copyright of (WIS).

Fig.4 Exterior of the building and its surrounding environment

Warm welcome environment which can be seen even from outside, clean surrounding environment and playground for pupils. An unclean schools and environment poses serious risks to mental as well as physiological health.. There are numerous health benefits of cleaning and from children to adults, all need a clean and healthy environment to grow, work and live.
Productivity of the mind and body increases immensely when one learn and stay in clean and healthy environment. Surrounded by a mess, children and teachers feel stressed and under pressure while working in a fresh and open environment keeps them fresh. Cleaning is imperative for a healthy children and healthy body. It is important to keep surroundings clean and free of disease causing agents as it has numerous health benefits and leads to a happy life.

Fig.5 Classrooms

Besides clean and good arrangement color play an important effect in the psychological learning environment and is a major element in interior design that impacts pupils achievement, as well as teacher

effectiveness and staff efficiency. Specific colors and patterns directly or indirectly influence the emotions, health, behavior, morale, and performance of pupils, depending on the individual's culture, age, gender, and developmental level. From space, form, texture and light even color in interior can have a major role on design element than can be used to create a good learning environment.

Fig.6 Hall, Library, Sport room

3 Conclusions

Based on my research I conclude that, this primary school is informal school and doesn't fulfill any of criteria for considering a usable building. More than anything else is dangerous place for mental, physical,social and emotional aspects of pupils to stay on this informal building. Everything is inappropriate for an educative environment. However even renovation is questionable because the building is too old and damaged, it may be risky.

References

1 EVIDENCE-BASED DESIGN of Elementary and Secondary Schools, AUTHOR Peter C.Lippman, Published by John Wiley & Sons, Inc, Hoboken, New Jersey.

2 Creating Innovators: The Making of Young People Who Will Change the World AUTHOR Tony Wagner

3 Ernst and Peter Neufert Architects' Data, Edited by Bousmaha Baiche and Nicholas Walliman

Planning for the Development of Tourism in the Natural and Archeological Park of Orikum

Florian Nepravishta[1], Armand Vokshi[1]
[1] Polytechnic University of Tirana, Faculty of Architecture and Urbanism, Tirane, Albania
{florian.nepravishta, armand.vokshi}@fau.edu.al

Abstract. The questions posed by the sustainable development of the natural and heritage sites have opened the discussion of new ways of planning these tourist territories. The aim of this paper is to show, by means of Orikum case study, how planning can contribute to the natural and cultural preservation, as well as to the tourism development. The paper opens by describing the main relevant contextual factors that have influenced the tourism market. It follows with the theoretical background and some definitions. In the next section it focuses on national strategies for the tourism development, describing the potentials, possible scenarios for tourism development planning of Orikum area. The results of research show that the planning concepts of sustainability and innovation will be highly strategic and operative to reach successful tourism development in the natural and archeological sites.

Keywords: planning, tourism development, preservation, natural and archeological park

1 Introduction

Orikum is situated in the southern part of Albania. This includes in its territory one of most important natural and archeological park of the country. It is a perfect example of a place between past and future. This area has been generously donated a beautiful and an untouched nature, a magical coastline with a rich underwater archaeology. Archeological excavations, across the plain of Orikum revealed elements highlighting the close relationship between human settlement and landscape in which it occurs. Stratification periods of occupation, from antiquity to the present day are clear on the site, including military installations, which last for 2500 years. The Orikum zone is around 31400 hectares, and it includes many villages like Dukati village, New Dukati, Tragjas, and Radhimë.

The Orikum Municipality includes also the Old Tragjasi village, the Orikum Archeological Park, the Natural National Parks of Llogara and Karaburun, Lagoon and naval base of Pashaliman. The new settlement of Orikum City, populated since in 1949, is situated close to the ancient ruins of Oricu's. In 1961 proclaimed as a city and later expanded, especially with the opening of the Jonufër's terraces.
The city was rapidly developed in the last decade as a holiday center by using the strategic position next to the beach and beautiful natural parks. Coast line of Radhimë-Orikum-Karaburun contains qualitative beaches and rare landscape beauty. In recent years in the area are built hotels, bars, tents, tourist villages and buildings with residential destination.

The military harbor of Pashaliman served as an important naval base during the Cold War between the Eastern and Western blocs. Nowadays, except for some military relicsandaship repair workshop, there is nothing left of the former splendor. Archeological excavation were limited to the ancient Oriku's territory because of being part of the military naval base (Fig. 1). Archeological center is located on a low rocky limestone hill called Paleocasto at the end of a wooden scaffold that separates a small lagoon by the bay. A channel, turned into a marsh lagoon, separate it from the Necropolis.

Fig. 1. Oricu's archeological excavations.

Lagoon, National Parks of Karaburun and Llogora represents rare natural beauty with variety of flora and fauna. Orikum natural environment, as in many other places in Albania, is under constant pressure to indiscriminate exploitation trends, so the issue of development requires protection of its qualities. The questions posed for the sustainable development planning of the area and its openness to the public for tourism, should consider integrating all parameters, including natural and archeological heritage protection.

1.1 Urban Development

The economic development of the area has led to demographic changes associated with changes in terms of social structure and the increasing demand for construction. New development occurring after '90 and implementation of the "Legalization Law" have increased the informal construction without complying with any kind of survey and urban planning. Recently we noticed a certain trend and pressure from private investors to build formal and informal tourist facilities in the coastal area of Radhimë-Orikum (Fig. 2).

Fig. 2. New development in the seaside Rradhimë-Orikum.

The informal constructions and cemented beaches are a clear risk to environmental protection and sustainable development of the area. In this context the Orikum's Municipality have adopted in recent years important planning documents as "Local Development Plan", "Regulatory Plan of the Orikum City" and "Study on a tourist priority area of Rradhimë-Orikum". Although, according to Law no. 10119, "On Territorial Planning", it has to develop new local planning instruments as "The local unit territorial development Plan (LUTDP)" and "Local general Plan (LGP)". Development of these local planning instruments will enable the sustainable development, controlled and oriented territory ensuring a healthy environment for today's and the future generations.

1.2 Economic Development

Tourism and related services represent one of the most important sectors of the economy in Orikum, through which give the main income for residents. Because of the terrain and tradition farming occupies an important role in the economy. Also, agriculture remains the main economic activity as opportunities for development of this sector are good, especially in the Plain of Dukat and Tragjas. Cultivation of viticulture, horticulture, citrus, have increasingly grown trend. Olive, citrus and fruit trees join the largest surface of the planted areas.

1.3 Socio-Cultural Life Development

In recent years life's quality for Orikum's residents has improved because of investments realized in public facilities and infrastructure. However, there is the low economic level of families and the phenomenon of massive emigration of the working youth. This has led to creation of social problems in the area as unemployment, housing, and for the third generation. Cultural life before the 90s has been very active in Orikum, for reasons of closeness with Pashaliman military base. Now residents recall with nostalgia the dance halls and cultural activities taking place at the time of the military. Another picture is present today. With exception of the touristic season in the major part of the year the cultural life is relatively poor.

2 Preservation of Natural and Archeological Heritage

UNESCO's 1972 Convention Concerning the Protection of the World Cultural and Natural Heritage[18] considers monuments, groups of buildings and sites as cultural heritage. An area is identified as a heritage center if the works of man or the combined works of nature and people (including archeological sites) within its footprint are recognized as having outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view. Preservation of this heritage is very important for the sustainable development. The global cultural organizations such as the UNESCO, ICCROM, and ICOMOS and the Albanian institutions such as the Ministry of Culture and Tourism, Ministry of Environment, the Institute of Cultural Monuments (ICM), Institute of Archaeology and communities seem to generate some success in their efforts to meet greater interest for the preservation of natural and archeological heritage. The cultural heritage in Albania, as part of the national culture, deserves protection. The Orikum's natural and archeological heritage since the year 2005 has acquired the status of a conserved asset[1]which can improve the present and the future of the region. These could become an economic advantage with good prospects for economic exploitation, such as, through tourism for culturally based image establishment of local economic development, or, the promotion of small enterprises.

3 Defining Natural, Cultural and Heritage Tourism

The concepts of heritage and cultural tourism are reflected by broad range of references in the literature such as the historical tourism [1], [2], heritage tourism [4], [5], and the cultural tourism [3], [7], [8]. A number of explanations are made for this purpose. “The meaning of heritage tourism is broad and sometimes it is considered a subset of cultural tourism” [10]. It is necessary to say that “even when cultural heritage is not the main purpose of a journey it adds value to the tourists' experience” [6]. According to the World Tourism Organization, heritage tourism is “an immersion in the natural history, human heritage, arts, philosophy and institutions of another region or country” [10]. Heritage tourism is probably the most popular and conspicuous in natural and archeological sites, where the main attraction is the same heritage we are trying to preserve. Heritage is a concept that includes the natural and the cultural environment. Although, within this general division the archeological heritage is considered cultural heritage, the importance of the natural environment in shaping and influencing the built environment needs to be taken into consideration.

As defined by National Geographic the natural heritage tourism is “tourism that sustains or enhances the geographical character of a place - its environment, culture, aesthetics, heritage, and the well-being of its residents” [17]. According to Arkansas Conservation Center “Natural heritage tourism is an umbrella concept, and ecotourism, focused on nature, as well as agritourism, focused on agricultural lifestyles, can be considered subsets. Ecotourism focuses on local culture and wilderness adventures and understanding the means by which people in other parts of the world are living off the land around them. An important element of most ecotourism is how sustainable development can best meet the social, economic, and environmental needs of an area and promotes biological biodiversity. Agritourism

focuses on learning about and direct experience of agricultural operations of all types, often emphasizing the relationship of agriculture to biodiversity, wildlife compatibility, and local culture or cuisine" [15]. For purposes of this paper, cultural and heritage tourism is conceived as the "visits by persons from outside the host community motivated wholly or in part by an interest in the historical, artistic, and scientific or lifestyle/heritage offerings of a community, region, group or institution" [8].

4 National Strategy for the Tourism Development

The importance of tourism in economic development and the social structure in Albania is included in the National Strategy for Development and Integration (NSDI) 2007-2013 [14]. National Strategy of Tourism [12] reflects the strategic vision of the development direction expressed in the NSDI. Under this strategy, the purpose of Albanian tourism development is to increase the quality of life for Albanians, emphasizing the development of cultural tourism and ecotourism focusing on the benefits of local communities, who now face limited economic opportunities. Some of strategic priorities of this sector are:

a) "Product development and diversification of tourism will focus on the discovery of Albania through nature and culture. This will be accomplished by depending, on the capacity of local areas to manage effectively, to alter their natural values and cultural viable tourism product.
b) Investment areas and culture could be achieved particularly through the creation of long-term financial mechanisms and the development and validation of tourism plans, which encourage investors by giving the principal directions of development and implementing an incentive policy for future investments in tourism.
c) Territorial organization will support the development of tourism through plan adjustment, urban studies, as well as infrastructure investment" [14].

Making tourism more efficient requires sustainable planning and management. "Creating a balance between the welfare of tourists, host communities and the environment, reducing conflict and recognition of mutual dependence, requires destination management approach" [11].

5 Findings from the Contextual Analysis of Tourism Potentials

Orikum region offers different tourism attractions for the tourism development. National Archeological Park of Orikum. In the southeastern part of Karaburun Peninsula is situated the ancient settlement of Oricu's, dates back to the beginning of VI century BC. It became an important economic and cultural center in the Mediterranean during the ancient Greek and Roman periods until the medieval period. Later it became an important Turkish port (Pashalimani). Among the important archeological findings in this area could be mentioned a small theatre and acropolis, the harbor, rocky stairs, the altar, the temple, the courtyard and the fountain. On the sea and lagoon underwater are situated a considerable number of wrapped soaps and many archeological objects that testimony the relations of this area with other great civilizations of the period. The visitor can also see traces of the two world wars of the 20th century. It's strategic position next to the Vlora bay, with diversified landscape and rich flora and fauna, is a required destination for tourists (Fig. 3).

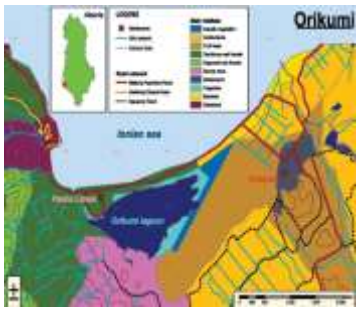


Fig. 3. Map of Orikum Areas.

Orikum Lagoon. The area offers very good possibilities for sustainable development of tourism. These possibilities are not only for the archeological site, but also for the very rich flora and fauna. The lagoon has proper habitats for waterfowl birds and other species. Among possible constraints for the preservation of the natural environment in the area are the new settlement of Orikum and the existence of the military naval base of Pashaliman.
National Park of Llogara is another tourist attraction, which begins with Shasta and encompasses the entire area of the park. These area stretches along the national road and stands for healthy climate. Its geographical position and height of 600m above sea level creates a spectacular view towards the Vlora bay. For this area the Master Plan approved provides the development of the elite tourism.
National Park of Karaburun. The Karaburun coastal area extends over an area of 120 km^2, which belongs to the Municipality of Orikum with 60 km coastline. This area is a rare beauty, especially when visited by boat from the sea, which gives tourists the possibility of discovering caves, canyons and small beaches. It's the only untouched area throughout the Mediterranean Sea. Underwater floras of the peninsula are also a rare beauty. This area represents the most beautiful and impressive coast views for the underwater tourism development. This area also possesses precious archeological, historical and cultural values. On the southwestern coast of Karaburun Peninsula is situated Grama Bay, a former famous cave and harbor since ancient times. On its rocks there are abundant inscriptions in the old Greek and Latin languages, dating back more than 2000 years that have made this bay to be considered one of the richest "rocky diary" in the Mediterranean.

6 Possible Scenarios for Tourism Development

Orikum offers potentials for various tourism activities in different destinations. What makes it unique are a variety of attractions and the relative proximity of these attractions in a remarkable natural and cultural context. The exact combination of activities and destinations present the best opportunities for building a thriving tourism sector. While the main attraction of tourism development will continue to be the coastal tourism market, the tourism profile for Orikumi area should shift from the mass market predominance of visitors to the beaches in a great variety of more active tourists with wide interests. Along the entire length of Coastal Zone Orikum-Radhimë, in recent years, were built hotels, bars, tents, tourist villages and buildings with residential destination. The area is somewhat protected by massive and uncontrolled construction, while maintaining the character in a certain way and the natural landscape. The archeological park is unexplored and has limited accessibility. Tourism market is very interested in this type of heritage. New archeological excavations and opening to the public makes the site very attractive for tourism.

Nature and cultural environment in the area of Orikum, as part of national culture, are protected areas. Other tourist attractions are exploring the natural parks as: Llogora National Park, Karaburun National Park and Orikum Lagoon which are exceptional beauty and with rich flora and fauna. These could be an economic advantage with good prospects for economic development, such as, through tourism, culture-based image creation of local economic development, or promotion of small enterprises.

Vlora Bay Area is a rich area with attractive buildings, archeological monuments, visited spots and other elements related to cultural tourism. Local villages with their livestock and agriculture developed and based on tradition present excellent opportunities for agritourism development.

For a sustainable development of the area should that cultural heritage, natural resources and urban development today to live in harmony with each other. Continued promotions of cultural and historical values and simultaneously development of other urban, economic and contemporary social standard dimensions serve to this purpose.

7 Planning the Natural and Archeological Territory for Tourism Development

Nature and cultural environment in the area of Orikum could be an economic advantage with good prospects for economic development, such as, through tourism culture-based image creation of local

economic development, or promotion of small enterprises. Nowadays new ways of planning the natural and cultural heritage territory have emerged out of the concept of sustainable development. The international project conducted between HEPIA of Genève and Polytechnic University of Tirana gave different ideas for planning and for the sustainable development of the area. It shows, by means of a case study, the way in which the sustainable planning design can contribute to the preservation of the natural environment and the local culture, as well as to the development of the community. The study was thought as a master plan which includes in its surface area the local communities of Orikum city, archeological and the natural parks. It was created as a strategic planning proposal intended to enhance tourist values on an area that is defined by the significance of its archeological, historical and natural heritage value and regarded as a major cultural resource with scientific, social and economic dimensions. This planning proposal, for the tourism development in the Orikum area is a tool through which the local communities can manage, control and protect their heritage resources. This area has an impressive natural environment and different archeological sites that represents important periods of human history (Fig. 4, 5). The increase of visitors to these sites and especially to the ancient ruins of Orikum reveals a growing interest in Cultural Tourism.

Fig. 4. a)Archeological Site of Orikum; b) Coastal line and military naval base of Pashaliman

Fig. 5. a) Marmiroi Church; b) Lagoon

Planning for sustainable development of Orikum region intersect many disciplines related to each other, like urban planning, architecture, archaeology, environment and landscape. The design process responded to the complexity of this project. The program includes different interest areas (Fig. 5): the heritage area with archeological ruins of Oriku's and the Marmiroi Church, the Lagoon area, the rural area, the bathing beach area with the promenade and the tourist structures (a cultural tourist route, a heritage museum, a flora and fauna museum, the cold war museum), and the inhabited areas where the local community will provide accommodation services and offer typical local food along with knowledge of the local celebrations, customs and traditions.

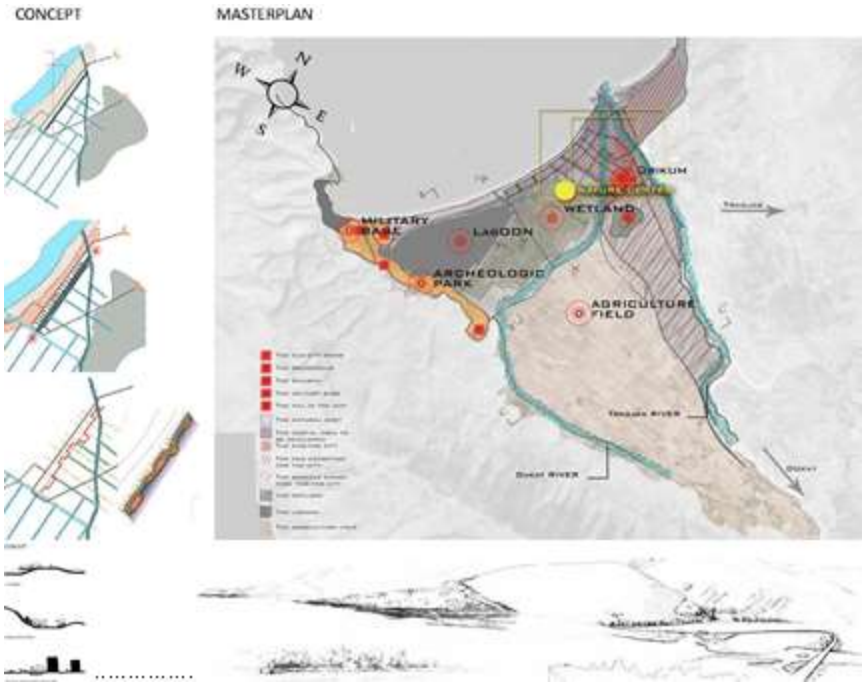


Fig.6. The master plan includes in its surface area the Archeological Park, Natural Parks and the Orikum city.

In the urban scale the project focused to create visions on how to develop the city. Its exams issues related to the management of expanding the city limits, the relationship of the built environment with the morphology of the territory and natural elements, orientation and character of spaces and hierarchical relationships (Fig. 7). Is planned the expansion of the city towards the coast, on both sides of the river, leaving the beach a space of 200 m from the shore.

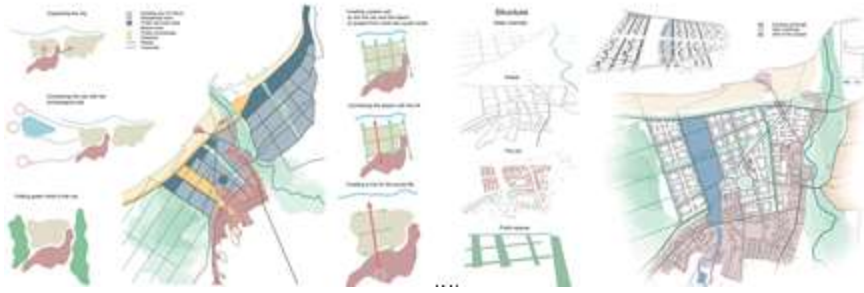


Fig. 7. The urban development plan of the Orikum.

A promenade with green, sidewalks and services is situated between the beach and the build area (Fig. 8). Buildings near the promenade will be used for tourist services (hotels, bars, restaurants, shopping centers, etc.). The other area will be used for housing while maintaining the existing water channels. Create a physical connection through an itinerary as well as the visual opening of some axes to lead in the archeological area and national park of Karaburun. Setting limits to expansion of the city with the creation of green parks on both sides of it. It will create a massive green park to prevent further expansion of the city.

Fig. 8. Master plan of beach promenade.

Preservation and revitalization of parks and archeological heritage was mainly successfully faced in the urban plan itineraries with different proposals for alternative tourism development such as the beach tourism and the cultural, natural, agricultural tourism. The sustainable development of the area suggests that the course of the project has to re-evaluate the major natural and historical assets. Urban management strategy is expressed in three main directions: access, connection and preservation. In the master plan are proposed the connection of the important points not only by a road, but also with a green line that flows naturally from the parks, in order to develop them. This green line shows the way to the historical site (Fig. 9).

Fig. 9. Proposed connections of the important points and illustrations.

When designing the plan of Archeological Park, landscape and facilities, contextual, environmental, functional, formal and technological criteria were reviewed. These criteria were later adopted when it came to taking project design decisions. These criteria involve taking a stand on the future desirable environmental results and the spreading of the project sustainable elements. The principles of sustainable planning and environmental design for tourism development could be focused in the following topics: *Landscape design*. It is necessary to develop a master plan and a site plan to set up a balanced relationship with the topography, landscape, wetland and agricultural land, fauna and flora, sea water, lagoon water, water drainage canals, heritage sites and urban development aspects. *Linkages or touristic itineraries*. Consideration should be given to the environmental conditions of linkages or touristic itineraries between different interesting points, adjusting the scale and proportion of the human-made environment to the natural environment. *Built facilities and their services*. The planning for touristic facilities and housing will be based in the sustainable development of territory taking in the consideration all environment factors influencing them. The use of green, water canals, orientation

could influence positively their impact in the surrounding environment and its preservation. Services in the planning area will be based in the use of renewable sources and passive technologies. *Preservation of nature and resources.* Sustainable project should commit to the preservation of natural habitat and archeological sites as well as among the others minimizing waste, sewage, noise and maximizing of the use of renewable sources. *Use of environment friendly technologies and materials.* The sustainable planning design should be based in the local resources and traditional technologies adding comfort and environmental quality. The project consists in developing the Orikum region. It begins with a master plan and a developing strategy for this area. The strategy was to find out the importance of heritage, the biodiversity and the values of flora and fauna for the sustainable tourism development. Agriculture, farming and people's tradition will show the true values of this area and it will be done by the strategies of economic development. For the region coastal profile was prepared, containing an analysis of the socio-economic situation, artificial and natural resources, and definition of the environmentally sensitive areas. Appropriate linkages (road networks, footbridges), tourist information points, viewpoints and terraces are also part of the proposal (Fig. 10).

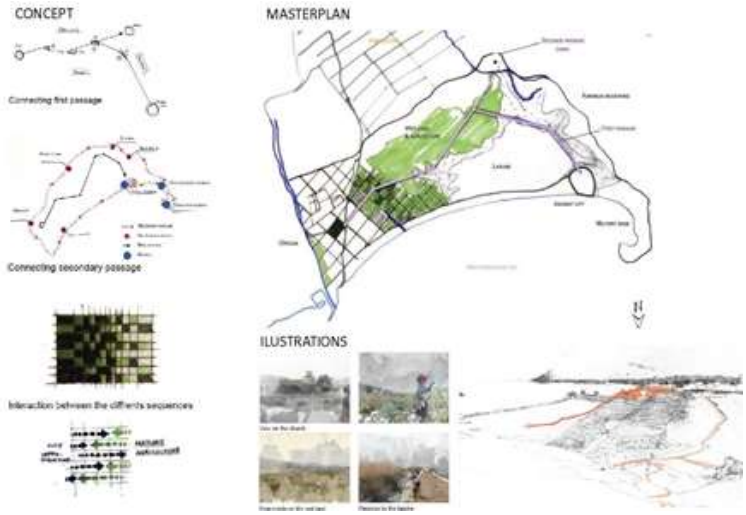


Fig. 10. Proposed connections and definition of the environmentally sensitive areas.

There has been some proposal design for different architectural typologies: socio-cultural and museum objects in the urban site or in the heart of nature. Some of these proposals are represented in the (Fig. 11, 12).

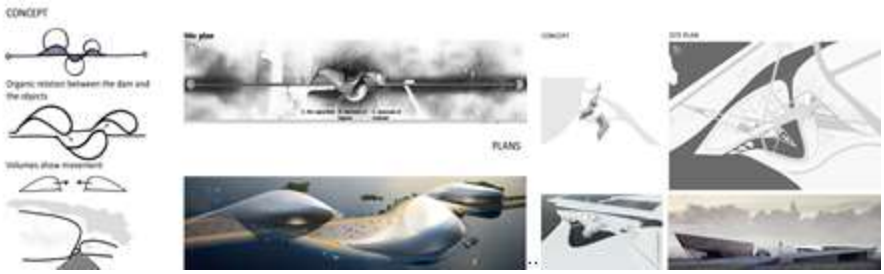


Fig.11. a)The water museum. b) The cold war museum.

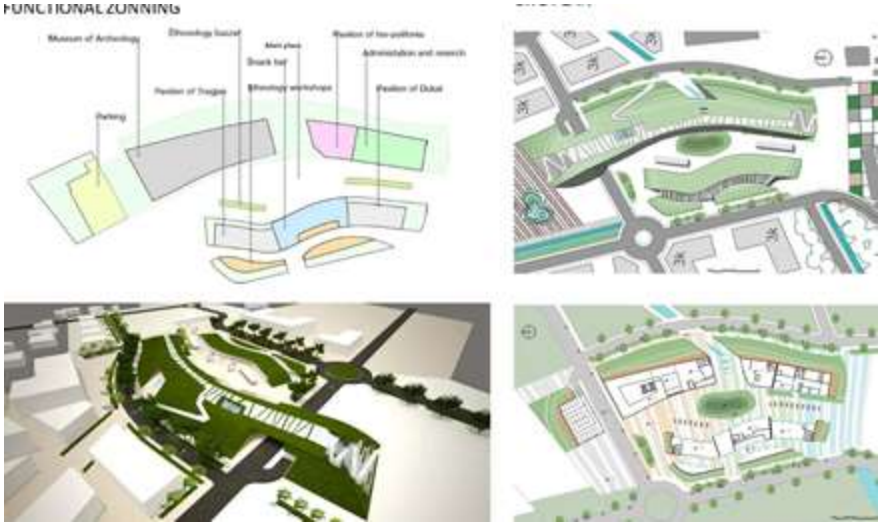


Fig. 12. The heritage museum.

Discussion of the sustainable planning in terms of socio-economic dimension, the key aspects in the development of the guidelines for a sustainable tourist product are: public private community partnership, participation of community in the planning process, relationship between local community and global tourism market, research and promotion of the touristic territory. This case study presents an experience in terms of planning design that makes possible to think for sustainable use heritage resources and their relationship with tourism. Moreover, this proposal sets a precedent and may be applicable to other planning projects, with the necessary adaptations depending on the particular contextual circumstances.

8 Conclusions

Project proposals for the sustainable development of Orikum concentrating on these major issues: biodiversity and environmental protection; tourism, conservation and cultural heritage; institutional capacity building; and integrate them. Tourism is an important source of foreign exchange. Given the collapse of industrial activities and the military base, the relatively good health of the remaining natural environments, environmentally based tourism that is not only sensitive to coastal and marine habitats, but which also embraces their quality, is the most practical development option. Linking tourism with nature through the establishment of protected areas, not only provides an environmental standard incentive for facilities, but also ensures that large areas of nature are protected. Spatial planning is a major tool to create conditions for the tourism development in Orikum. This intervention was undertaken in two phases. The goal of the first phase was to outline the strategy for tourism development based on the sustainable use of coastal resources and of the second phase was the strategy for heritage tourism.

Examination of natural and archeological heritage and the key trends in tourism development clearly demonstrates that tourism, and in particular, international tourism, will be the fastest-growing sectors of the economy in the Orikum region. Tourism has the powerful economic, social and ecological contribution and potential; it will give positive effects by increasing the number of jobs, boosting economic development. As noted, tourism depends heavily on cultural and natural attractions, many of which are in the Orikum region. Conversely, tourism can make important contributions to the protection and management of cultural and natural heritage-it can help keep the traditions alive and finance heritage protection, as well as increase visitor appreciation of that heritage. On the other hand, tourism can damage heritage when not well planned and managed. The concept of sustainability identifies new trends of tourism planning. This case study presents an experience in terms of planning and design that

makes it possible to think of a sustainable use heritage resources and their relationship with tourist space design. The concept of sustainability could be instrument for thinking possible ways of implementing it, in this case ways to connect heritage and tourism. This should be understood in relationship with the persistence in time and the current and future conception of the human-made environment.

References

1. Ashworth & Tunbridge, (1990) The tourist-historic city. London: Belhaven.
2. Ashworth, G.J. & Larkham, P.J. (1994). Building a new heritage: Tourism, culture and identity in the new Europe. New York: Routledge.
3. Davies, M. (1993). Cultural tourism, history, and historic precincts. In M.C. Hall & S. McArthur (Ed.), Heritage management in New Zealand and Australia. pp. 188-196. Auckland: Oxford University Press.
4. Herbert, D.T. (1995). Heritage places, leisure and tourism. In Herbert, D.T. (Ed.), Limited heritage, tourism and society. N.Y: Mansell Publishing Limited.
5. Light, D. & Prentice, R.C. (1994). Who consumes the heritage product? Implications for European heritage tourism. In Ashworth G.J., & Larkham P.J. (Ed.), Building a new heritage: Tourism, culture and identity in the New Europe. New York: Routledge, 90-116.
6. Orbaşli, A. & Woodward, S. (2009) 'Tourism and Heritage Conservation' in the SAGE Handbook of Tourism Studies, ed. Tazim Jamal and Mike Robinson (Los Angeles: SAGE, 2009), pp. 315.
7. Squire, S. (1994). The cultural values of literary tourism. Annals of Tourism Research, 21, pp.103-120.
8. Silberberg, T. (1995). Cultural tourism and business opportunity for museums and heritage sites. Tourism Management, 16(5), 361-65.
9. Tyler,T.R (1990).Why People Obey the Law. New Haven: Yale University Press.
10. Timothy Dallen J. & Stephen W. Boyd (2003). Heritage Tourism. New York: Prentice Hall, 2003, pp.5-6.
11. Chamber of Commerce and Industry (2006). Guidance on sustainable development of tourism in Albania. Tirane.
12. Ministry of Tourism, K. R. (2007). 'Strategy of Tourizm'. Maj 2007, Tirana.
13. The Council of Ministers, R. e. (2008). National Strategy for Development and Integration 2007-2013. March 2008, Tirana.
14. The Council of Ministers,(2005). DCM No. 396, dated 31/03/2005 "On the approval of regulations for border management of archeological parks of Shkodra, Lezha, Apollonia, Byllis, Amantia, Orik, Antigonea Finiqi of Butrint" (Official Journal No. 53, Year 2005, pp. 1893).
15. 15.Arcansas Conservation Center "What is Natural Heritage Tourism" http://www.stateconservation.org/mississippi/article.aspx?id=61&sid=8&sn=Ecotourism [accessed 15.09.2013]
16. ICOMOS,(1987) "Charter for the Conservation of Historic Towns and Urban Areas"(Washington,), http://www.icomos.org/charters/towns_e.pdf [accessed 15.09.2013]
17. National Geographic, (2013) "About Geotourism" http://travel.nationalgeographic.com/travel/sustainable/about_geotourism.html [accessed 15.09.2013]
18. UNESCO, (2010). Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris, 1972), 2. http://whc.unesco.org/archive/convention-en.pdf (accessed December 26, 2010).

Tuned Mass Damper: An Intelligent Device As A Protection System Instructural Engineering

Feti Selmani[1], Musa Stavileci[1]
[1] PAN Engineering Prishtina, Kosovo
panengineering@gmail.com

Abstract. Nowadays, destructive environmental forces such as earthquakes, tsunamis and winds accompanied with landslides, have mobilized the minds of the civil engineering communities around the world for finding new and better means for the protection of structures. As it is well known already, the conventional design approach, requires, that the structures passively resist environmental disturbances through a combination of strength, deformability and energy dissipation. Our experience shows that this is neither sufficient nor satisfactory. The basic role of passive energy dissipation devices when incorporated into a structure is to absorb or consume a portion of the input energy, thereby reducing energy dissipation demand on the primary structural members and minimizing possible structural damage. This paper represents an effort to strengthen the structural engineer's interest on the problem of our modern times: passive energy dissipation. In this paper we have approached one of them: Tuned Mass Damper (TMD).

Keywords: Absorption, Passive energy dissipation, Tuned Mass Damper, Optimal damping, Control

1 Introduction

During the design of civil engineering structures, the actions taken into account are usually those, which are acting as a consequence of gravity. They represent actions that a structure must endure during his exploitation /Design Working Life, acc. to ENV 1991-1/. Here are accounted for, not only permanent actions such as the self weight of the structure itself, but also those actions that takes place as a result of structure's exploitation. The idealization resulting by adopting of static model of actions, having into consideration their nature, seems to be acceptable /slow variation of actions/. Nowadays, material resources are frequently limited. For this reason, during the process of structural design, raises the need for structural optimization. Having said that, static model is no more valid. Altogether and added the stochastic nature of ambient phenomena such as strong winds accompanied by earthquakes and landslides, arises the need for development of new ideas and concepts of structural protection systems. Various concepts and innovative technologies are under experimental and practical implementation.
This paper represents a temptation to raise the attention of our community relatively to the problem and the role of passive energy dissipation devices in first, absorbing and after dissipating the input energy of an earthquake or environmental hazard. One of the most evident advantages of seismic isolation is that offers to the structure the possibility to be flexible, meanwhile to behave as essentially rigid. Every external perturbation can be imagined as an energetic "injection" into the civil engineering structure, whereas the design consists on the "management" of this input energy inside the structure. The primary role of passive energy dissipation devices, when incorporated in a structure, consists in absorbing the input energy, respectively in reducing the absorption demand of the primary structural elements, resulting in an increase in its /structure's/ survivability.
These last years, a feasible technology is used in many parts of the world (Japan, USA), whereas constant efforts are under way for improvement and further development of the concept. A number of those structural protective systems [11] has already passed the test (e.g., Taipei 101) successfully. Having into consideration the applied approaches for this energy input management, the passive energy dissipation devices are classified as it follows [6]:

- Metallic Dampers
- Friction Dampers

- Viscoelastic Dampers
- Viscous Dampers
- **Tuned Mass Damper/s**
- Tuned Liquid Dampers
- Liquid Wall Dampers etc…

Let us consider the lateral motion of a single-degree-of-freedom (SDOF) mathematical model, shown in Figure 1, consisting of a mass m, supported by a shear frame with total linear elastic stiffness k, a damper with linear viscosity c and the generic passive damper element (device) Γ.

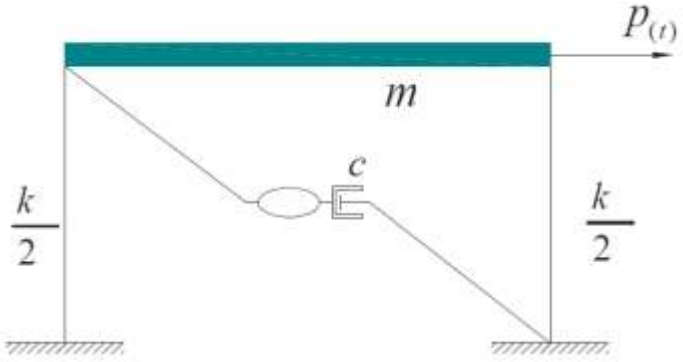


Fig. 1. Simplified SDOF shear frame structure under the influence of a harmonic action $p(t)$

The dynamic response of the structure will be influenced, of course, from this supplementary devices (non-viscous in their nature) which will "support" the primary structure with a supplementary strength ("muscle"), i.e. it will improve the resistance capacity of the structure. Symbol represents a generic integro-differential operator [Soong] such that its corresponding force is . In this way, the differential equation governing the response of the system given in $Fig.1$ The plot giving the relation force-displacement, for the damper/device/ with mass $m\ d$ and generic damping ratio [6] is shown in $Fig.2$, where it can be seen that the damper (device) is modeled in form of an *elastic-perfectly plastic* (elastoplastic) element, having as initial stiffness and yield strength .

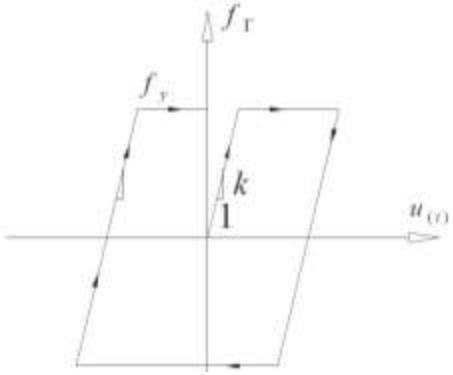


Fig. 2. Simplified elastic-perfectly plastic (elastoplastic) force-deformation relation

1.1. Tuned Mass Damper

A very elegant way to protect structures, especially when wind induced forces are into question is, the *tuned mass damper* (TMD). TMD consists of mass with properly tuned spring and damper attached to the primary (main) structure, providing with a frequency-dependent hysteresis loop that increases considerably the damping of the primary structural system. The main objective, is, that the natural frequency of the TMD has to be tuned with a chosen natural frequency of the primary structure (mainly

the fundamental one for MDOF, the first for SDOF). When this primary structure's frequency is exited, the TMD *will resonate out of phase* with the structural motion, permitting thus energy dissipation by the TMD inertia force acting on the structure. The basic principle of TMD has been laid by Frahm 1909, in reducing the rolling motion of ships as well as ship hull vibrations, whereas theoretical basis has been given by the Dutch engineer J. Den Hartog in his notorious book Mechanical Vibrations in 1940.

Since then, the principle has been used in mechanical engineering and only in the late eighties found some application in structural and civil engineering. In order to expose the problem in a simple and clear manner, let us consider the mathematical model given as indicated in fig.3, below. The primary structure is excited by the harmonic force , whereas the ground moves according to the periodic law .

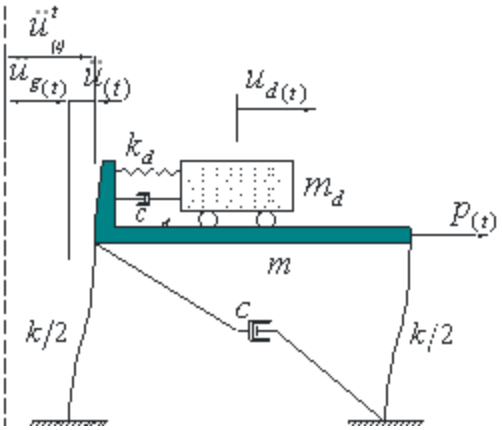


Fig. 3. Simplified mathematical model of a two degrees-of-freedom structure under the influence of a harmonic action $p(t)$

Sometimes, in order to better estimate the beneficiary contribution of TMD in the absorption and subsequently the dissipation of the input energy, the primary damping c is taken from the structure ($Fig.3$).

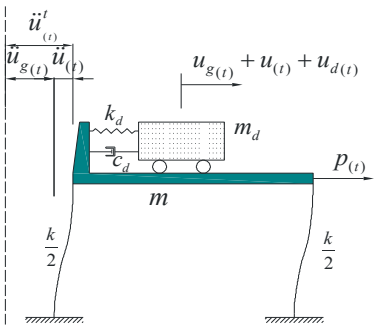


Fig. 4. Simplified mathematical model of a two degrees-of-freedom structure for the undamped primary structure $c = 0$, under the influence of a harmonic action $p(t)$

The equations of equilibrium after the application of the d'Alembert's principle (fig.4c) are:

$$m\ddot{u}_{(t)} + ku_{(t)} - k_d u_{d(t)} - c_d \dot{u}_{d(t)} = p_{(t)} - m\ddot{u}_{g(t)} \ . \tag{2}$$

$$m_d \ddot{u}_{d(t)} + c_d \dot{u}_{d(t)} + k_d u_{d(t)} + m_d \ddot{u}_{d(t)} = -m_d \ddot{u}_{g(t)} \ . \tag{3}$$

The differential equation (2) governs the motions of the primary structure's mass, whilst equation (3) governs the motions of the TMD. After addition of the equation (2) and equation (3), we obtain the differential equation, governing the motions of the combined structure (3.1) as follows:

$$(m+m_d)\cdot\ddot{u}_{(t)}+ku_{(t)}=-(m+m_d)\cdot\ddot{u}_{g(t)}-m\ddot{u}_{d(t)}+p_{(t)}\ . \qquad (3.1)$$

where

m primary structure's mass

m_d tuned mass damper's mass

k primary structure's stiffness

k_d tuned mass damper's stiffness

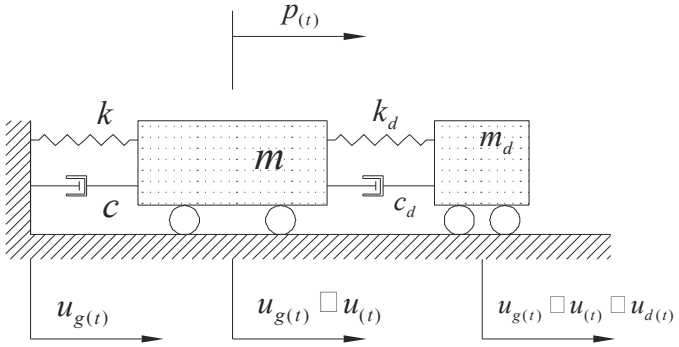


Fig. 4a. Simplified mathematical model of a two degrees-of-freedom structure under the influence of a harmonic action $p(t)$, *mass-spring-damper* model

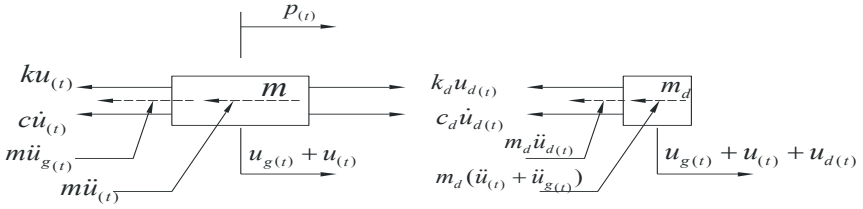


Fig. 4b. D'Alembert principle applied to the equilibrium of the two degrees-of-freedom *mass-spring-damper* model

The equations of equilibrium after the application of the d'Alembert's principle (Fig.4b) once again are:

$$m\ddot{u}_{(t)}+ku_{(t)}-k_d u_{d(t)}-c_d\dot{u}_{d(t)}=p_{(t)}-m\ddot{u}_{g(t)}\ . \qquad (2)$$

$$m_d\ddot{u}_{d(t)}+c_d\dot{u}_{d(t)}+k_d u_{d(t)}+m_d\ddot{u}_{d(t)}=-m_d\ddot{u}_{g(t)}\ . \qquad (3)$$

The differential equation (2) governs the motions of the primary structure's mass, whereas equation (3) governs the motions of the TMD. After addition of the equation (2) with equation (3) we obtain the differential equation, governing the motions of the combined structure (3.1) as follows:

$$(m+m_d)\cdot\ddot{u}_{(t)}+ku_{(t)}=-(m+m_d)\cdot\ddot{u}_{g(t)}-m\ddot{u}_{d(t)}+p_{(t)}\ . \qquad (3.1)$$

where

m primary structure's mass

m_d tuned mass damper's mass

k primary structure's stiffness

k_d tuned mass damper's stiffness

$\ddot{u}_{(t)}$ relative acceleration of the primary structure's mass

$\ddot{u}_{g_{(t)}}$ ground acceleration

c_d tuned mass damper's damping coefficient

$\dot{u}_{d(t)}$ velocity imposed to the tuned mass damper

$u_{d(t)}$ displacement of the TMD's mass at a given time instant t

$p_{(t)}$ external excitation (e.g. wind)

To solve differential equations (2) and (3), let analyze the case when the ground moves according to the law (4) whereas the external force varies according to the equation (5)

$$\ddot{u}_{g(t)}=\ddot{u}_{g0}e^{i\Omega t}\ . \qquad (4)$$

$$p_{(t)}=p_0e^{i\Omega t}\ . \qquad (5)$$

Dynamic response is supposed as given per equations (6) and (7)

$$u_{(t)}=u_0e^{i\Omega t}\ . \qquad (6)$$

$$u_{d(t)}=u_{d0}e^{i\Omega t}\ . \qquad (7)$$

After introducing the expressions (4), (5), (6) and (7) into the expressions (2) and (3) we obtain:

$$(m_d\Omega^2+ic_d\Omega+k_d)u_{d0}-m_d\Omega^2u_0=-m_d\ddot{u}_{g0}\ . \qquad (8)$$

$$-(ic_d\Omega+k_d)u_{d0}+(-m\Omega^2+k)u_0=-m\ddot{u}_{g0}+p_0\ . \qquad (9)$$

From the expressions (8) and (9) after transformation of complex solutions into polar ones the solutions for and , became:

$$u_0 = (p_0 / k) A_1 e^{i\delta_1} - (m\ddot{u}_{g0} / k) A_2 e^{i\delta_2} \ . \quad (10)$$

$$u_d = (p_0 / k) A_3 e^{-i\delta_3} - (m\ddot{u}_{g0} / k) A_4 e^{-i\delta_3} \ . \quad (11)$$

Factors (i=1, 4), in the expressions (10) and (11), define the amplification of pseudo-static responses, whilst the factors represent phase angles of external forces (ground motion or wind action) as well as dynamic responses of the structure. These amplification factors are given as it follows:

$$A_1 = \frac{\sqrt{(f^2 - \rho^2) + (2\zeta_d \rho f)^2}}{|D_2|} \ . \quad (12)$$

$$A_2 = \frac{\sqrt{((1+\mu) f^2 - \rho^2)^2 + (2\zeta_d \rho f (1+\mu))^2}}{|D_2|} \ . \quad (13)$$

$$A_3 = \frac{\rho^2}{|D_2|} \ . \quad (14)$$

$$A_4 = \frac{1}{|D_2|} . \quad (15)$$

$$|D_2| = \sqrt{((1-\rho^2)(f^2 - \rho^2) - \mu\rho^2 f^2)^2 + (2\zeta_d \rho f (1 - \rho^2 (1+\mu)))^2} \ . \quad (16)$$

$$\delta_1 = \alpha_1 - \delta_3 \ . \quad (16.1)$$

$$\delta_2 = \alpha_2 - \delta_3 \ . \quad (16.2)$$

$$\tan \delta_3 = \frac{2\zeta_d \rho f (1 - \rho^2 (1+\mu))}{(1-\rho^2)(f^2 - \rho^2) - \mu\rho^2 f^2} \ . \quad (16.3)$$

$$\tan \alpha_1 = \frac{2\zeta_d \rho f}{(f^2 - \rho^2)} \ . \quad (16.4)$$

$$\tan \alpha_2 = \frac{2\zeta_d \rho f (1+\mu)}{(1+\mu) f^2 - \rho^2} \ . \quad (16.5)$$

where: $\mu = \frac{m_d}{m}$. mass ratio

$\omega^2 = \frac{k}{m}$.

$$c = 2\zeta\omega m \ . \quad (16.6)$$

$$\omega_d{}^2 = \frac{k_d}{m_d}$$

$$c_d = 2\zeta_d \omega_d m_d$$

$$f = \frac{\omega_d}{\omega}$$

$$\rho = \frac{\Omega}{\omega}$$

ω_d circular frequency of the TMD

ω circular frequency of the primary structure

Ω circular frequency of exciting force or ground motion

Ratio between the mass of TMD and the mass of primary structure, for the majority of practical cases in structural engineering is $\mu \leq 0{,}05$. From this it results that amplification factors for both external forces A_1 and ground motions A_2 are approximately equal ($A_1 \approx A_2$.) This holds also for phase angles ($\delta_1 \approx \delta_2$).

The main reason for incorporating the TMD is to bring the amplitude A_1 at its lowest possible value whereas holding the ratio ρ as much as possible near 1 (the case of classic resonance). The minimum of this value can be achieved by optimizing the f ratio in such a way that it takes the value below:

$$f_{opt} = \frac{1}{1+\mu} \ . \tag{17}$$

For $f = f_{opt}$, the amplitude of forced vibration u_0 is:

$$u_0 = \frac{p_0}{k}\sqrt{1+\frac{2}{\mu}} \ . \tag{18}$$

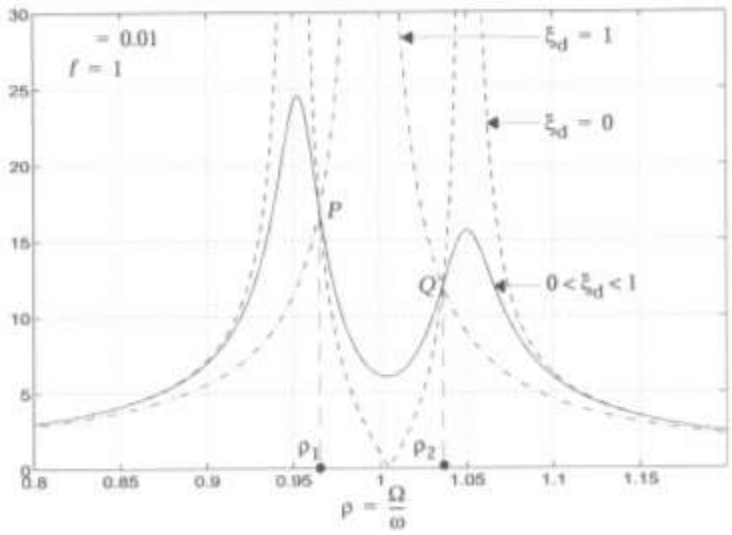


Fig. 5 Plot showing the displacement amplitudes of the primary structure for the case of mass ratio $\mu = 0.01$ and the frequency ratio $f = 1$. One can clearly see the position of fixed points P and Q are independent of damping ratio ξd

Fig 5 [Den Hartog] shows the variation of the amplification factor relatively to specific values of ratios and and different values of the damping ratio . In the case when , on both sides of ratio , appears two peaks (infinite values) of coefficient . As becomes larger, these two peaks are approaching each other, and finally take the same values. This kind of behaviour let us understand that there must exist a certain value of , for which the configuration of the TMD allows the absorption and afterward the optimal dissipation of the input energy.

One another characteristic that can be observed from the $Fig.5$ is that all curves passe through two points marked as P and Q (no matter what values the damping ratio takes). From this results the important fact that the position of these two points depends on coefficients and only.

As a result, the expression (13) can be transformed in the following form:

$$A_2 = \frac{\sqrt{a_1^{\,2} + \zeta_d^{\,2} a_2^{\,2}}}{\sqrt{a_3^{\,2} + \zeta_d^{\,2} a_4^{\,2}}} = \frac{a_2}{a_4}\sqrt{\frac{a_1^{\,2}/a_2^{\,2} + \zeta_d^{\,2}}{a_3^{\,2}/a_4^{\,2} + \zeta_d^{\,2}}} \quad . \tag{19}$$

where:

$$a_1 = (1+\mu)f^2 - \rho^2) \quad . \tag{19.1}$$

$$a_2 = 2\rho f(1+\mu) \quad . \tag{19.2}$$

$$a_3 = (1-\mu)(f^2 - \rho^2) - \mu\rho^2 f^2 \quad . \tag{19.3}$$

$$a_4 = 2\rho f(1-\rho^2(1+\mu)) \quad . \tag{19.4}$$

In this way, for an amplification factor which doesn't depend on , the following condition has to be fulfilled [Den Hartog]:

$$\left|\frac{a_1}{a_2}\right| = \left|\frac{a_3}{a_4}\right| . \qquad (20)$$

The corresponding values of , for points P and Q are:

$$A_{2\_P,Q} = \left|\frac{a_2}{a_4}\right| . \qquad (20.1)$$

After introducing the corresponding values for a_i (from 19.1 until 19.4) in the expression (20), one can obtain the quadratic equation for ρ^2 as it follows:

$$\rho^4 - [(1+\mu)f^2 + \frac{1+0.5\mu}{1+\mu}]\rho^2 + f^2 = 0 . \qquad (21)$$

Expression (20.1) can be developed further:

$$A_{2\_P,Q} = \left|\frac{1+\mu}{1-\rho_{1,2}{}^2(1+\mu)}\right| . \qquad (22)$$

For an optimal behavior of the primary structure, it is needed that the amplification factor A_2 gain minimum values in the neighborhood of $\rho = 1$. In order to obtain equal values of A_2 in the points P and Q one needs to fulfill the following condition:

$$\left|1-\rho_1{}^2(1+\mu)\right| = \left|1-\rho_2{}^2(1+\mu)\right| . \qquad (22.1)$$

By replacing the corresponding values for ρ_1 and ρ_2, obtained from the equation (21) we obtain the optimal value of the coefficient f_{opt} [Hartog]

$$f_{opt} = \frac{\omega_{d,opt}}{\omega} = \frac{\sqrt{1-0.5\mu}}{1+\mu} . \qquad (23)$$

The corresponding values are:

$$\rho_{1,2,opt} = \sqrt{\frac{1 \pm \sqrt{0.5\mu}}{1+\mu}} . \qquad (23.1)$$

$$A_{2,opt} = \frac{1+\mu}{\sqrt{0.5\mu}} . \qquad (23.2)$$

All this can be seen clearly in the Figure 6 below

A_2

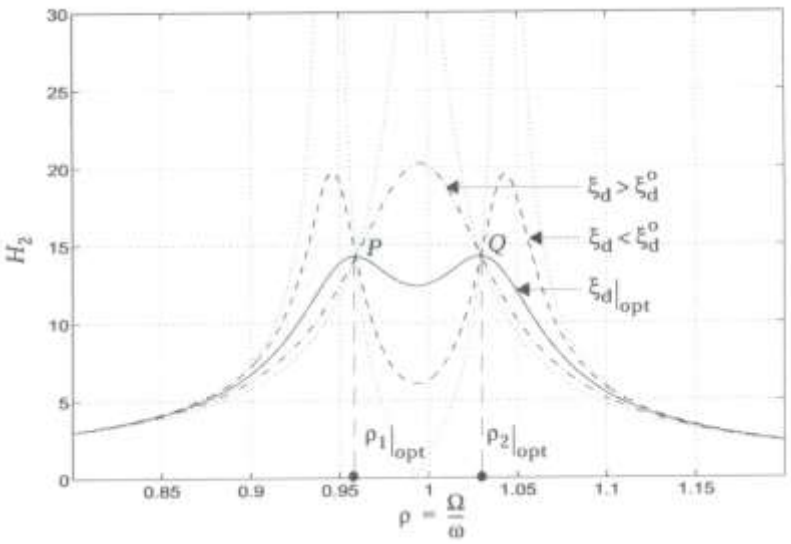


Fig. 6. Plot showing the displacement amplitudes of the primary structure for the case of the optimal damping ratio $\xi_{d,\ opt}$

Finally, the optimal value of the damping coefficient for the TMD is given by the expression (24) [Soong]:

$$\zeta_{d,opt} = \sqrt{\frac{\mu(3-0.5\sqrt{0.5\mu})}{8(1+\mu)(1-0.5\mu)}} \ . \tag{24}$$

1.1.1. Example

In order to better appreciate the beneficiary contribution of a TMD when mounted on the top of a structure, we will show it through two simple examples, as shown below.

- A shear frame such as the one shown in the Figure 4 above with a mass lumped at the story level $m = 300\ kg$ and a story stiffness $k = 2 \cdot 10\ 6\ N/m'$ is subject to the action of a harmonic force $p\ t\ =\ p\ 0\ \cdot sin\Omega t$, with an amplitude $p\ 0\ = 3000\ N$ and with a circular frequency of $\Omega = 110$ rad/sec. The task is:
  First Case - TMD "control" (undamped shear frame, undamped TMD)**:** Design a TMD in such a way that the story displacement of the primary structure vanishes completely (this is only theoretically possible) whilst the *steady-state* displacement amplitude of the TMD is less than $0.02\ m$.

The *steady-state* amplitude of the tuned mass damper needs satisfy the following condition

$$u\ d\ =\ p\ 0\ \ k\ d\ < 0.02\ m \text{ or, } k\ d\ >\ p\ 0\ \ 0.02\ =\ 3000\ 0.02\ = 150000\ N/m$$

This implies that the mass ratio $\mu =\ m\ d\ m$, and $m\ d\ m\ =\ 1\ f\ 2\ \cdot\ k\ d\ k$, from where results

$f =\ \omega\ d\ \omega\ =\ \Omega\ \omega\ =\ 110\ \ k\ m\ =\ 110\ \ 2000000\ 300\ = 1.347$, therefore

$m\,d\ m\ =\ 1\ f\ 2\ \cdot\ k\,d\ k\ =\ 1\ 1.347\ 2\ \cdot\ 150000\ 2000000\ =0.0413$, Chosen $\mu = m\,d\ m\ =0.06$

Using a short script within Matlab, will yield the *steady-state* amplitudes of the primary shear frame structure (Figure 7a) and the TMD (Figure 7b)

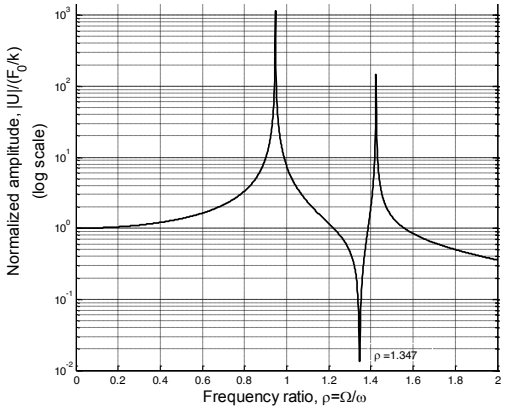


Fig. 7a. Plot showing the *steady-state* displacement amplitude of the primary structure - the lumped mass of the shear frame

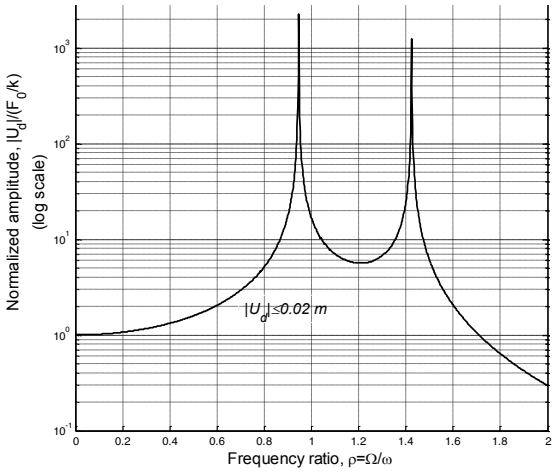


Fig. 7b. Plot showing the steady-state displacement amplitudes of the TMD structure

<u>Second Case - primary structure "control"</u> (undamped shear frame, damped TMD - optimal TMD Design)**:** Design a TMD in such a way that the story displacement of the primary structure remains less than $0.009\ m'$.

Once again, with the help of a Matlab optimization function (*absorbmsratio*) it is found that the ratio $\mu =\ m\,d\ m\ $ should be greater than $0.057\ (m\,d \sim 5.7\% \cdot m)$ in order to meet the displacement amplitude constraint of the primary structure - see Figure 8a below

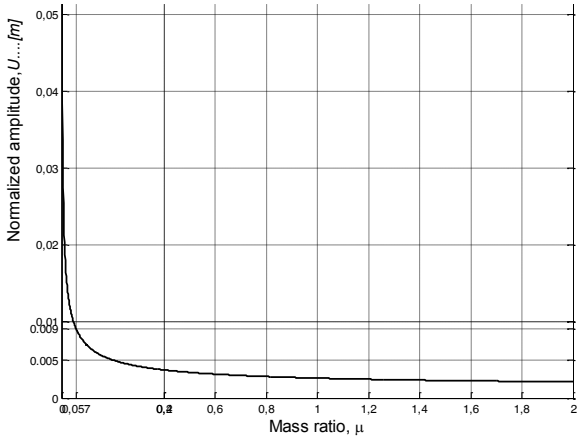


Fig. 8a. Plot showing the *steady-state* displacement amplitude of the primary structure *vs.* mass ratio μ, for $\mu = 0.057$ on meet the design criteria $u\ 0\ < 9\ mm$

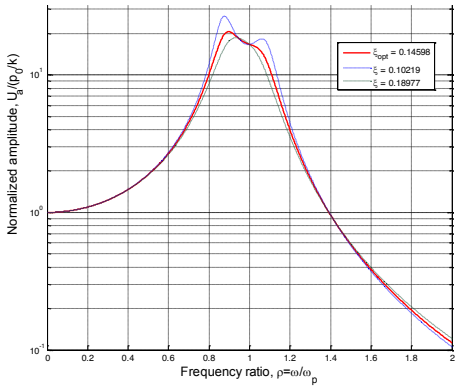
Let $\mu = 0.06$, then the Matlab script [Bingen Yang] *absorbopt* yields the optimal TMD parameters as follows:

- the optimal frequency ratio (equation 23) $f\ opt\ = 0.934$
- optimal damping ratio $\xi\ d,\ opt\ = 0.14598$
- approximate damping ratio (equation 24) $\xi\ d,\ appr\ = 0.14569$
- TMD mass $18\ kg = 0.06 * 300$
- TMD damping coefficient $c\ d\ = 404.804\ Ns/m$
- TMD stiffness $k\ d\ = 106799.57\ N/m$
- TMD natural circular frequency $\omega\ d\ = 77.028\ rad/s$
- Maximum normalized displacement amplitude of the primary structure $U\ \ p\ 0\ k\ = 5.8649$ at $\rho = 0.88784$
- Fixed points P and Q at $\rho\ 1\ = 0.88453$ and $\rho\ 2\ = 1.05609$
- Normalized displ. amplitude of the primary structure $U\ \ p\ 0\ k\ = 5.8595$ in P

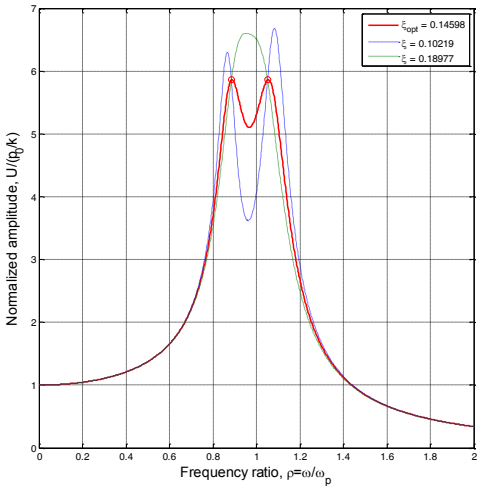
The two figures, Figure 9a and Figure 9b below, show the normalized displacement amplitudes at the optimal damping ratio $\xi\ d,\ opt\ = 0.14598$ and two other comparing damping ratios.

The maximum displacement amplitude of the primary structure under the so designed and built TMD is $U\ max\ = 5.8595 \cdot\ 300\ 2 \cdot\ 10\ 6\ = 0.00087\ m < 0.009\ m$

Requirement (design criteria) fulfilled - the shear-frame possess the required stiffness



a)



b)

Fig. 9a, b. Plot showing the *steady-state* displacement amplitudes of the optimally tuned TMD and the primary structure *vs.* frequency ratio ρ

2 Conclusions

- The TMD can be tuned to a single structural frequency
- The TMD is independent from an external power supply
- Use of inertia force to counteract primary structural motions
- A simple, yet a very elegant way of reducing the structural motions
- The TMD is much more effective for wind induced vibrations than earthquake ones
- The TMD can become out-of-tune or off-tune due to changes in the primary structure' natural frequency, resulting from addition or removal of masses
- Can be used in combination with other structural protective systems

References

1. Den Hartog J. P. (1947). *Mechanical Vibrations*, New York: Dover Publications, INC.
2. Ray W. Clough, Joseph Penzien. (1993). *Dynamics of Structures*: MCGRAW-HILL Second Edition.
3. Bachmann H. (1981). *Experiments and Models for the Damping Behaviour of Vibrating Reinforced Concrete Beams in the Untracked and Cracked Conditions*: Zürich. ETH.
4. Anil K. Chopra. (2007). *Dynamics of Structures*: Prentice Hall. Third edition.
5. Der Ingenieurbau. (1999). *Technische Mechanik "Grundwissen"*: Ernst&Sohn.
6. Soong T. T., G. F. Dargush. (1997). *Passive Energy Dissipation Systems in Structural Engineering:* Chichester, John Wiley & Sons Ltd.
7. Soong T. T. (1994). *Passive and active structural control*: Springer Verlag.
8. Thompson D'Arcy. (1961). *On Growth and Form*: Cambridge University Press.
9. Feti S., Musa S. (2005). *Izolimi sizmik – një shans për të mbijetuar strukturat edhe pas tërmeteve të forta*: Tetovë, Simpoziumi SHAIN.
10. François Frey. (2000). *Analyse des structures et milieux continus*, Lausanne. Traité de Génie Civil de l'EPFL – Mécanique des structures.
11. Chu S. Y., Soong T. T., Reinhorn A. M. (2005). *Active, Hybrid and Semi-Active Structural Control*, Edition Wiley.
12. www.digitexx.com, www.csiamerica.com\

Analogy in elements: breaking the national identity

Kujtim Elezi[1], Nuran Saliu1
[1] State University of Tetova, Faculty of Applied Sciences, Republic of Macedonia, University Rectorate

Abstract. The first aim of this paper is to present the after W.W.II temptation of the Macedonian authors to identify national elements that is Macedonian elements in houses build in Macedonia. After identifying them, the same elements (now national) will be used to declare the national heritage in Macedonian houses. Secondly, we would like to compare the same elements found as Macedonian with other places, like Turkey (involving Bursa, Istanbul and other cities), to see if they really are different as those from houses in Turkey, or there is a similarity between them.

Keywords: **tradition, identity, history of architecture.**

1 Introduction

The year of '49 marks the beginning of the search for national elements in houses build in Macedonia, when a Slovenian born architect Dusan Grabrijan will be called to make a study trip to Macedonia and identify Macedonian national elements in houses build in the late 19th century and begin of the 20th century. Grabrijan, and after him other Macedonian authors, not only will identify Macedonian national elements in houses build in Macedonia, but moreover will speak about the analogy between Le Corbusier and houses build in Macedonia; the Macedonian influence on Le Corbusier and the importance of the national architecture in Macedonia for the modern movement. One might be satisfied and might believe in all what was written about these topics, only when one side of the story is taken for granted. On the other side, if we compare houses build in Macedonia with those build in Turkey, we hardly can find the difference between their elements.

2 National elements in architecture

It can be said that all the authors that worked and studied profane architecture of the end of 19th century and the beggining of 20th century in territories of Macedonia were lucky, because after the Second World War they would find the full ´dough´and almost intact from war. As a start let us mention the study done by Aleksandar Deroko, whose work *(Narodno Neimarstvo I, II*, Naućno Delo, Beograd, 1968*)*. presents the real situation of different cities across Yugoslavia, were a part of the contents will make the presentation of the situation in Macedonia (Deroko 1968). Deroko´s work, if it was not for thorough and rational analysis of urban and architectural solutions of old city houses, it will be important for presenting inf form of photographs for many buildings, which very soon will leave place to new interventions, mainly done in name of modernism that was belatedly embraced. It seems that the given denomination *´People´s Architecture´* is general one, or better said all-embracing one, because the term *national(people´s)* would be included buildings from south of Macedonia to north of Slovenia. Above all, this universal denomination was not revealing the macedonian identity in architecture. Therefore, later we observe that macedonian researchers reveal desire to present what was built in Macedonia initially exclusively macedonian, and later as national. It is worth mentioning local authors, who will intentionally guide their studies towards identifying macedonian elements in the architecture of houses, and the national character expressed through architecture. *Sotir Tomoski,* describes the whole value of the Macedonian house. He names the chardak as the most important element of the house, around which the anonimous master organizes other rooms (Tomoski 1960). According to Tomoski, the chardak is the heart of the Macedonian house, it is the place where one relaxes and has the possibility of the good view. Standing in the chardak makes you believe one is up in the air. Further, Tomoski talks about the two storey level that the house has, than the flexibility of the floors, where he discovers that every flor

can be (or is) organized differently compaired with other ones. The great number of windows designed and build close to each other is another element that vecon the Macedonian house from that of the Orient. Indeed, according to Tomoski the Macedonian house is open to the public, that is street, has nothing to hide inside. Another key element named as Macedonian is the geometry of the house itself, where, due to the terrain complexities the ground floor is very small, and above the ground floor the master in Macedonia uses the console, the erker and the chardak as elements that would settle order in the geometry of the floor, and makes the first or the second floor bigger, compaired to the ground floor. More specifically, Tomoski suggests that, "*These* [Macedonian] *houses are the ancestors of modern architecture...*" (Tomoski 1960) *Krum Tomoski,* in his 1966 work '*Dejnosta na majstorite graditeli od Debar'*(*The Creativity of the Master Builders of Dibra*) did not discuss the qualities of Macedonian nineteenth century architecture, and instead occupied himself with the "identification" of the masters builders from this period. Of all the achievements in the sphere of nineteenth-century architecture in Macedonia, he concentrated on the master builders from the city of Dibra and the surrounding region. According to Krum Tomovski, Dibra's master builders built not only in Macedonia but in the whole area of the Balkans and Asia Minor. The proverb "If Istanbul is destroyed, Dibra will re-built it, but if Dibra is destroyed even Istanbul cannot rebuilt it" is said to prove the importance of the "Dibra School" in the whole region of the Balkans during the nineteenth century.

Boris Čipan in his *'Starata gradska arhitektura vo Ohrid'* (*Old Town Architecture in Ohrid*), lists the characteristics of the nineteenth century architecture in Macedonia. He claims that Macedonian houses have separated the functions in the house floors, such the ground floor contents the working place, storage rooms, and other floors, one or two are reserved for the dwelling or living purposes, in short in summer and winter living areas. Čipan explains: "The creative capability of the master builder, with which he solves this problem, has as a result an architecture that is entirely humanized, setting the master builder from Ohrid close to the protagonists of modern architecture."(Čipan 1982). Elsewhere in his book Čipan argues that the Bondruk structural system allowed the master builder great flexibility and freedom in planning the floors and the facades. Sometime later, Jasmina Haxhieva-Aleksievska argued in her 1984 book Merki, antropomorfnost i modularni proporcii kaj starata Makedonska kukja (Measures, anthropomorphism and modular proportions in the old Macedonian house) that the anonymous master builder stays very close to the modernists in applying mathematical and geometrical ordering principles in his architecture. In analyzing houses from almost all cities in Macedonia, Haxhieva-Aleksievska discovers that geometrical and numerical methods, such as "square decomposition" the "Pythagorean theorem", the "Golden Section" and the "Fibonacci series" have been used in vernacular architecture in Macedonia (Haxhieva-Aleksievska 1984). She claims that this was not a coincidence, because there are too many examples of buildings that conform to one of these systems. Instead of chance, the use of these theorems has to have been some sort of "education" during which the anonymous master builders went through (Haxhieva-Aleksievska 1984). She found little difference between the Arshin, a proportional system allegedly used by the master builders of Dibra, and Le Corbusier's Modulor. The Arshin comprises of the sequence: 28,5 cm - 47,5 cm - 76 cm - 84,5 cm - 114 cm - 180,5 cm - 228 cm, while Le Corbusier's Modulor proscribes the dimensions 27 cm - 43 cm - 70 cm - 86 cm - 113 cm - 183 cm - 226 cm. *Marula Nikoloska* is worth to be mentioned here for the various examples of the houses in the city of Krusevo. In her study, *Prostorna organizacija gradske kukje XIX veka u Makedoniji* (a Doctoral thesis), Nikoloska shows the importance of the dwelling process, the role of the chardak in the house of Kruševo, and different solution of the floors, based most likely on the complexity of the terrain. The soul of the Macedonian house it can be followed in the descriptions of another native author *Petar Mulićkoski*. Mulićkoski in his book claims that the soul of a nation can be read from the architecture it produces (Mulickoski 2000). However, he points out that Macedonian architecture can't be represented solely by the architecture of the nineteenth century for the Macedonian way of dwelling reaches back to antiquity. Based on its particular qualities, Mulićkoski claims that the Macedonian house can be compared with other "well known models from around the world" such as the Pompeian house, and dwellings from Japan and China (Mulickoski 2000). However, as a bible of the Macedonian house will count a publication of a not native author- *Dušan Grabrijan*. Published in 1955, *Makedonska kuća* [*The Macedonian House*] presents all of what Grabrijan had investigated and found interesting in Macedonia back in 1949. One of the first issues to be discussed in the book concerns house typologies. Basing on examples from the region, Grabrijan distinguishes two basic house types in Macedonia: 1. Velesi or "low" type; and 2. Ohrid or "high" type (Grabrijan 1955).

Grabrijan argues that due to the climate in Macedonia there is a division of the living areas through the different levels of the house; the winter living areas organized on the massive ground floor constructed of stone, and in the summer living areas organized on the upper floor constructed of a wooden frame, and organized around the chardak, which may be open or closed, depending on the climate. The human scale of the rooms in a Macedonian house is expressed, Grabrijan argues, by the changing floor levels, which create varying heights in the rooms. In contrast to other rooms, the chardak, and sometimes the trem, occupy a two-storey space. All dimensions are quite small, and rooms gain life only through the presence of man. According to Grabrijan, the external appearance of the house is also enlivened through habitation, thus lending a harmonious quality to the entire structure. For Grabrijan, the human scale of these houses makes them homey, intimate and human.

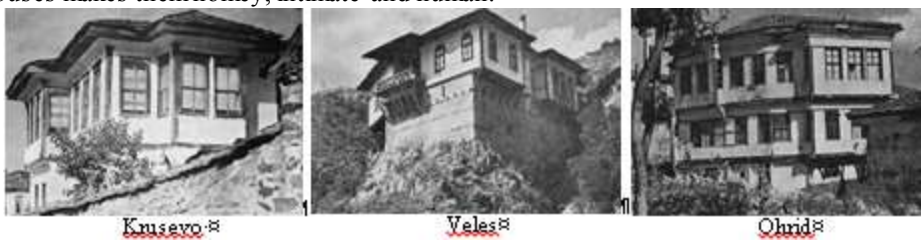


Fig.1. Grabrijan´s Photographs of Macedonian Houses

However, what gave the book special importance are two of Grabrijan's conclusions. Firstly, he argues that Macedonia, thanks to its geographical location, mediates between two entirely different cultures, simply because the Macedonians never totally relinquished their European way of living and were always able to respond to newly emerging needs (Grabrijan 1955). Grabrijan concludes that the Macedonian house presents a transition from the traditional Oriental to the modern European house.

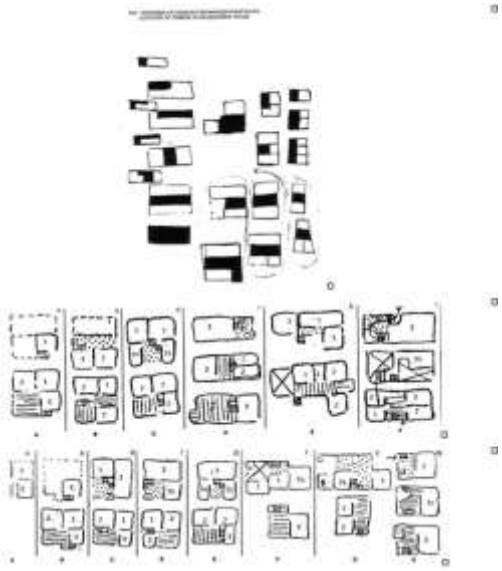


Fig 2. The matrix of planimetric organizations of Macedonian house according to Grabrijan (1955)

Secondly, Grabrijan claims that the nineteenth century architecture of Macedonia follows "modern architectural principles." Grabrijan sees the Macedonian house as a dialogue between "Oriental" and "modern" architectural thinking. "Human scale", "plasticity of spaces", "flexibility", "unobstructed views", and "geometry" were the modern principles he discovered in the Macedonian house (Grabrijan 1955). He believed it was very hard to dismiss the links between the modern and Macedonian house. As an energetic protagonist of progressive architecture, Grabrijan unveiled in the Macedonian architectural heritage a source of creative inspiration for contemporary architecture.

2.1 Conclusion

Going after the above quoted authors, one comes to the conclusion that elements, such as the presence of the chardak as a house element, the asymmetry of the first floor, the geometry of the second and third floor, the look of the house to the street, their openness and lightness, the erker, the console, the bondruk structure, the human scale, the two story level (the gallery), the trem, flexibility of the floor planning, its space full of plasticity, are recognizable Macedonian elements that identify the Macedonian character of the House itself, build in Macedonia during the late 19th and the begin of the 20th century. The chosen elements, identified as Macedonian by different authors in Macedonia, will help them to express the dose of nationalism in architecture at that time, building this way their identity through architecture. The dose of Nationalism looking to be expressed in architecture, confirms the desire of the Macedonians to build the image of identity.

3 International Recognition, Le Corbusier read by Grabriijan

Grabrijan not only was the best example of explaining the meaning and the value of the Macedonian house, but also he will go a step further- that of international recognition of the Macedonian house. The Internationalization of the Macedonian house Grabrijan has achieved comparing the houses he discovered, studied and analyzed in Macedonia with the work of the most recognized Century architect - Le Corbusier.

Grabrijan is deeply convinced there is an analogy between the Macedonian house and Le Corbusier's villas. "I would like to discuss the analogy between the Macedonian house and the modern one. Maybe this analogy seems strange to you." He continues: "Maybe, but only at first, because one is used to hear discussions about the analogy between Le Corbusier and the Oriental house, which at some point withstands scrutiny, but never about the analogy between Le Corbusier and the Macedonian house, simply because here things are a little more sensitive". "After all the parallels presented," Grabrijan insists, "no one can deny the influence of the Macedonian house on Le Corbusier's language of architecture." (Grabrijan 1955).

3.1 Bondruk versus Dom-Ino

For Grabrijan, the most important element in the Macedonian house is its wooden structure, known as the Bondruk. For Grabrijan, the Bondruk system exhibits a logical structural concept; light and adaptable, it is a structure that offers very broad functional and organizational possibilities. Moreover, the Bondruk is said to be analogous to Le Corbusier's Dom-Ino: "The only difference between the structures is in the materials used; here [in Macedonia] it is wood, while Le Corbusier uses the béton armé." (Grabrijan 1955). According to Grabrijan, the columns that support a slab of wood open up the possibility of organizing the each floor independently of the others. Walls need to rest upon those below but they can be freely built where they are most needed, they can meander about or be eliminated altogether if more space is required. Likewise, different functions are possible on each level. Grabrijan states: "It wouldn't be incorrect to compare this with Le Corbusier's *Plan libre*" Grabrijan thinks that the structure also makes it possible for the walls to include open windows in rows, or even for the whole wall to be replaced by windows. "With such a construction, we can open windows everywhere in the wall structure, or the walls can even be completely eliminated. With such a structure, the possibility arises to organize the interior space as one wishes, to model the façade and to open windows in walls. Like it or not," continues Grabrijan, "I come to think here of Le Corbusier's *façade libre and fenetre en longueur."* (Grabrijan 1955).

3.2 Erker in Macedonia

The flexibility offered by the Bondruk structure is not limited only to the planning of the floors and facades. Grabrijan also finds attractive the potential the structure gives the master builders to correct the irregularity of the ground floor plan on the first floor, to enlarge the area of the first floor during the process of correction, and to practice the cantilever. From his comments on houses from Ohrid, Struga

and Velesi we see that Grabrijan admires the "oriel principle" "These floors", writes Grabrijan, "thanks to the use of the oriel principle, are hung like boxes in the air. The first architectural visitors to Macedonia used to call these floors "hanging places." "Can we call them monumental?" asks Grabrijan, later answering the question himself with: "monumental, explained Le Corbusier once, are only those creations [buildings] with a clear form that come together in one whole." (Grabrijan 1955) So the answer is yes, we can call them monumental because they allow a clear, pure form to come together in a single whole that is the Macedonian house. Grabrijan then poses the question: "Ask yourself, wasn't Le Corbusier using the same elements in his villas"? (Grabrijan 1955)

3.3 The hangar houses

Further similarities are to be found in the plasticity of the "space architecture." Grabrijan compares Ohrid's kiosks that "fly" like airplanes in the air with Le Corbusier's "air architecture" and with Nemours: "Looking at the hanging houses on the steep terrain in Macedonia, which hang one above the other, we have to think in Le Corbusier's Nemours" (Grabrijan 1955). For Grabrijan, the most important point is the resemblance of the "hangar houses" in Ohrid or Struga to Le Corbusier's solutions in Pessac (1925), and his workers' housing in Barcelona (1933). Grabrijan argues that the problems with which Le Corbusier and the master builders in Macedonia had to deal with were the same; that is two long sides of the house were not available for openings, and a minimum amount of surface was available for "both architects" to come to a functional solution for the house. Comparing the houses of Ohrid and Struga with those in Pessac and in Barcelona, Grabrijan points out similarities in the ground floor plans, where the functional concept of the ground floor, entails simplicity and a high level of freedom in their spatial organization. Neither the master builder nor Le Corbusier, explains Grabrijan, won't foresee the use of corridors or free spaces meant, only for circulation, independent of other functions. "Judge for yourself whether these houses [the Ohrid fisherman's house and the Struga gipsy house] are that far from Le Corbusier's workers' houses in Pessac and Barcelona", declares Grabrijan, insinuating that there is an analogy between "both architects." (Grabrijan 1955)

3.4 The concept of the Minimal House

Grabrijan further sees a similarity between the Macedonian house and Le Corbusier's minimal houses: in both cases, external stairs are placed in the front of the terrace. To make this point, Grabrijan, uses the example of a house from Velesi, along with photographs from Tetova and Struga, showing how one flight of stairs is placed beside the exterior wall of the house. Comparing examples of Macedonian minimal houses with Le Corbusier's designs Grabrijan explains: "Le Corbusier organizes the household functions on the ground floor of his minimal house and raises the areas for dwelling up to the first floor. To enter the house, he places a flight of stairs beside the exterior wall, as did the master builders in the Macedonian minimal houses." Le Corbusier, according to Grabrijan, speaking about the problem of using the stairs, once explained:"these stairs beside the exterior wall of the house constitute a tremendous architectural element." (Grabrijan 1955)

3.5 The double-height space

Elsewhere in The Macedonian house Grabrijan thinks that the gallery is yet another architectural element used both by the master builders and Le Corbusier. Grabrijan quotes Le Corbusier as having said that "the house can never be minimal, but rather some functions have to take up smaller areas, however its heart should not be a chicken-coop, it has to be 'a space'." And Grabrijan asserts that the gallery is the element forming the heart of the Macedonian house. Grabrijan claims that Le Corbusier places rooms around the living-room in the same way as the master builders use the chardak in Macedonian houses, and that Le Corbusier's living-room is indeed the same thing as the Macedonian chardak. Comparing the section of the unbuilt Villa Baizeau, Carthago (1928) with that of a Macedonian house (Fig. 58, 59, 60), Grabrijan concludes that Le Corbusier "already knew of this particular problem." He suggests: "Analyze the gallery in houses in Ohrid and Struga, around which are placed other rooms, and you arrive at Le Corbusier's Weissenhof building in Stuttgart or Maison Cook in Paris." (Grabrijan 1955)

3.6 The architectural promenade

Grabrijan also spoke about the *promenade architecturale* in Macedonia: "You begin by passing through the trem on the ground floor, inside the trem there is an open stairs that leads you to the chardak on the first floor, which is surrounded by rooms, either opening directly on to the chardak or connected to it via passages."(Grabrijan 1955). He explains that the spatial path one takes from the trem to the chardak in a Macedonian house is a promenade through space always revealing new surprises. These paths go from one side of the house to the other one: they begin from the ground floor, pass up the stairs and go through the chardak. There are houses, explains Grabrijan, such as in Kruševo, Struga and Ohrid, where you can have three levels on one floor. Describing the promenade architecturale Le Corbusier's villa in Auteuil (1922) Grabrijan then asks: "Is this not the same promenade architecturale one sees in the houses in Struga with their double-height trems?" Then, using the same idea of the path which he claims Le Corbusier learned from Macedonian houses, Grabrijan suggests also that Le Corbusier expressed a similar theme in his exhibition pavilion in Paris from 1937.

3.7 Other analogies

Grabrijan has noticed other similarities between the Macedonian house and Le Corbusier's villas, for instance in the Macedonian rooms without furniture, because, as Grabrijan explains, "the only furniture one finds in the room is a bed and a chair." Furthermore, there is a similar desire for built-in furniture, "because", explains Grabrijan, "the Macedonian "dolaps" [built-in wardrobe] and "sergens" [the horizontal pole under ceilings for hanging men's clothes] are indeed Le Corbusier's furniture that he hides in the walls." (Grabrijan 1955). Grabrijan further explains that an analogy can be seen also in the heights of the spaces in the houses. The height 210cm + 30cm + 210cm = 450cm, which he claims is used also by Le Corbusier in his living rooms, comes from the Macedonian two-storey trem. Grabrijan claims that Le Corbusier's Modulor can be used completely in the Macedonian houses, because the master builders in Macedonia also used the human body as the basis for all their measurements.

Other similarities between the Macedonian house and the Corbusian one, according to Grabrijan, can be found in the "modernity" ground floor plan and elevations, in the independence of the inner disposition of rooms from the wall structure, in the architecture of the outer rooms, in the use of the fireplace and the brise-soleil. "Modern terraces", concludes Grabrijan, "have their origin in the chardaks and brises-soleil that were used as sun breakers." There is no doubt in Grabrijan's mind that Le Corbusier was inspired by the Macedonian way of sun protection, and argues "how else could a northern man come to the idea of using sun protection, when normally he is missing the sun all the time."

3.8 Conclusion

Grabrijan is more than sure that The Oriental house stops here in Macedonia, where it begins the Macedonian house, Macedonia is the red line where one house stops [the Oriental one], and begins the other one [the Macedonian one].
Grabrijan discusses even the question of Le Corbusier, being in Macedonia or not, concluding that Le Corbusier must have been influenced by the Macedonian house, which he seemed to knew, and there lays the importance of the Macedonian house. Macedonian houses, thinks Grabrijan are the ancestors of modern architecture, as they influenced the pioneer of modernism, Le Corbusier himself. "We" [the Macedonians] have contributed to the creation of modern architecture through the mediation of Le Corbusier. "In his Oeuvre Complete 1910-1929 we see sketches, chardaks (verandas) and interiors of our houses. Our old house, naked, rich with the sun, air and green surfaces, with large glass surfaces and with its wooden skeleton, couldn't keep away the feelings of an artistic soul like that of Le Corbusier, who will then demand modern architecture to contend with the same values" helps here Tomoski (Tomoski 1960).

4 Discovering the Turkish house, Sedat Hakki Eldem and Asim Eyup Kömürcüoglu

Some 1500 km away (east), in today's Turkey, authors through their works presented what was built during the past time. One of the earliest of them is Sedat Hakki Eldem and his book *Turk Evi Plan Tipleri*, which goes back to the 1930s, are one of the most important one.
Eldem through his research, attempted to go back to the origins of typologies in their historical vernacular existence. He's diverging his well-studied houses in two different groups: one is flat-roofed, white-washed house with a West Anatolian or even Mediterranean connotation; the other one, a decisively Central Anatolian house exhibiting the language of mud brick or adobe as the primary material of the region. Eldem's preferred Anatolian house with the traditional plan features and horizontal window proportions of the 17th century Amacazade Köprülü Hüseyin Pasa Yali (Fig.3), was an all-time favorite of Eldem's (Bozdogan et al. 1987).

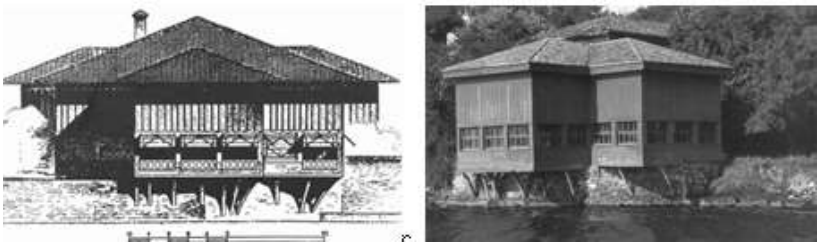


Fig.3. Amacazade Köprülü Hüseyin Pasa Yali (1699)

According to Eldem's research of the last group, we recognize his attempt to present this specific house typology based in *Avlu* (trem) as main element of the house. He is willing to determine the *avlu* as an element surrounded by other rooms, and the stairs that lead to the first floor where the *Diva*n (chardak) is the key element of the floor. Eldem argues that due to the climate there is a division of the living areas through the different levels of the house; the winter living areas organized on the massive ground floor constructed of stone, and in the summer living areas organized on the upper floor constructed of a wooden frame, and organized around the divan (Eldem 1954).

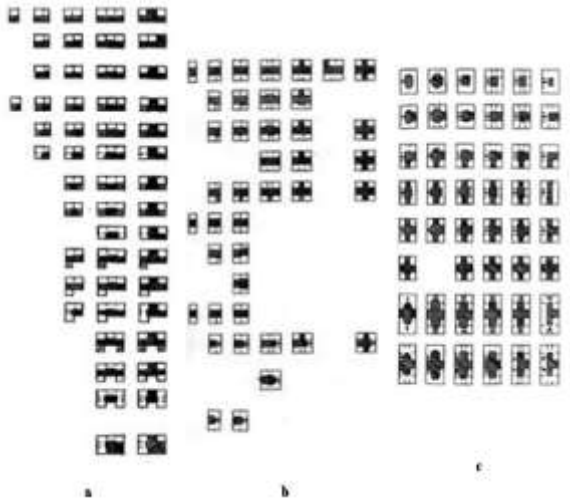


Figure 4. The matrix of Planimetric Organizations of Turkish House according to Eldem;
a) plan type with an outer sofa; b) plan type with an inner sofa; c) plan type with a central sofa

Through his many examples he brings us a variety of plans (floor) qualities. In his study Eldempresents floor plans that are irregular in the first level, than, they attempt to become regular in form, using the so-called *Cikma Konstruktion*, that is the way of 'expending' the floor surface of the house through the console made by wooden framework The wooden frame work, a high quality of a solid house structure is the solution on the hand of the master in Turkey, to get the most of the floor and spatial flexibility.

Knowing and using this structure- all made by wood, the one [the master] was able to build the house where its functionality and philosophy were the main achievements.
The house Eldem is presenting in Turkey is characterized with the horizontal repetition of the vertical windows of 1:2 proportions. The usage of e great number of windows on the walls, tells the desire of the house inhabitants for street view and the light. According to Eldem's explanation, the horizontal repetition of vertical frames, are indeed the vernacular examples of the Turkish house.
The great number of the windows used by the local master goes to the final act of creating the house as a whole: full of lightness, transparency and modular logic (Eldem 1954).
Eldem has noticed that the house in general is a '*non occupied space'* because there is almost no furniture inside, a space build in human scale where one can seat, meditate, rest or work. Indeed, the house is huge, thanks to the proportions used by the master when he builds the house.
Design elements such is minimal space occupied by the house and the *promenade architectural* are two idioms Eldem finds in the houses he studies. Houses that contain the philosophy of the Turks everyday life, are small and huge at the same time, moreover according to Eldem a Turkish House is a generic term applied to a house type, based on a wooden framework, with highly standardized plans and architectural elements.

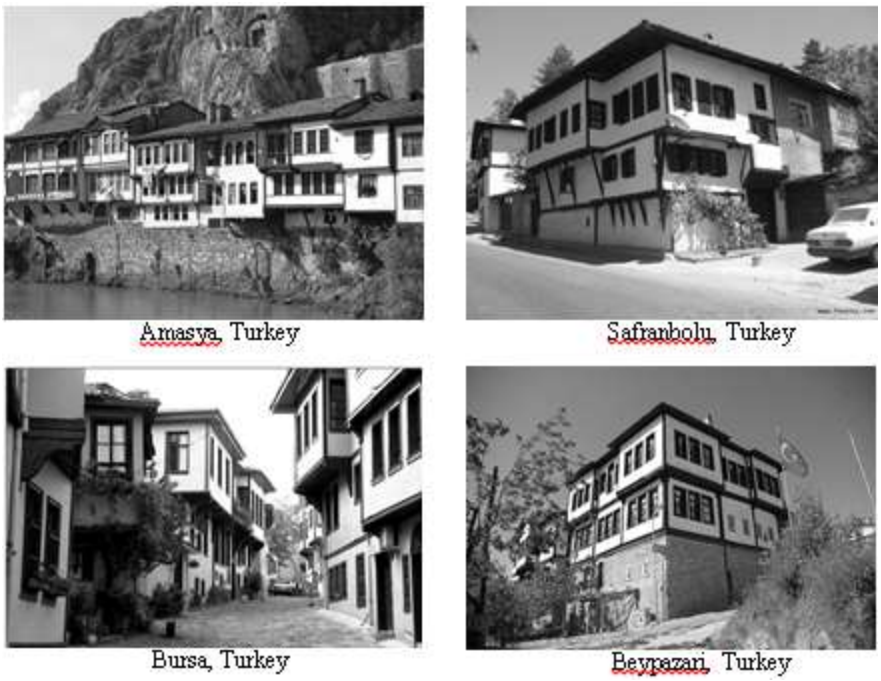


Fig.1. Old Turkish Houses in different cities around Turkey

Another author, Eyup Asim Kömürcüoglu, in his book *Das Alttürkische Wohnhaus*, [*The Old Turkish House*], discuses about the everyday life of the Turks, and how indeed the everyday life has been used as a motif, organizing the house floors in Turkey. Different position of seating, eating and expecting guests, makes different floor levels in the house. That is why, states Kömürcüoglu, in one single floor in the house we find even three different levels, for each purpose one level to be used.
Kömürcüoglu, thinks that the climax and the way the master was using the house elements, such is the *divan*, *avlu*, and the *roof* makes the Turkish house very special. Especially he argues about the possibility of making the roof as a shadow creator in the façade of the house, where the sun 'attacks' the house during the long day. The same roof will be used for the protection of the façade from rain.
Kömürcüoglu concluded that the house in Turkey is built from stone and mud, mostly the ground floor, above which the house continues to grow vertically all made by wood. The wooden structure allows the flexibility in floors, in façade, and the furniture.
Examples of floor plans, presented by Kömürcüoglu, are the most significant examples of how the master did manage the terrain during the 'planning' process of the house. We recognize very well analyzed circumstances where the master places the house, makes the ground floor very small, and then

after he has lifted his house above the ground floor, he will use his '*saçak*' construction and his '*çikma*' construction (Kömürcüoglu 1966) to correct the irregularity of the ground floor, caused by the terrain, than to enlarge the surface of the next floor, where he organizes his '*harem*' and '*selamly*k'.
Kömürcüoglu is convinced that the best description of the Turkish house is that the Turkish house is a conglomerate of the high quality architectural elements, such as the flexibility of plan and structure, philosophy of everyday life realized through architecture, a play of cubes, shadow and the light, altogether brought in the Turkish house as a whole.

4.1 Conlcusion

Table 1. Important elements in Macedonian and Turkish Houses – Comparative table

Elements of Macedonian house according to above mentioned authors	Elements of Turkish House according to Turkish authors
chardak	divan
asymmetry of ground floor	irregularity of ground floor
openness and lightness	lightness and transparency
the erker	cikma construction
bonkruk structure	bondruk structure
human scale	human scale architecture
the trem	avlu
flexibility of the first floors	spatiality and flexibility

Elements that describe the Turkish house: the *avlu*, *divan*, *cikma construction*, the horizontal wooden window, the irregularity of ground plan, the geometry used as a tool to come to the order, the human scale architecture, the lightness and the transparency, the spatiality and flexibility, the building materials, are indeed the same as the elements described the Macedonian house. Their function, philosophy and usage were known and applied by the master in Turkey long before they were spread and used in Macedonia.

5 Dialogue with modernism

Searching the analogy between the Turkish house and the name of Le Corbusier (same as Grabrijan did between the Macedonian house and Le Corbusier) we have to mention some of the Le Corbusier's biographers.
Giuliano Gresleri selected, arranged and published Le Corbusier's notes from his journey through the central Balkans and Asia Minor in 1911. His book *Le Corbusier; Reise nach dem* Orient, contains detailed notes about Le Corbusier's travels in the Balkans, for example cities that he visited in Serbia, then his passage to Romania, his stay in the region of Arbanasi, Shipka, Kazanluk, Veliko Trnovo etc. in Bulgaria, his arrival in Istanbul and at the end his stay in Thessalonica, before he took the road back to La Cheaux-de-Fonds, this time via Italy (Gresleri 1991).
The second of Le Corbusier's biographers suggested by Madame Trehin was Ivan Žaknić who also writes about Le Corbusier's *Voyage* through the Balkans in 1911. In his book there are details described Le Corbusier's passage through the Balkans and his final destination - Turkey, exactly the city of Istanbul (Žaknič 1987).
In *Le Corbusier,* The *Noble Savage*, Adolf Max Vogt agrees to the effect that without the oriel principle, the Villa Stein and the Wiessenhofsiedlung could not have been conceived. Vogt describes the oriel principle, or as he calls it the "*Çikma* construction", as a Turkish element that had been used in architecture for a considerable time. Vogt believes that Le Corbusier got this element from houses he was sketching along the Bosphorus in 1911 during his stay in Istanbul (Vogt 1998). Unlike Vogt, Giuliano Gresleri states in *Le Corbusier; Reise nach dem Orient* (1991) that Le Corbusier had studied the oriel principle in Tarnovo in Bulgaria, where he sketched houses with this particular element. On the other hand, According to Vogt, Le Corbusier found an architectural configuration in which walls are replaced with columns in Istanbul as well (Vogt 1998). Vogt is able to show that Le Corbusier studied the *pilotis* of the Kiosks or the pavilions in 1911 and claims that without this experience, the

Villas in Carthage and Poissy could not have been built. It would have been the Orient where Le Corbusier studied the *pilotis* principle. Vogt thinks that the Third Point– the *fenetre en longueur*– was developed by Le Corbusier by analyzing the pavilions along the banks of the Bosphorus in 1911. Furthermore, the pavilions gave the inspiration for two other of the five points: the *pilotis* and the *façade libre*

5.1 Conclusion

Le Corbusier visiting, staying and studying the old houses in Turkey is more likely to have been influenced by what he saw back in 1911, and the analogy between the works of Le Corbusier and the Turkish house it comes from that part of his 'education'. Shortly, Le Corbusier is influenced from the Turkish house, however not the Macedonian one.

6 General Conclusion

- It is plausible to conclude that there might be a *Macedonian elements* in the houses build in Macedonia, simply because the same '*Macedonian*' elements miss their originality, they are used in other places too, even before the same ones have been applied in houses in Macedonia (Wilde 1909). The same architectural elements are identified in Turkey– identifying the Turkish house. From here, one can not conclude that there is a Macedonian house, because analogies between houses build in Macedonia and the Turkish house is enormous.
- Le Corbusier could not have been inspired or influenced from houses build in Macedonia, simply because he never was there. There is a connection, or influence from the Orient - that is the Turkish house, because Le Corbusier was in Turkey in 1911 and studied the Turkish house in order to get some influence for the new modern architecture. From here, our conclusion will be that he had some influences from houses he saw in Turkey.
- Grabrijan conclusion that the Macedonian house presents a transition from the traditional Oriental to the modern European house is also plausible enough. Macedonia is not the border where the Oriental (Turkish) House stops, and begins the Macedonian house. Grabrijan itself, who made this conclusion, is controversy with himself when concluding some time later that the Bosnian house is the imitation of the Turkish house in Balkans, establishing the link between the Turkish house and the Bosnian Oriental house (Alic 1999).
- The analogy between the Turkish houses and Le Corbusier's villas at one side, and the analogy of the houses build in Macedonia and Le Corbusier's work at the other side, confirms the analogy between houses build in Macedonia and those build in Turkey. Since the analogy is sustainable (strong) there is no doubt that houses build in Macedonia might have different elements, which at the very end can be named as national Macedonian.

References

1. Alic, Dijana. „From Ottoman house to Bosnian style: Neidhardt's design for workers' housing in Bosnia and Herzegovina (1939 to 1942)." *Site Vol.1*, 1999.
2. Bozdogan, Sibel, Suha Ozkan, und Engin Yenal. *Sedat Eldem: Architect in Turkey*. Singapore: Concept Media / Aga Khan Trust for Culture, 1987.
3. Čipan, Boris. *Stara gradska arhitektura vo Ohrid*. Skopje: Makedonska Kniga, 1982.
4. Deroko, Aleksandar. *Folklorna Arhitektura u Jugoslaviji, Narodna Arhitektura I*. Beograd: Naucna Knjiga, 1968.
5. Eldem, Sedat H. *Türk Evi Plan Tipleri*. Istanbul: Instanbul Teknik Üniversitesi Yani, 1954.
6. Eldem, Sedat H. „Toward a Local Idiom: A summary History of Contemporary Architecture in Turkey." *Conservation as Cultural Survival*. Philadelphia: Aga Khan Award for Architecture, 1980. 89-99.

7. Grabrijan, Dusan. „Makedonska kukja, ili preod od stara oreintalska vo sovremena evropska kukja.“ *Ljubljana*, 1955.
8. Gresleri, Guiliano. *Le Corbusier, Reise nach dem Orient*. Zürich: Spur Verlag, 1991.
9. Haxhieva-Aleksievska, Jasmina. *Merki, antropomorfnost i modularni proporcii kaj starata makedonska kukja*. Skopje: Studenski Zbor, 1984.
10. Kömürcüoglu, Eyup Asim. *Das Alt-türkische Wohnhaus*. Wiesbaden: Otto Harrassovitz, 1966.
11. Mulickoski, Petar. *Kreativniot duh na makedonskata kuka*. Skopje: AEA, 2000.
12. Tomoski, Sotir. *Makedonska narodna arhitektura*. Skopje: Tehnicki Fakultet, 1960.
13. Tomovski, Krum. „Dejnosta na majstorite graditeli od Debar.“.
14. Vogt, Adolf M. *Le Corbusier the Noble Savage"*. Cambridge, Massachusetts, London, England: The MIT Press, 1998.
15. Wilde, H. Brussa. *Eine Entwicklungsstätte türkischer Architektur in Kleinasien unter den Ersten Osmanen*. Berlin: Ernst Wasmuth Verlag, 1909.
16. Žaknič, Ivan. *Journey to the East*. Massachussets: MIT Press, 1987

Modified Sma Design Mix For Motorway Wearing Course – Case Study Kosovo Motorway

Esat Gashi [1] , Hajdar Sadiku[2]
Civil Engineering Faculty, University of Prishtina & University for Business and Technology - Prishtine
esat.gashi@uni-pr.edu ; esat.gashi@ubt-uni.net
[2]Lecturer at the Civil Engineering Faculty University of Prishtina,
Department of road Infrastructure,
hajdar.sadiku@uni-pr.edu

Abstract: Stone Mastic Asphalt (SMA) mixtures rely on stone-to-stone contacts among particles to resist applied forces, and permanent deformation. Aggregates in SMA should resist degradation (fracture and abrasion) under high stresses at the contact points. For the Motorways, SMA stone grid must fulfil the Mineralogical-petro-graphic condition to be on rock of igneous and/or metamorphic origin but of silicate composition, specific weight and LA method on resistance to fragmentation. During the construction of the Kosovo motorway for wearing course was used the SMA as a asphalt layer providing longer lifetime to the road construction. During the Motorway construction the contractor was short of stone material with as specified in GTR material for wearing course, therefore it was compulsory to compose a new asphalt design mix with available rock in Kosovo. New quarry was explored in place called Golesh where stone extracted from this quarry have LA resistance on fragmentation lower than specifications allow for motorway. Specific weight of this stone is for 15% greater than ordinary stone used in laboratory design mix. For this specific stone were prepared special asphalt design mixtures with binder content 4.5% which was well below than typical SMA composition of 6.0 −7.0% binder. During the asphalt paving some bitumen patches were noticed due to the specific weight of the stone in design mix, therefore it has been reduced vibration during the asphalt compaction. In this paperwork we will present design mixes with stone used from golesh quarry and results gained in laboratory and on site.

Key words: SMA design mix, stone grid, structural design , bitumen content, quality assurance, quality control

1 Introduction

Current practices for asphalt mix design and acceptance testing rely on volumetric properties. Vital to the calculation of mix volumetric properties are specific gravity measurements of the mixture and the aggregate in the mixture. In essence, the specific gravity measurements are conversion factors which allow conversion of mass percentages to volume proportions/percentages. By the nature of the materials used for construction, it is impossible to design a road pavement which does not deteriorate in some way with time and traffic, hence the aim of structural design is to limit the level of pavement distress, measured primarily in terms of riding quality, rut depth and cracking, to pre-determined values. Variability in material properties and construction control is always much greater than desired by the design engineer and must be taken into account explicitly in the design process. Only a very small percentage of the area of the surface of a road needs to show distress for the road to be considered unacceptable by road users.

The purpose of structural design is to limit the stresses induces in the sub grade by traffic to a safe level at which sub grade deformation is insignificant whilst at the same time ensuring that the road pavement layers themselves do not deteriorate to any serious extent within specified period of time.
Each new structure initially need to be design and calculated, road structure as well,

2 Stone Mastic Asphalt Mixes

Stone Mastic Asphalt is a high stiffness, high macro texture bituminous mixture suitable for use in high demand and/or high speed areas. The high macro texture compared with asphaltic concrete allows good surface drainage hence reducing the risk of aquaplaning, and also reduces traffic noise compared with chip seals or asphaltic concrete. International evidence has shown that Stone Mastic Asphalt resists the reflection of cracks in underlying layers as well. The process of designing a SMA mixture involves adjusting the grading to accommodate the required binder and void content rather than the more familiar process of adjusting the binder content to suit the aggregate grading.
Commonly used additives are fibres, such as cellulose fibres. Mastic is the mortar comprised of fines, filler, binder and stabilising additive, and may be modified with polymers to improve its rheological properties. The composition of the mastic mortar is a crucial factor contributing to the performance of Stone Mastic Asphalt. Bituminous binder shall be 60/70 penetration grade bitumen. Sufficient stabilising additives shall be added to the Stone Mastic Asphalt to ensure binder drainage does not occur during storage, transportation and construction. The design process for Stone Mastic Asphalt involves adjusting the grading to accommodate the required binder content (minimum of 6% to 7% depending on maximum aggregate particle size) and voids content rather than the traditional design process for other asphalt mixes, of adjusting the binder content to suit an aggregate gradation. Only crushed aggregates are specified for the Stone Mastic Asphalt to ensure suitable aggregate interlock. The use of natural aggregates containing polished or rounded particles, such as sand, is not permitted.

2.1 Stone

The use of certain types of stone in the pavement structure asphalt courses depends on the mineralogical and petrographic composition, the physical and mechanical properties and the granular stone materials production technology.

2.2 Quality requirements

Stone quality as raw material for production of granular stone material must full fill the conditions in order to be used for the asphalt pavements, some of the criterias are shown at the Table 3 .

3 Asphalt Mix Design Properties

Due to the fact that close to the Motorway site it was not available stone quarry with stone resistance to crushing LA < 16 as it is requested by the EN standard for stones, it was taken in consideration to design a new asphalt mix using the stone granular from the quarry close to the Motorway (MIM Golesh quarry) with following to major characteristics:

Stone resistance factor to crushing **LA =18** Density of stone material mix **ρ_{smm}=3100 kg/m^3**

The new design asphalt mix was prepared with this stone for execution of wearing course of highway. Wearing course of highway was stone mastic asphalt of stone material with maximum (nominal) particle size of 16 mm (SMA 16 mm). For new asphalt design mix were prepared 6 samples for initial job mix formula according to standard procedures.

Table 1. Composition and properties of designed asphalt mixtures.

	AM1	AM2	AM3	AM4	AM5	AM6
Density of mixture FKM [t/m^3]	3,070	3,070	3,070	3,067	3,061	3,054
Density AM [t/m^3]	2,829	2,863	2,881	2,816	2,818	2,820
Percentage of bitumen content in AM [%(m/m)]	4,12	3,49	3,18	4,33	4,20	4,04

Bitumen density: The density of bitumen used for preparation of asphalt mixtures and test specimen made according to Marshall Method (EN 15326), Picknometer Method ρB=1,001 (t/m^3). Bitumen type is
PmB 45/80 – 65 (Ex –Fis), and the bitumen content in asphalt mix design is 4.5 %.
Additives: used at the design mix were: Fibres „ Arbocel ZZ 8/1 with share in design mix 0.4 % and „Interflow – T'' as chemical additive with share id design mix 0.6%.
The final mix design for wearing course of highway with stone mastic asphalt of stone material with maximum (nominal) particle size of 16 mm (SMA 16 mm) was accepted with following distribution See table 2.

Table 2. New mix design

ASPHALT MIX DESIGN			
Stone material	Aggregate fraction	Share in mix [%(m/m)]	Density [t/m^3]
Cement	Filler	6.7	3,000
Mim Golesh	0-4	21.6	3,108
Mim Golesh	4-8	16.7	3,107
Mim Golesh	8-11	18.5	3,096
Mim Golesh	11-16	36.5	3,120
Density of stone material [t/m^3]			**3,105**
Type of bitumen			PmB 45/80-65
Density of bitumen [t/m^3]			1,012
Bitumen content in AM design			**4.5%**
Additive ; Fibres „ Arbocel ZZ 8/1			0.4%
„Interflow – T''			0.6%

Table 3. Grain size distribution diagram

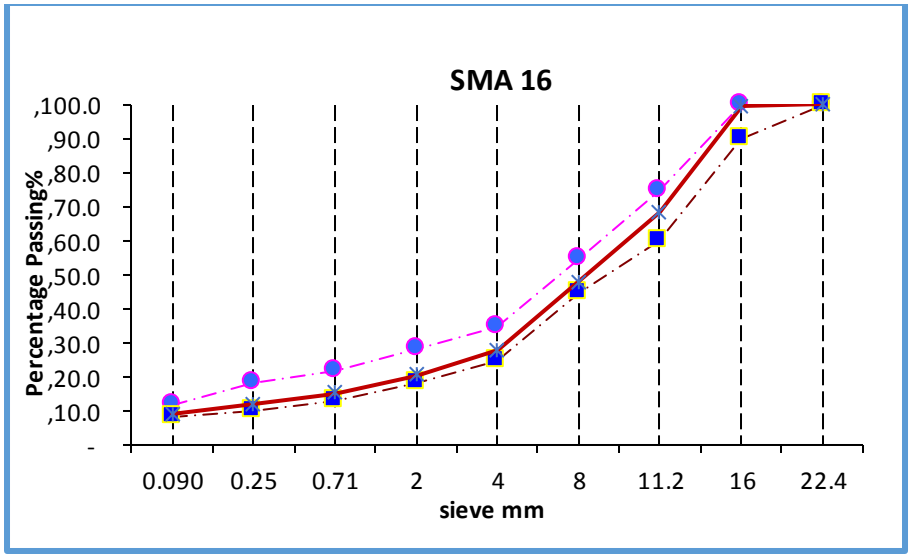


Table 4. Physical-mechanical properties an laboratory testing results for asphalt mixture Stone Mastic Asphalt SMA

No.	**Technical characteristics**	**Test standard**	**Laboratory Results**	**Quality conditions**	**Category EN 13108**
1(a)	Void content, [%] Vmax	EN 12697-8	4.5	3 - 6	Vmax6 Vmin3

2(a)	Voids filled with bitumen, VFB max	[%]		73.8	71 - 83	VFBmax83
3(a)	Voids filled with bitumen, VFB min	[%]				VFBmin71
4(b)	Drained material, D	[%]	EN 12697-18	0.11	≤0,6	D0,6
5(c)	Indirect tensile strength ratio, ITSR [%]		EN 12697-12 EN 12697-23	86.93	≥ 80	ITSR80
6(d)	Wheel tracking slope, WTSAIR	[%]	EN 12697-22	0.038	≤ 0.07	WTSAIR 0.07
7(d)	Proportional rut depth, PRDAIR	[%]		4.63	≤ 5.0 [%]	PRDAIR5.0
8(e)	Stiffness	[MPa]	EN 12697-26	4022	3600 - 7000	Smin3600
9	Bulk Density	[kg/m^3]	EN 12697-6	2702	-	-
10	Maximum Bulk Density	[kg/m^3]	EN 12697-5	2828	-	-
11	Degree of compaction, min.	[%]	EN	98	98	Min 98
12	Stability	[kN]	EN 12697-34	8.8	-	-
13	Deformation	[mm]		3.9	-	-
14	S/D	[kN/mm]		2.3	-	-
15	Bitumen cont. in AM	[%]	EN 15326	4.5	6-7%	-

4 Test Analyses of paved wearing course SMA – 16

During the laying down of the wearing course SMA 16 some smooth areas were noticed after the ironing of the paved surface, even the test analysis were within the GTR requirements. These smooth areas were created as a consequence of appearance on surface of excessive amount of bitumen and polymers in the bitumen coat. see picture 1 and picture 2

Fig. 1. Smooth areas of WC – SMA 16

Fig. 2. Smooth areas of WC –SMA 16

Checked samples of WC – SMA 16 composition and physical mechanical properties of the hot mix asphalt meet the GTR requirements as presented at table 8, in the light of the probleme occurred of non

uniformity of the wearing course the operator with the presence of internal control and surveillance reduced the energy of the compaction of asphalt layers. The standard compaction procedure 1 S+3V+0.5 S was reduced to 1 S+2.5V+0.5 and the uniformity of the wearing course was slightly improved as showned in the picture 3 and picture 4 .

Fig 3. Uniformed Paved WC – SMA 16 surface after reduction of energy

Fig 4. Uniformed Paved WC – SMA 16 surface after reduction of energy

it need to be stated fact that even the vibration energy was reduced, test results prove that the asphalt wearing course compaction is within the GTR parameters (general technical requirements) for road works of wearing course.

By all project stakeholders The Client, The Employer Representative and by the Contractor is accepted that for Kosovo Motorway SMA wearing course a reduced energy compaction to be used until the completion of the motorway unless the rock is changed.

5 Conclusion:

- Stone quality as raw material for production of granular stone material must full fill the conditions in order to be used for the asphalt pavements.
- Sometimes can be considerd stone for producing the granular material with the higher resistance on fragmentation and higher specific weight as well.
- Superpave design mix with stone granular material with higher spefic weight than optimum stones requires less bitumen in the design mix.
- Designers who prepare the superpave design mix with stone grit not fulfilling the standard conditions need to compare gain results with the design mix used in any previous project as reference,
- SMA design mix used in Kosovo motorways requires less energy for the compaction than reference design mix,
- With increase of weight with specific percentage the contractor must decrease the unit price for that percentage because the asphalt wearing course mass is same for two different stone materials even the specific weights change.

References

1. AASHTO Guide for Design of Pavement Structures 1993,
2. Hot – Mix Asphalt paving Handbook 2000, US Army Corps of Engineers,

3. Druschner, L; Schafer, V; „Stone Mastic Asphalt'' German Asphalt Associations – English Version 2005,
4. Ramljak, Z;Pejnovic,V; „Possibilities for using the carbonate stone material for binder courses
5. on asphalt pavement of all traffic loading categories'', Construction Almanac, Union of Construction Engineers and technicians of Yugoslavia, Belgrade (1983), pages 337-340.
6. Test Report No MD (BEGP – KMP) -08-03/2011, (WC – SMA 16), Ramtech October 2011, Zagreb,
7. Test Report No 61054-20-2739/11 Resistance to degradation of crushed rock aggregate from MiM Golesh by compaction of Marshall Sample, Zagreb October 2011,
8. General Technical requirement for Motorway Construction , Zagreb 2011,
9. EN 12697-1;2005 Bituminous mixtures – Test method for hot mix asphalt, Binder content

Analysis On Energy Consumption In The Health Sector And Energy Saving Measures

Kadrush Latifi [1]*, Nafije Gashi [2] ,Luljeta Hoxha [3],Mehmet Qelaj [4] , Driton Ademi [5],
[1]* Studio e projektimit LINKS 4, Prishtinë
[2] Studio e projektimit LINKS 4, Prishtinë
[3] NNP Consult-ENG, Prishtinë
[4]M.ZH.E. Prishtinë
[5] Studio e projektimit LINKS 4, Prishtinë

Abstract. The services sector within which is also the Health Sector is a sector with particular importance given that the majority of consumers in this sector are public services consumers. Under Directive 2006/32/EC this sector should play promoter role of developments in terms of improving energy efficiency. Given the fact that many projects in the field of energy efficiency mainly funded by donors aimed the Public Health sector because besides achieving energy savings there should also be reached the comfort level within the building as most of the Health care buildings in Kosovo lack the basic comfort level regarding internal temperature, air flow and lighting.

Keywords: Energy auditing, Health sector, Public buildings

1 Introduction

Most of the Hospitals and Family Health care Centers in Kosovo are built between 1970-1990 therefore they present low thermal insulation properties as the building codes at that time had little or no consideration for thermal transmittance. Hospital buildings are in general not provided with outside walls insulation while windows are mostly wooden double pane window or with aluminum frame. Central heating system is the most used heating alternative. This paper aims to define energy consumption in these buildings and to analyze actual projects regarding implementation of energy efficiency measures and application of the renewable energy resources. The work will be based on the findings of relevant studies and energy audits for energy consumption for heating, cooling, cooking, water, sanitation, electrical equipment and economic feasibility of efficiency measures being taken during renovations of buildings. The paper will also give recommendations on what should be done to lower energy intensity of these buildings.

2 Health Care Building Stock

Energy consumption in buildings differs from:

- Age of the buildings (construction materials)
- Function-usage
- Geographical location
- Equipment installed regarding heating, cooling, lighting and other.

Most of the public buildings including Health care buildings are built before 1999. Due to the construction year, these buildings present low thermal insulation properties. If built before 90-ies, the most common building material was full brick (1960), perforated (hollow) brick during 1970-ties and 1980-ties. There was no thermal insulation introduced in building envelope.
However, during the last decade Health care buildings among other public buildings have gone through a refurbishment process with mostly windows being changed with new PVC double glazed or wooden frame double glazed.

The total number of building stock as to the Kosovo Statistical Agency is 1440. It is divided to:

- 10 Clinics
- 7 public hospitals
- 24 private hospitals
- 477 public centers of family medicine
- 922 private laboratories and dispensaries

As the major part of buildings in health subsector belongs to periods 1961-1980 (35 %) and 1981-1999 (24 %). However a considerable part of buildings (26 %) which belongs mainly to the private sector are constructed in the period after 2000.

3 Energy Consumption

The last few years there were several Energy audit projects conducted from Donors and Kosovo Government. Health care building from public sector were on focus of these audits. Also Ministry of Economic Development conducted "Study on Distribution of Energy Consumption and Possibilities for Energy Efficiency". The outcomes of these projects show the followings.

3.1 Specific Energy Consumption

Consumption of energy in buildings differs from the size of building, number of clients (patients), heating/cooling process etc. In order to have a comparative instrument, energy consumption is given as a ratio of energy per heated area or energy per patient/client. As the sources of data are more reliable for heated area it is decided to have the sum of all energy consumers as specific energy consumption measured per year. In other terms it is given as kWh/m^2/year. A survey conducted from Studio LINKS 4 shows the following findings:

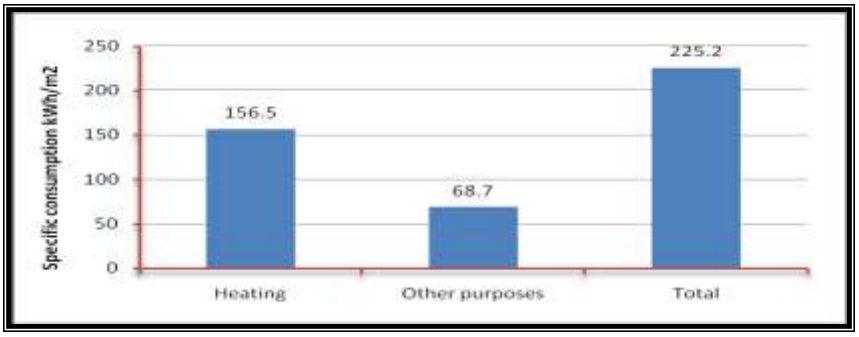


Fig.1 Specific consumption for heating purposes, other purposes and total specific consumption in the health sector

With 156.5kWh/m^2/year normally it should indicate that buildings are operating in relatively good working conditions if we take under consideration that Health care buildings usually operate 24 hours a day. However the findings from Detail Energy Audits conducted only in public owned buildings, show higher specific consumption in buildings.

Table. 1 Specific heat consumption before, after and savings

	Building	Specific heat consumption before EE [kWh/m2/ann]	Specific heat consumption afterEE [kWh/m2/ann]	savings [kWh/m2/ann]
1	QKMF, Rahovec	318	193	125
2	Ndërtesa e Hemodializes, Prizren	323	273	50

3	Ndërtesa e Infektivës, Prizren	299	169	130
4	Instituti Special, Shtime	387	226	161
5	Ndërtesa e Internos, Prizren	323	273	50
6	Ndërtesa Qendrore e Spitalit, Prizren	303	213	90
7	QKMF, Lipjan	243	152	91
8	Spitali Rajonal, Ferizaj	372	260	113
9	Blloku Internistik, Pejë	420.97	289.41	99.68
10	Blloku Kirurgjik, Pejë	213.13	171.68	41.45
11	QKMF-Emergjenca, Mitrovicë	272.4	127.38	144.6
12	QKMF, Drenas	355	148	207
13	Ndërtesa e Instituteve, Prishtinë	291	141	149
14	Klinika Gjinekologjike, Prishtinë	435	178	257
15	Klinika Kirurgjisë, Prishtinë	301	149	152
16	Klinika Ortopedisë, Prishtinë	370	166.9	203.1
17	Klinika Neurologjisë, Prishtinë	317	198	119
18	Klinika Infektive, Prishtinë	243.7	150.2	93.5
19	Ambulanca Specialistike, Pejë	369.56	275.07	84.54
Konsumi per tere sektorin		**324.04**	**197.56**	**124.26**

The data shown in the above graph were taken during survey and represent the reported energy consumption for the existing conditions in building. On the other hand the data from Table 1, (Energy auditing reports) show specific energy consumption normalized for comfort conditions in the building. The difference between these two sources indicates that Health care buildings are operating under standard comfort which is an internal temperature of 20-22^{0}C. This comes as a result of:

- Not insulated building envelope
- Old windows
- Inefficient Heating/cooling system
- Not efficient lighting system

3.2 Distribution of Energy Consumption

Energy consumption in buildings is distributed among main consumers such as space heating, sanitary water, equipment etc. As in other sectors from Public Sector Buildings, Health Care buildings consume the vast of energy for space heating. The survey shows the following findings:

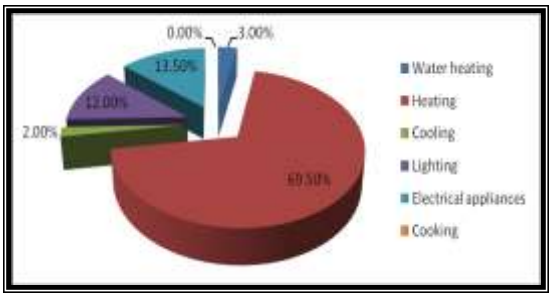


Fig. 2 Energy distribution as to the "Study on Distribution of Energy Consumption in Services Sector and Possibilities for Energy Efficiency Improvement"

Similar results are given from energy auditing in public buildings.

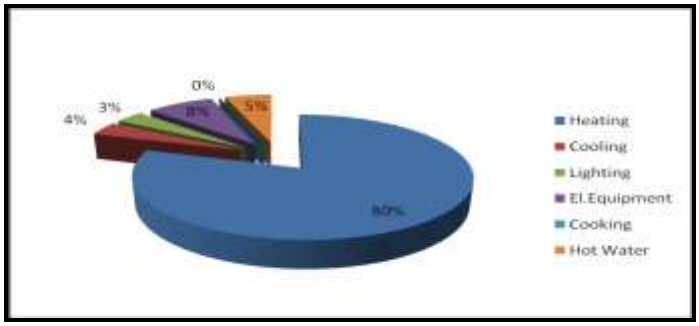


Fig. 3 Energy distribution as to the "Study on Distribution of Energy Consumption in Services Sector and Possibilities for Energy Efficiency Improvement"

It indicates that the Energy is mostly consumed for Heating and then other consumers are aproximatly evenly distributed.

Although public Health care buildings use dominantly the central heating system in buildings yet in other hand they lack of central hot water boilers while they use electricity for heating of sanitary water. In relation to sanitary water heating it is worth mentioning also the low percentage of solar energy use for this purpose (only 1 %). This indicates the high potential for energy saving which can be realized by installing solar panels for water heating in this subsector.

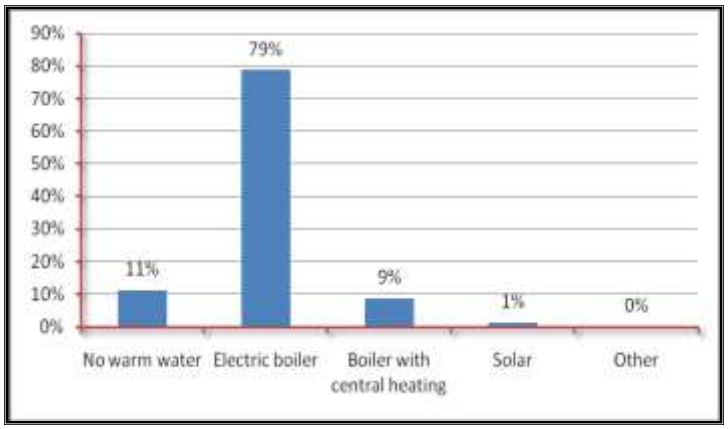


Fig.4 Water heating mode in health subsector as to the "Study on Distribution of Energy Consumption in Services Sector and Possibilities for Energy Efficiency Improvement"

3.3. Energy saving potential

The high values for specific energy consumption for comfort conditions indicate that there is also a huge potential for saving energy. If the highest consumption of energy is for space heating then saving potential should be within the same category.

There are two main groups recommended for energy efficiency:

- Group of measures for reduction of heat load
- Group of measures for reduction of hot sanitary water load.

From the results of this survey and from existing studies in the field of energy efficiency, it was concluded that buildings in Kosovo that are constructed after 2000 are very well build regarding energy savings and the practice of this kind of buildings is growing.

The focus is more concentrated to the buildings constructed before 1999 where the JUS standards of that didn't enforce the energy saving and also the market was poor regarding the thermal insulation materials.

3.4. Measures for reduction of energy demand for heating

In order to reduce e heat load following measures must be implemented:

- Thermal insulation of external walls of buildings
- Replacement of windows and external doors with higher quality regarding the heat efficiency
- Thermal insulation of the ceilings
- Thermal insulation of the floors (this measure has to be thoroughly examined since the floors that are in contact with ground has small difference of temperature therefore heat loss are not high; on the other point of view the return of investment for renovation of floors is taking longer time) and
- Replacement of insufficient heating systems with those who have higher efficiency.

3.5 Application materials and their presence in local market

Local market is rich enough with all kind of materials necessary for application regarding the energy efficiency. Most of those materials are imported but some of them are also produced in the local factories or they are taken as a raw material or semi-manufacture and are processed in local factories for final use or trade.

4 Conclusion

Presented results in this paper show that energy consumption for the need of heating is the highest share of the total consumption for Health Care building sector. Therefore, the focus of institutions for improvement of energy efficiency must be on the tentative for improvement of thermal characteristics of buildings in this sector.

Based on the trend of energy consumption and in the experience of the regional countries some of the measures that are recommended for Kosovo are:

- Drafting a program for renovation of public buildings of services sector
- Implementation of schemes (procedures) for certifying of buildings regarding the energy performance
- Application of solar panels and geothermal heat pumps in public buildings.

References:

1. **The World Bank:** "Kosovo Energy Sector - Heat Market Study";
2. **NNP Studio Links 4:** Study on Distribution of Energy Consumption in Services Sector and Possibilities for Energy Efficiency Improvement
3. **NNP Studio Links 4:** Programi mbështetës – Auditimi I Energjisë në ndërtesat e shërbimit Publik

Standard Energy Audit In The Residential Buildings - A Case Study In A Residential Apartment In Street ,,New Kalabria" In Pristina

Mehmet Qelaj; Flamur Bidaj; Nafije Gashi; Ali Muriqi; Driton Ademi; Violeta Nushi

Abstract. In an energy audit, the main goal is to achieve energy savings, identify opportunities for savings, the measures for saving energy efficient, prepared the report on energy saving measures. The energy auditis aimed adequate knowledge on the current state of energy consumption in buildings and identify opportunities in energy consumption and cost effective reporting of results. The data to be analyzed are: energy bills (electricity, fuel) for the audit period, for the last three years (and/or next year), building plans and studies and its energy installations electromechanical characteristics building/structure and operation of the apparatus/equipment basic climate data for the period in which the auditis being done. This paper will present an analysis of the overall energy audit standard for residential dwellings in Pristina

Key words: audit, efficiency, electricity consumption, specific consumption

1 Layout and apartment on the seventh floor

The object is located in the district, "New Calabria'' in Pristina and new construction. This building consists of eight floors, ground floor and basement. Flats which is audited found on the seventh floor, overlooking the South. Its area is 62.7 square meters, has sufficient insight and also has sufficient lighting.

The present paper will appear auditing standard apartment and found the specific consumption of electricity and thermal energy and has determined that a need to take measures or not. If yes, should be taken, if not, it is consumption remains current.

a)

b)

Figure 1: The layout of all floors in two entries, A and B - the first object

Table 1: Data of the auditing apartment

Building auditing	**Building First, First Entry - Residential Apartment - Floor VII, No. 1**
Date of audit	
The person interviewed	**owner**
Year of construction	2009
Type of building	More storey residential structure
Type of construction	Skeletal system
Number of floors complete	10 (suteren, ground floors 8)
Apartament	Located on the seventh floor
General state sanitary Technical	Good
Residents	
Accessibility	The permanent
Number of users	3

2 Existing State Building

Apartment building, respectively apartment is in very good condition in terms of energy efficiency, because it is new construction and is comfortable enough, both in terms of heat, both in terms of lighting. The building was built in 2009 and has external insulation with Styrofoam insulation addition of 10 [cm].

2.1 Energy For Heating And Other Energy Use

The heating system is installed in a building central system, based on its own boiler.
Table 2 Interior comfort for working spaces

Heating System	Own central system, but the function is just a radiator. Heating system at home there, but the feature is not issued due to high costs of electricity and is replaced by a small electric heater, which spends very little electricity with a capacity of 2 [kW].	
Subject to burns	Electricity	
The average annual consumption		
Operation of the system	Hours per day	18 hours
	Heating season	October 15-15th April. Is not involved in **TERMOKOS** heating, but the network is ready whenever you connect to the district heating system
	operates	Operates
	Termination of heat (justification)	Not due to saving
The state of comfort	Good, because it is new construction and is comfortable enough, both in terms of heat, as well as the lighting.	

Electricity is used for lighting, cooking equipment, sanitary, but the key is to heat it. Calculation of electricity is made by the expression:

$$VV = P \cdot t = U \cdot l \cdot t$$

VV - Electricity, P - Power, U-voltage, I - Intensity,T - Time.
Terms of comfort for heating, lighting, cooling and ventilation are calculated based on the setting of standards and conditions for a unified system in Kosovo under legislation and applicable international standards described above in the first chapter:

Table 3: Geometric Data

The main geometrical data									
No	**Wall**	**The perimeter of the wall [m]**	**The height of the wall [m]**	**The height of the wall [m] net**	**Windows [m²]**	**Exterior doors [m²]**	**Area [m²]**	**Apartment area [m²]**	**The volume of Apartment [m³]**
1	Foreign	8.2	3	2.8	5.32	1.68	24.6	62.7	175.56
2	Corridor	15.3	3	2.8		2.1	45.9	62.7	175.56
3	Neighbors	8.8	3	2.8			26.4	62.7	175.56
Total					**0**	**0**	**96.9**	**62.7**	**175.6**

2.2 Situation Standardized Calculations

Table 4: Data on state standardized apartment

	Consumption situation of standardized comfort [kWh]	Consumption after EE measures [kWh]	Saving [kWh]
The exterior walls	200.84	200.84	0.00
The walls of the corridor	1506.28	1151.00	355.28
Adjoining walls	1369.00	1369.00	0.00
Window	0.00	0.00	0.00
Doors	566.60	566.60	0.00
Tiles on earth	402.59	402.59	0.00
Ceiling Tiles	0.00	0.00	0.00
Transmission loss	0.00	0.00	0.00
Infiltrate loss	4045.31	3690.03	355.28
Yield heating system	681.15	681.15	0.00
ENERGY FOR HEATING	4726.46	4371.18	355.28
The surface of the S=62.7 [m^2]	75.38	69.71	5.67

Power transmission losses for different elements of the coat are expressed in the following figure.

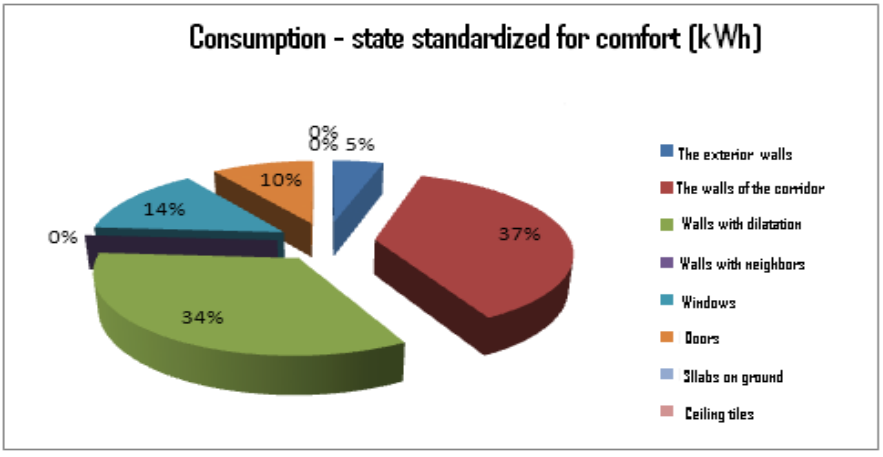


Fig. 2 Losses in transmission

The chart above shows that the greatest losses are in the walls of the corridor, which included the dilatation wall. This is an indicator that there should intervene in isolation, but would technically be possible only by stairs wall insulation. Energy losses from the floor and ceiling are zero because the apartment has other apartments above and below, which we assumed that the standard heated $20^{o}C$. Also, the wall that separates losses neighbor, for the same reason, the losses are calculated as zero.

2.3 Current Loads For Heating

Table 5: Data of electricity for heating

No	Equipments	Quantity	The power unit [kW/h]	Overall power [kW]	Annual hours of use	Annual consumption [kWh]
1	Electric Heating	1	1.5	1.5	480	720
					Total	**720**

Table 6: Data for sanitary hot water

No	Equipments	Quantity	The power unit [kW/h]	Overall power [kW]	Annual hours of use	Annual consumption [kWh]
1	Boiler 80 l	1	2	2	1480	2960
					Total	**2960**

2.4 Current Loads

Table 7: Data on household appliances

No	Equipments	Quantity	The power unit [kW/h]	Overall power [kW]	Annual hours of use	Annual consumption [kWh]
1	Freezer	1	0.35	0.35	1200	420
2	Equipment for boiling water, coffee	1	1	1	365	365
3	Frieze	1	0.5	0.5	750	375
4	Baking oven	1	2	2	200	400
5	Hair dryer	1	1	1	50	50
6	TV	1	0.08	0.08	1825	146
7	Ironing	1	2	2	120	240
8	Washing	1	2.5	2.5	180	450
					Total	**2446**

2.5 Current Loads

Table 8: Data for lighting

No	Equipments	Quantity	The power unit [kW/h]	Overall power [kW]	Annual hours of use	Annual consumption [kWh]
1	CFL bulbs in day care	3	0.011	0.033	1825	60.225
2	CFL bulbs in bedroom	1	0.011	0.011	185	2.035
3	CFL bulbs in bathroom	1	0.011	0.054	185	9.99

4	CFL bulbs in the corridor	1	0.011	0.011	365	4.015
5	CFL bulbs in the kitchen	2	0.011	0.022	730	16.06
6	CFL bulbs in the terrace	1	0.011	0.011	90	0.99
					Total	**93.315**

2.6 Use Of Liquid Petroleum Gas (Lpg)

Annual expenses with LPG in a residential dwellings in Pristina, spent 12-14 with LPG bottles, worth 2 euros.

Table 9: Data for the Liquefied Petroleum Gas (LPG)

An LPG bottle Its weight in liters	2 $[euro]$ 1 botlle = 2.9850 [liters] = 2 [euro]
Price per liter of LPG Months of the year: 12	1 liter = 0.67 [euro/liter] $12*1*2.9850 = 35.820$ [liters/year] $14*1*2.9850 = 41.79$ [liters/year] 35.820 [liters/year]*0.67[euro/liter]=23.99 [euro/year] 41.79 [liters/year]*0.67[euro/liter]=27.99 [euro/year] --- So with LPG annual expenses have cost approximately 24 to 28 euros per year. Calculating the average cost around 26 euros per year.
- Overall total annual gas costs, - Number of proofreading skills in refining the LPG	From 23.99 to 27.99 [euro/year] 12-14 [bottle/year]
- The value of the total amount for an LPG bottle A bottle of LPG per month and its price per liter	2.9850 liters $2\ [euro]/0.67[euro/l] = 2.9850\ [liters]$
Average expenditures for the past three years with LPG Use of LPG in a flat housing	In the household sector, liquefied petroleum gas (LPG) used for preparing various food standards for the preparation of coffee, tea, water heating, etc.
Saving energy	With the use of LPG in a residential dwellings, has a great saving of electricity, so the use of LPG in the household, it is very cheap and useful than the use of electricity at home. From this conclusion, it appears that we have very great saving electricity, replacing it with LPG for a family of three members and high energy efficiency.
DESCRIPTION DETAILS ABOUT THE USE OF LPG IN FLAT	**GENERAL INFORMATION LPG**

2.7 Details For Calculation Of Different Scenarios

Scenarios are taken for calculation:

1. Consumption, which are reported electricity bills and expenses for LPG,
2. Consumption state of comfort, which express the consumption of the apartment in the state in which,
3. Consumption after EE measures that said flat consumption, as implemented energy efficiency measures, and
4. Savings, which expresses the difference between the state of comfort and state standardized after implementation of EE measures.

Table 10: The data reported for the specific consumption and consumption data for standardized comfort

	Reported consumption [kWh/year]	**The situation of comfort [kWh/year]**	**After consumption measures (EE) [kWh/year]**	**Saving [kWh/year]**
The Liquefied Petroleum Gas (LPG)	496.8	496.8	496.8	0.0
Various consumers of electricity	3321.8	4389.32	4389.32	0
Energy for heating		4726.46	4371.18	
Total energy	3818.6	9612.6	9257.3	355.3
The object quadrature [m^2]	Specific Consumption [kWh/ m^2/year]			
S=62.7 [m^2]	60.9	153.3	147.6	5.7

The table above shows that specific apartment has reported consumption of 60.9 [kWh/m^2/year], while consumption is 153.3 standard for comfort [kWh/m^2/year], which means that in terms of missing flat comfort.

3 Conclusions And Recommendations

- Apartment is located on the seventh floor of an apartment building, consisting of eight floors, overlooking the south and surrounded by three sides with three other apartments. K bright enough picture and also to some extent by the warm rays of the sun, which fall directly into the windows of the apartment during the winter season;
- Apartment building is new construction, has insulated exterior wall thickness 10 [cm] and there is no need for additional investments and other, that have high energy saving;
- In calculating the electricity bills, it appears that energy costs are not high, because there saving and careful use of energy. Reason for energy saving, is that instead of electricity is also used liquefied petroleum gas (LPG) for household;
- With the use of LPG for household needs, has high saving electricity, based on the prices of LPG, electricity prices for [kW] and the time of their use in preparation of food and heat;
- Another trigger energy saving is the reason that from 11:00 until 17:00 stopped several electric and LPG, besides a fridge, a freezer and electric boiler are about 24 hours in the grid;
- Based on the above points and findings in electricity bills, it appears that there is room conform to energy saving. So power consumption to the masses is 153.3 [kWh/year], and then pick measures 147.6 [kWh/year], so consumption is 5.7 [kWh/year].

References

1. Gashi N: Kalkulimi i konsumit të energjisë në banesë. Byro Projektuese - Studio Links 4, Prishtinë 2013;

2. Berisha A: Planimetia e banesës dhe objektit banesor, për hyerjet A dhe B në Lagjen Kalabria e Re në Prishtinë – Kompania Fitorja – Ferizaj 2009;
3. Rregullore Teknike 03/2009 Për Energji Termike dhe Mbrotje Termike në Ndërtesa, MMPH - Qeveria e Kosovës, Prishtinë 2009;
4. Rregullorja Nr. 01/2012 për Themelimin dhe Funksionimin e Komisionit për certifikim të auditorëve dhe menaxherëve të energjisë, MZHE;
5. Udhëzim Administrativ Nr. 14/2012 për Promovimin e Efiçiencës së Energjisë të përdoruesit fundor dhe shërbimet energjetike, MZHE, Prishtinë 2012;
6. Islami B: Stathis V. Metodologjia e auditimit të energjisë në Ndërtesa Publike, Trajnim profesional për auditim të energjisë – Danish Energy Management&Kantor, Prishtinë 2010;
7. Qelaj M: Trajnim professional: Auditimi i Energjisë në Ndërtesat e Sherbimit Publik, Danish Energy Management&Kantor, Prishtinë 2010;
8. KEDS, Faturat e energjisë elektrike për tri vitet e fundit 2010-2013, Prishtinë 2013.

Building Typology In Kosovo Based On It's Thermal Characteristics

Luljeta Hoxha[1], Kadrush Latifi[2], Nafije Gashi[3],Lutfije Dervishi[4],
[1]Consult-Eng, Prishtinë
[2] Studio e projektimit LINKS 4, Prishtinë
[3] Studio e projektimit LINKS 4, Prishtinë
[4] KEDS

Abstract - Each country should develop it's own building typology. For this purpose the state must have a system of classification defined by year of construction, building function and size of the existing buildings. It should then find examples that represent that category. The relevant data of these objects (external walls, windows, exterior doors, roof and slab above the ground), along with their respective photographs of buildings create countries typology. Its importance lies in the fact that when the object is being renovated regarding energy savings, rising the comfort or simply to maintain the structure of the building must know in advance some of the features of the building that are typical for its type.A typical classification of building stock will give professionals preliminary data for quick calculations on the potential energy savings, sustainability of the building structure, historical values etc. This paper will present the first steps in Kosovo for creating building typology and its application by analyzing existing projects in this field that were conducted from Kosovo Government, World Bank, EU and other NGO or Companies. The paper will also give best solutions for improving thermal characteristics by implementing Energy efficiency (EE) measures.
It will also show what are these measures and how will they affect heat transmission and energy consumption in general.

Keywords: Building typology, clasification, building structure

1 Introduction

Kosovo lack building typology catalogue which in most countries is a useful tool in determining energy saving potential by using specific categories in catalogue like year of construction, construction materials, types of windows installed, building size etc. In order to gain required information when working with countries building stock, some projects mostly financed from donors (ex. World Bank Kosovo Heat Market Study) have developed through surveys a classification of building stock being focused in energy performance on buildings. Also Ministry of Economic Development (MED) in 2011 made a study on countries public building stock (Study on Public Building Stock for Energy Auditing) being more focused in reported consumption and size of the building. Other relevant studies are also conducted from MED in last few years regarding energy consumption and distribution in a specific sector. The most relevant study is with focus on one branch of public sector such as "Study on distribution of energy consumption on service sector and possibilities for EE improvement". The relevance of this study lies on fact that it contains data on Public sector buildings and all the subsectors such as Education, Health, Commercial, Tourism etc.

1.1 Typical clasification

The most common classification criteria of a building stock are year of construction or period of construction. Each period is characterized by building system, building materials, heating system as main characteristics while there are also other not so important diversities.

2 Classification as to the period of construction

As to the WB study "Kosovo Heat market study" the following four periods of construction year were defined:

- Period 1: buildings built until 1959; basically pre FRY period
- Period 2: buildings built between 1960 and 1998;
- Period 3: buildings built between 1999 and 2001; emergency post war period
- Period 4: buildings built after 2002; end of emergency period and recent times.

Period one, three and four are fully determined, while period two covers a variety of buildings and it should have been explained in more details. Hence in order to have a more comprehensive view on building stock from this period it should be sub-divided.

In addition another classification is the classification as to the construction system

- Massive
- Skeleton
- Combined.

These construction systems are also linked to the building materials classification.

2.1 First building period

This period covers stock of buildings constructed prior to year 1959. These buildings are characterized with thick baring walls constructed with solid bricks, double pane windows, wooden board floorings without thermal insulation and ceilings consisting of plastered cane and wooden boards.
Because of wall thickness, these buildings consists of mostly 2-3 floors; openings (windows) are small in size hence lack of lighting comfort.
Most of these buildings have gone through a refurbishment, but, those that aren't refurbished should take under consideration following:
- Wall thickness usually fulfills the heat transmission values set in "Technical regulation for Energy savings in buildings" that requires value U<0.8 W/m2K. This means that no additional insulation is needed.
- If building is considered a cultural heritage, EE measures should be carried out only in close cooperation with official experts.
- Before any intervention, municipal or ministerial officials should evaluate the bearing capacity of the structure in order not to have refurbishment process if building is not considered stable.
Public buildings from this period share almost same specifics throughout Kosovo, while residential sector was less developed.

2.2 Second building period

This period should be divided in 1960-1979 and 1980-1999 due to changes in JUS (Yugoslav Standards) regarding energy efficiency.
Public buildings built betwen1960-1979 are characterized with new skeleton framing structure made of reinforced concrete. Walls are usually 25-30 thick with larger openings, hence larger glass mass comparing to full mass. Skeleton framing enabled multistory buildings. During this period prefabricated panels were introduced in construction sector but not widely applied. Clay hollow blocks were the most common building element. Thermal insulation was not applied even though designed. During '80-ties with new JUS code requiring a value U<1.25 W/m^{2}K, composite walls came to scene. These buildings are largely constructed in every town in Kosovo in form of Schools, Family health care centers, Kindergarten, Administration etc. They were characterized with large windows that span to the 1/2 of building's facade, flat roofs and un-insulated concrete skeleton frame. Regarding EE, these buildings are big energy consumers due to glass/wall ratio, thermal bridges, un-insulated envelope etc. In other hand there is also a big potential for saving energy and whenever possible during EE implementation the glass mass should be reduced and substituted with insulated walls.

2.3 Third building period

The emergency period or post war period had sheltering as priority. The emergency period renovations

in Kosovo were conducted in a non professional manner and with bad quality materials. Walls were left un-insulated while thermal insulation was only installed in new ceiling because it was less expensive then constructing new concrete slab. However there are cases that not even ceiling was insulated. **Windows during** emergency period were produced from wet wood which during first year of being mounted cracked due to contraction. At present, those windows do not close properly and air penetrates throughout their frame. **Floors** during this period were only covered with wooden boards which have rotten within first years of being installed. In order to extend their life cycle, personnel had them dyed with motor oil. Such an undertaking is not lawful as it is hazardous for health but was a necessity until next refurbishment.

2.4 Fourth building period

This period covers the new buildings constructed from 2003 and nowadays. Thermal measures are implemented in building envelope for almost all of the public buildings constructed during this period. However, the residential sector had different specifics regarding Energy conservation; multistory apartments are constructed in accordance with state standards while individual houses in majority do not implement energy conservation measures.

3 Classification as to the building system

- Massive
- Skeleton
- Combined

Massive building system was widely used until late 1960-ties. With baring walls constructed from full brick, these buildings could only go up to 4 floors. Wall thickness is different in each floor, with thicker in lower floors.
This construction system is used to construct buildings from the ottoman period (considered building heritage) and early Communist period.
It covers a wide span of buildings in terms of utility; public buildings (schools, municipal administration, hospitals etc) residential (dwellings, multistory apartments, dormitories, army barracks etc).

Skeleton building system has a reinforced concrete frame which consists from elements such as columns, beams and slabs. Its importance lies on releasing walls from bearing function. Hence, perimeter walls are usually 25-30cm thick and openings or glass mass are unlimited in size. With no bearing walls, buildings rise to significant height.
This system has been widely adopted in Kosovo starting 1970-ies.It was used to construct dwellings in Prishtina, Mitovica, Gjilan, public buildings such as New Postal Office, KEK distribution building, Press Pallas (now Governmental Building) etc.

As to the wide span in time (1970-current) buildings constructed with this system represent various thermal characterics. As such it cannot be considered as a typical classification for the building stock.
Combined system is mostly used for individual houses. It combines booth bearing walls and reinforced concrete frame. Thickness of bearing walls is reduced by the significant concrete masse used to fill clay hollow blocks. The combination of these systems comes more as a result of traditional craftsmanship than a real need for extra strength in structure.Thermal measures are not considered during construction and there is a significant EE potential.

4 Classification as to the building materials

As to the construction materials, buildings can be classified regarding four specific materials:

- Stone

- Brick (hollow, full)
- Concrete
- Steel

These are only few of the materials used in construction, but there can be also other materials and subdivisions.
If built before 80-ies, the most common building material was full brick (1960) and perforated (hollow) brick during 1970 without outside insulation whatsoever. New building code enforced in 1982 acquired thermal transmittance of walls lower than 1.25 [W/m2K] which brought composite walls (perforated brick + façade brick) to the scene. Even then no thermal insulation was required and no attention was paid to thermal bridges. Most of the buildings built during '80-ies have composite walls while perimeter concrete slabs and columns are left un-insulated and uncover with bricks creating this way a so called "Thermal bridge".
Until 80-ies roofs were constructed as flat roofs with a thin layer of thermal insulation covered with water insulation and gravel. However, later on these roofs were reconstructed as pitch roofs due to leakage problems. Whatever the thermal insulation was provided in original roof, it was damaged from leakage and from construction works carried out while reconstructing roof and during energy auditing it's thermal transmittance should be neglected as if there isn't any insulation.
Windows installed during '60-ties and '70-ties are double pane windows with single glass, while during '80-ies double glassed windows with aluminum frame were introduced. Such windows were produced in town of Suhareka, Kosovo for only a short period and stopped the production, which then left most of installed windows without spare parts hence damages couldn't be fixed. These windows were largely installed in public buildings. However, during the last decade public buildings have gone through a refurbishment process with mostly windows being changed with new PVC double glazed or wooden frame double glazed.

5 Standards and regulations

As to the World Bank study "Kosovo Heat market study", the first measures concerning heat conservation in the buildings in ex-Yugoslavia were issued in 1968. The “Proposal for maximal thermal transmittance” predicted three climates zones for the state. In accordance with the selected climate zone the maximal allowable thermal transmittance k (W/m2K) was limited. The city of Prishtinë and most of Kosovo was classified in the third zone (III). The maximal allowable thermal transmittance was k = 1.37 W/m2K (Official Gazette SFRJ 45/67). In the year 1970, the maximal allowable thermal transmittance coefficient was reduced down to k = 1.28 W/m2K (Official Gazette SFRJ 35/70).

A greater improvement concerning the heat conservation in buildings was achieved by the JUS.U.J5.600 code which was published in 1980. It was not only limited to the maximum allowable thermal transmittance but it took into consideration also other influences as minimal thermal stability of civil structures and vapor diffusion through the building outside walls. The maximal allowed thermal transmittance was significantly decreased. For Kosovo (climate zone III) it was limited to k = 0.83 W/m2K, which represented a reduction of about one third with respect to the regulation of 1970. Calculation methods for thermal heat transfer coefficient, vapor diffusion and thermal stability of the civil structures were defined in the JUS.U.J5.510, 520 and 530 codes, also published in 1980.
In 1984, a new regulation”Rules for rational use of energy (Official Gazette SRS 31/84” was released in Slovenia due the reduction of the maximal allowable heat losses in Europe.
The regulation was included in the JUS.U.J5.600 code which was released in Yugoslavia in 1987. In the same year, the JUS.U.J5.510 code was amended.
However, during an inspection carried out in 100 public buildings conducted for a GIS ORF project " Preparation of methodology for M&V of energy savings" it was experts task to review building design layouts and compare them with existing situation in order to evaluate a common heat transmission factor .
It was concluded that JUS standards were not respected and enforced during construction with no insulation installed in building envelope though it was foreseen in building design. Same conclusion was made also during previous energy auditing projects emphasizing the lack of insulation materials in building envelope.

6 Short proposed features for building catalogue

7 Conclusions and recommendation

It is very important for a country like Kosovo to have developed building typology and building catalogue. For such an undertaking officials should take the following steps:

- Analyze existing documents regarding description of building stock in country and neighboring countries especially former Yugoslavian republics.
- Analyze existing energy auditing of public and residential buildings
- Conduct surveys to cover a wider range of buildings that may not be part of existing audited buildings. Create the building typology and building catalogue.

References

1. The World Bank: "Kosovo Energy Sector - Heat Market Study";
2. NNP Studio Links 4: Study on Distribution of Energy Consumption in Services Sector and Possibilities for Energy Efficiency Improvement
3. Gashi N: Building Typology, Danish Management and Kantor "training for Energy Auditors"
4. Gashi N, Latifi K: UNDP "Training of Craftsmen on Building Insulation"
5. RregulloreTeknike 03/2009 PërEnergjiTermikedheMbrotjeTermikenëNdërtesa, MMPH - Qeveria e Kosovës, Prishtinë 2009;
6. Rregullorja Nr. 01/2012 për Themelimin dhe Funksionimin e Komisionit për certifikim të auditorëve dhe menaxherëve të energjisë, MZHE;
7. Udhëzim Administrativ Nr. 14/2012 për Promovimin e Efiçiencës së Energjisë të përdoruesit fundor dhe shërbimet energjetike, MZHE, Prishtinë 2012;

12 YEARS

LEADERSHIP and INNOVATION

Education • Research • Training • Consulting

2001/2013

Katalogimi në botim – **(CIP)**
Biblioteka Kombëtare dhe Universitare e Kosovës

004(496.5)"2013"(063)
72(496.5)"2013"(063)

Proceedings of the 2nd Annual International Conference on Business, Technology and Innovation : Architecture, Spatial Planning and Civil Engineering / Edited by Edmond Hajrizi. - Prishtinë : UBT, 2013. – 275 f. : ilustr. me ngjyra ; 30 cm.

Preface : f. 3. – References : f. 274-275

1.Hajrizi, Edmond

ISBN 978-9951-437-23-3

BUSINESS, TECHNOLOGY AND INNOVATION

LAGJJA KALABRIA P.N. KS - 10000, PRISHTINE
TEL: +381 38 541 400; FAX: +381 38 542 138
EMAIL: INFO@UBT-UNI.NET; HTTP//WWW.UBT-UNI..NET

ISBN 978-9951-437-23-3