Recognised for Excellence

PROCEEDINGS

OF 4th UBT INTERNATIONAL CONFERENCE ON

- Architecture and Spatial Planning &
- Civil Engineering, Infrastructure and Environment

November, 2015

Proceedings of the 4th UBT Annual International Conference on Business, Technology and Innovation

Chapter: Architecture and Spatial Planning
Chapter: Civil Engineering, Infrastructure and Environment

November, 2015

ISBN 978-9951-550- 13 - 0

International Conference on Business, Technology and Innovation Durres, Albania 6-7 November 2015

Editor: Edmond Hajrizi

Organizers: Albert Qarri, Felix Breitenecker, Krenare Pireva, Evelina Bazini, Kozeta Sevrani, Betim Gashi

Co-organizes: Ardian Emini, Muzafer Shala, Lulzim Beqiri, Mimoza Sylejmani, Besian Sinani, Xhemajl Mehmeti, Murat Retkoceri, Bertan Karahoda, Ermal Lubishtani, Albulena Jahja, Erveina Gosalci, Alfred Marleku, Ibrahim Krasniqi, Ylber Limani, Naim Preniqi, Rexhep Kera, Muhamet Sherifi, Ermal Gashi

Authors themselves are responsible for the integrity of what is being published.

Publisher, UBT

EDITOR SPEECH

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 different research area.

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 10 sub conferences in different fields:

- Computer Science and Communication Engineering
- Energy Efficiency Engineering
- Management, Business and Economics
- Mechatronics, System Engineering and Robotics
- Information Systems and Security
- Architecture - Spatial Planning and Civil Engineering
- Civil Engineering, Infrastructure and Environment
- Law
- Political Science & International Relations
- Journalism, Media and Communication

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: EUROSIM, Kosova Association for Control, Automation and Systems Engineering (KA – CASE), Kosova Association for Modeling and Simulation (KA – SIM), Quality Kosova, Kosova Association for Management.

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. We have paper from 15 different countries worldwide.

Congratulations!
November 2015

Prof. Dr.
Edmond Hajrizi
Chairman of ICBTI 2015, UBT

CONTENTS

International Conference on Architecture and Spatial Planning

IC-ASP

International Program Committee:

- Hajrizi E. (RKS) Chair
- Beqiri L. (RKS)
- Beqaj B. (RKS)
- Dangschat J. (A)
- Dilinger Th. (A)
- Elezi K. (MK)
- Galluzzi M. (I)
- Guralumi D. (AL)
- Heiduk E. (A)
- Jagxhiu F. (RKS)
- Kadiu F. (AL)
- Dimitrovska Andrews, K. (SLO)
- Klein J. (A)
- Marzolf K. (USA)
- Ramsak M. (SLO)
- Stirmer N. (HR)

National Organizing Committee:

- Hajrizi E. (RKS) Chair
- Ahmeti M.(RKS)
- Sylejmani M. (RKS)
- Jashari R. (RKS)
- Gashi B. (RKS)
- Sherifi M (RKS)
- Kosumi S. (A)
- Aliu V. (RKS)
- Aliu V. (RKS)
- Krasniqi I. (RKS)

Editors:

Edmond Hajrizi (UBT) & Thomas Dilinger (TUV) & Caroline Jaeger Klein (TUV)

Creating Urban Sense of Community through Façades

Binak Beqaj[1], Blerta Vula Rizvanolli[2], Gent Hasimja[3]

[1, 2, 3]Department of Architecture, UBT - Higher Education Institution, Pristina, Kosovo
{bbeqaj[1], blerta.vula[2], gent.hasimja[3]}@ubt-uni.net

Abstract. Urbanization is a continuous process, affected with different elements in different development periods.
Knowing that urbanization is a multi-sectorial process oriented to different activities with the aim of harmonizing urban –architectural landscape with natural landscape to achieve as much as possible urban sense of community living there (in behavior or sociological aspect).
Considering that role of different buildings all over urban area not only through their interior view functions-destinations but also through their exterior view architectural form-façades is un-substituted; this research is trying to give answer on question:
At what level façades can create urban sense of community living in urban area?
Searching for answer, was developed a research method "consumer preference for product" (called "Utility method"), where through survey are shown their preferences on observation on their actual made choices, this through:

- Visual representation (materialization)
- Visual context (integration)
- Visual integration(form-complexity, harmony)
- Visual socialization (behavior reflection on behavior)
- Visual aesthetics (color, rhythm)

Keywords: urbanization, community, sense, process, façades, visual, landscape.

1. Introduction

Population expansion, rapid urbanization, intensive construction, the quality of construction in urban areas, namely the confused structure of the buildings facades which shape the urban landscape , may impact the de-harmonization of urban life, increase inconsistencies and stress and behaviour in citizens when dealing with urban life, therefore directly affecting the shaping of urban sense of community.
Besides intensive construction, transformation of building facades also accured and along with this shaping of the urban community feeling related to:

Pic. 01. Façade evolution in Prishtina

- Energy efficiency and micro-climatic influence in the area
- Openings and communication
- Urban-architectural effects
- Perception and identity
- The level of viability and accessibility in public spaces

This fact shows that the facades connect the interior space with exterior and as well associate both these spaces with people (community) through perception and appearance. Thus, architectural facades are justified as the most compelling visual aspect in shaping the character of the city and also a very compelling aspect on the contribution towards the development of urban spaces sense.

2. Developing trends

It is known that rapid urbanization is accompanied by massive constructions in urban areas, related to the feelings and behaviour of citizens is significantly related to the answer on the question:

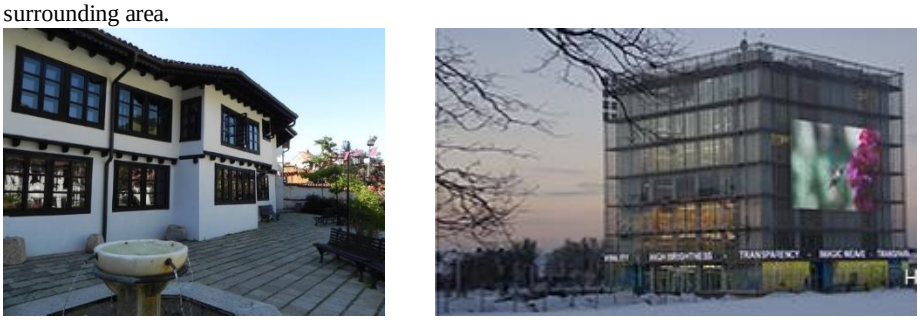
- *At what level façades can create urban sense of community living in urban area?*

So far the practice to improve the facades is mainly concentrated in terms of revitalizing the commercial corridors and in most cases there is lack of chronologically information on their development, repair and maintenance. Therefore the question is what made them "successful" and by which parameters we can determine and classify success? In order to answer the above question a research method called "customer preferences for the product" was applied by modifying it to "citizen preferences for facades" also known as "Utility Method". By using questionnaires and case studies this method shows citizens preferences on actual urban solutions and also their future preferences on the facades on the urban area the citizens live in. In addition the following indicators are used as valuators of citizen preferences:

Visual presentation (materialization)

- Visual perception (perception and integration)
- Visual integration (shape, complexity, harmony)
- Visual socialization (showing reflection on behaviour)
- Visual aesthetics (colours, rhythm)

Both case studies performed in Prishtina and Tirana, confirmed that facade improvement in urban areas can be considered as an indicator of success in changing the overall urban landscape and by doing so it also influences in community behaviour in terms of how they see them, how they use them or re-use the facades in the context of socio-economic dynamics of the development of the area.
Quality of the urban landscape is a result of direct impact of facade aesthetics and also has direct impact on how citizens feel in that environment, thus both building facades and citizen behaviour are closely related to each other within the framework of the whole urban environment.
The character and function of buildings changes together with time and also with changes in terms of increasing or decreasing the resident urban area, therefore with the evolution of the buildings functions the structure of the facades on these buildings changes together with the urban community behaviour. This study intends to analyze and present the dynamic development of facades presented in different ways; built within the framework of modern architectural forms and materializations, altered as a result of economic development trends, or restored as a result of protection of cultural and architectural heritage; in all cases indicating interconnection between nature, culture, economic and social aspects and urban space with community feelings and behaviour. Besides the architectural effects in buildings, facades, also have psychological effects on citizens with regard to their behaviour in space, both these together affect the overall urban environment, as the shapes, textures, materials, colours, lighting not only create a nice urban landscape but also affect the accessibility of spaces (especially public ones) in accordance with the dynamics of needs and aspirations of the citizens. One of the best examples which are presented in Pic.02 shows the revitalization of the façade of a cultural heritage building. The reconstructed façade, reshape the entire environment around the building and re-designate the usage of the public space, a space which can be used for resting, mediation, meetings, readings, etc. Another modern building with a special interactive façade is shown in Pic.02. This building would not have the same impact on pedestrians without audio-visual equipment which presents advertisements and other important information which has a big impact in the people in the surrounding area.



Pic. 02. Cultural Heritage Building façade and Modern interactive Building facade

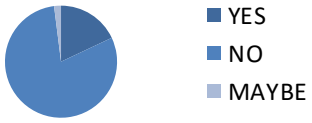
Study Case

As we mentioned above building's architecture, urban landscape and public spaces, determine the way of thinking and people's behaviour in urban space in that regard.
Development trends of facade improvement, until recently have been seen as a way to revitalize the commercial corridors so called "shopping streets", often ignoring chronological information for the space development and more sustainable development. The research work regarding the impact of facades in urban / architectural space, should be related to the context the facades offer within the space that can be analyzed as part of a comprehensive system primarily related to corporate identity based on Visual presentation (materialization), Visual perception (perception and integration), Visual integration (shape, complexity, harmony), Visual socialization (showing reflection on behaviour) and Visual aesthetics (colours, rhythm).

Impressive impact of architectural facades in urban space and humans is also studied by Le Corbusier, with a focus on the degree and the extent of urban activities.
A survey was undertaken with the aim of identifying some key parameters to regulate the architecture of the cities in urban context. Structure of respondents was mixed so we could achieve more

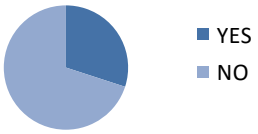
comprehensive results. Around 120 persons have replied the questionnaires out of which 5% Politicians, 2% Psychologist, 33%Planers, 40% Local citizens and 20% Transiting citizens.

DO WE HAVE SYMBOLIC FACADES



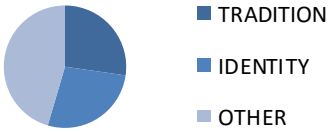
With the first question we aim to understand if Prishtina has symbolic facades which identify a certain neighbourhood and which set the direction for citizen's orientation in the city. Almost 80% of the answers were No, with only few answers related to administrative buildings in the city centre.

ARE THE FACADES MAINTAINED PROPERLY



In the question are the facades maintained properly in the public and private buildings in Prishtina, the majority of the respondent's answers were yes, but only in the public owned buildings, while as long as the ownership of common areas of private buildings is not legally solved, it is difficult to have properly maintained facades.

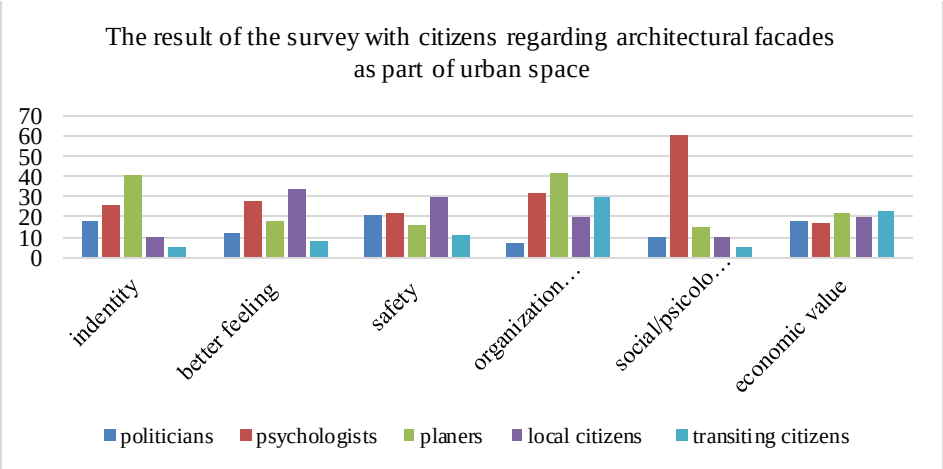
FACADES REFLECTION IN URBAN ENVIRONMENT



While in the question related the reflection and identity of the facades in Prishtina, most of the respondents said that they show tradition especially the buildings in the city centre and identity reflection the buildings destination.

Moreover additional question fulfilling the overview of the building's façades impact has been done:

- How much does the regulation of facades and urban landscape influence the city identity feeling?
- How much does the regulation of facades and urban landscape impact the urban sense of the citizens?
- How much does the regulation of facades and urban landscape impact the citizens in regard to safety feeling?
- How much does the regulation of facades and urban landscape impact the city organization and orientation?
- How much does the regulation of facades and urban landscape impact on the social and sociological aspect of the residents?
- How much does the regulation of facades and urban landscape impact the increase economic value of the building and urban space?



The planers supports the theory that the facades shall represents country's identity while citizens and psychologist say that well designed building's facades would impact a better feeling and have a big social influence on the people living in Prishtina. A better feeling reflects safety meanwhile according to planers good facades would help people orientation within the city.

Facades are the face of the building, the first thing that residents see and perceive, so the quality and design of the facades have a high impact in the total economic value of the building. This was the question were most of the respondents agreed unanimously.

A comparison between Tirana and Prishtina was undertaken to see if the results achieved in Tirana by façade colouring could be replied in Prishtina with the same impact. Color is perhaps the most easily seen and recognized physical aspect in our surroundings. Color is essential to the way humans experience the world—physically, emotionally and psychologically.

Colors communicate symbolic messages, contribute to order and differentiation, and indicate special functions. Most importantly, color crucially influences "the statement, effect, and acceptance of objects and space"

Tirana is a dynamic city of noise and contrasts, where the modern lifestyle meets old traditions. In 2000, the mayor of Tirana, Edi Rama was facing a post communist city with illegal buildings, high crime levels, no public spaces and a gray colour which owed the city: gray in buildings, gray in roads and therefore gray in people's life

The decision to paint a whole city in bright colour was one of the biggest risks that a mayor could take, but as a painter, the Tirana mayor was conscious about colour effects on people and their psychology. Big noise raised up: "What is this? What is happening? What are colors doing to us?"A decline in crime throughout the city, and an increase in taxpaying after this painting the exteriors and facades.

Pic. 03. First building in bright colour in Tirana

The same case was used to simulate the regulation of the facades in Dardania neighbourhood where we can see the impact of colour, shape and rhythm to the regulation of the view and perception.

Pic. 04. Simulation of façade colours change in Dardania - Prishtina

Conclusions

Finally based on the research findings it results that facades as elements of urban landscape / architecture are of special importance for urban landscape as a whole and people to whom these spaces belong and are used by. These influences are mostly reflected in:

- Architectonic perspective through urban landscape configuration
- Psychological effects through feelings, experiences or behaviours
- Visualisation in regard to interior/exterior, communication and correlation in this regard.
- Continuity of development through continuous improvement by providing the harmony of the existing facades with new ones

From what said above, the impact of architectural facades in developed areas is huge, primarily because of the influence in the character of the city, giving the sense of urban space more than any other element and this for the fact that and aesthetic quality of urban space, considered as key impact elements in relation to how people feel, act and correlate to urban surroundings. "Unfortunately, when we choose how to live or move, most of us are as free as our thoughts are. Our options are limited and they are defined by, planners, engineers, politicians, architects, economists; to which inculcate their individual values in the urban landscape" (Ch. Montgomery "Happy City").Finally, the reconstruction of facades and along with this the regeneration of urban space, encourage people to a better life with less environmental degradation and social awareness. Therefore facades are considered more than decoration, more than wrapping the building; they may as well be considered as the face of the city.

References

1. Charles Montgomery, "Transforming our lives through urban design", (2013)
2. Setha M. Low, Neil Smith, "The politics of public space", (2006)
3. Peter John, "Analyzing public policy", (2013)
4. Binak Beqaj, "Zhvillimi urban, planifikimi dhe dizajni", (2015)
5. Jan Gehl, "Life between buildings using public space", (2011)
6. Jan Gehl, "Cities for people", (2010)
7. Ministry for the Environment, Wellington, "The Value of Urban Design. The Economic, Environmental and Social Benefits of Urban Design". (2005)
8. Baltic University Urban Forum, "Built Environment and Revitalization", (2006)
9. John Chang, "The problematization of urban spravl in the United States", (2006)
10. EU Commission, "Making our Cities Attractive and Sustainable", (2010)
11. World Bank, "Measuring Growth and Change in Metropolitan Form", (2012)
12. World Bank, "Vleresimi i sektorit urban ne Shqiperi", (2007)
13. Aguinar and Pernao. 2010. Colour and participative processes in urban requalification, Social housing in Portugal. First International Conference 2010, Portugal
14. Boeri, C. 2010. A perceptual approach to the urban colour reading, Colour and Light in Architecture, Universita luav di Venezia, Venice
15. Erida Abazi, Sokol Dervishi, " Colour and Participative Process in Urban Requalification of Tirana", (2014)
16. Amir Hossein Askari, Kamariah Binti Dola, "Influence of Building Façade Visual Elements on Its Historical Image", (2009)
17. Erica Janine Maust, "Placing Color: Architectural Color & Façade Improvement Programs in Commercial Corridor", (2013)

Interrelation Community- Academy towards Sustainable Urban Planning

Binak Beqaj[1], Edmond Hajrizi[2]

[1,2]UBT – Higher Education Institution
{bbeqaj[1], ehajrizi[2]}@ubt-uni.net

Abstract. Considering urban development's World-wide, which are based on economic, social, environmental, cultural trends and good governance; towards sustainable development of urban areas, while there coming years will be concentrated most of the World's population, as result of that is very important development of interrelations Community-Academy conversely, in context of promotion of expected results such:

- Academic institutions as community based organization
- Community with base on general development projects
- Determination of common development objectives
- Sustainability through economic, social and environmental dimension

In general the aim of this study is through used comparative research methods and literature review, to present a better picture from relevant facts and concepts to possible benefits from developments in relation Community-Academy, as very important component of new approach to urban development

Keywords: urban, economic, social, academy

1. Introduction

Planning process is complex and should be based on relationships between different planning frameworks for settlements on different levels: International, European, National, Regional and Local. Identifying development challenges and achieving aimed development level in line with development objectives; is a concept related to sustainable urban planning too.
Analyses, planning and implementation of urban development presents the aim for better qualitative life through urbanization.
For achieving this aim should be clearly defined the role of urban planning, always, based on: innovative, economic, social and environmental perspectives for regulation, shaping and use of urban space. So, considering that urban planning is designed as system dealing with urbanization towards qualitative life in urban areas using rationally all resources for public interest and peoples welfare for community living there; it's understandable that people needs qualitative standards regarding shelter, work, transport, recreation and other for other local activities, so, city should be:

- Livable city
- Attractive city
- Safe city
- Sustainable city

"Community planning and design"..."Physically active residents"; to fulfill those above mentioned development concepts for city, should be considered some essential preconditions: professional human resources, case studies and good experiences, location and regulatory measures in correlation with economic, social and cultural development, environment protection and qualitative living standards too.

2. Development trends

Urban planners, cannot operate effectively as isolated, because they are planning for community needs, so, based on some good international experiences worldwide with community in focus like "Community planning and design"... "Physically active residents"…is understandable the need for proactive community involvement in urban planning process.
This, because of better community welfare, environment protection and efficiency use of resources in urban area, but, this can be achieved only if there is strong partnerships between community (everyday knowledge) and academy (expertise knowledge).

Why partnership academy-community is needed in urban planning process?

Its well-known from international practice-studies that nearly 20% from total contribution in urban planning belongs to academy, nearly 50% from total contribution in urban planning belongs to governing institutions while 30% from total contribution belongs community and private sector.
As it can be seen joint contribution of academy together with community comes nearly 70% and this contribution is based on integration of different respective knowledge's (everyday-expertise) as strong tool for urban development, as it can be seen in the Fig.1 below:

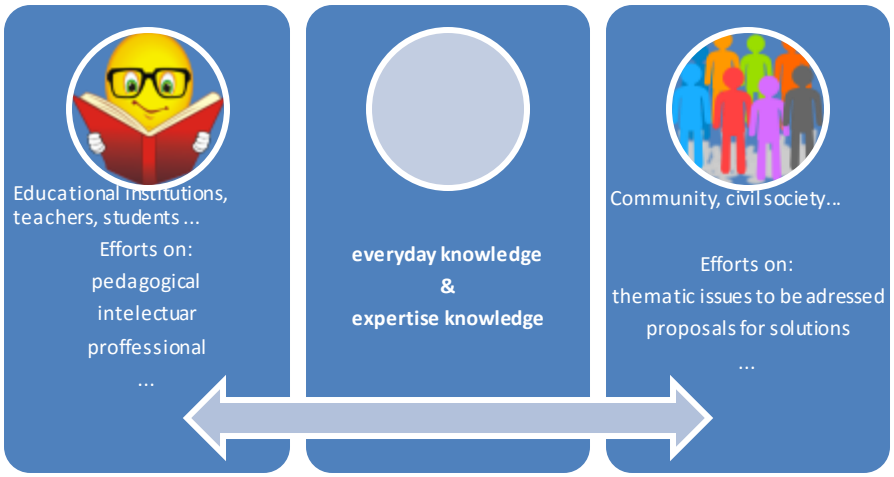


Fig1. Integrative process of partnership academy-community

3. Research and assessment of the topic

Considering all preconditions for sustainable urban planning community based, all those should be elaborated. Based on survey with different citizens groups in Prishtina (September 2015), there are identified some of parameters to be considered in the process of sustainable urban planning:

- Build area to be proportional with human dimensions
- Rationality on peoples movement
- Human sense of people for urban space
- Interrelation of human activities in urban space
- Behavior of the people there

All those preconditions should be in agenda of partnership academy-community, in this way partners can have wider view for development planning based on their acting role in the process, because they are different actors in partnership for the same development vision.
Who is community in this partnership? The subject who offers some of the resources in promotion of sustainable urban development through:

- Working space and equipment's
- Participating in budgeting partially
- Articulating everyday knowledge
- Promoting their needs and requests
- Linking different actors

Who is academy in this partnership? The subject who offers professional competence through research and education in promotion of sustainable urban development through:

- Studies
- Research
- Consultation
- Trainings

This relationship between two partners in urban planning process and their contribution, is explained in the Fig.2 as below, explaining framework of direct contribution of participants in the process.

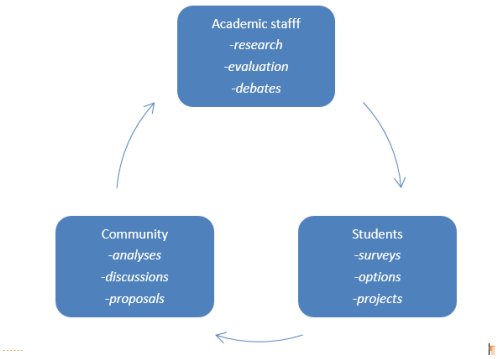


Fig2. Contribution of partners from partnership academy-community

How partnership can be established? Of course exploring and considering historical development of both sides, achievements and development aims. Establishing this partnership minds that should be considered specific and joint contribution of both sides as equal partners in the structure of partnership too. But, in this context, academy is expected to give more, as explained in Fig. 3. This contribution can be structured in three main pillars: study curriculum, academic staff and students; all of them linked in the circle.

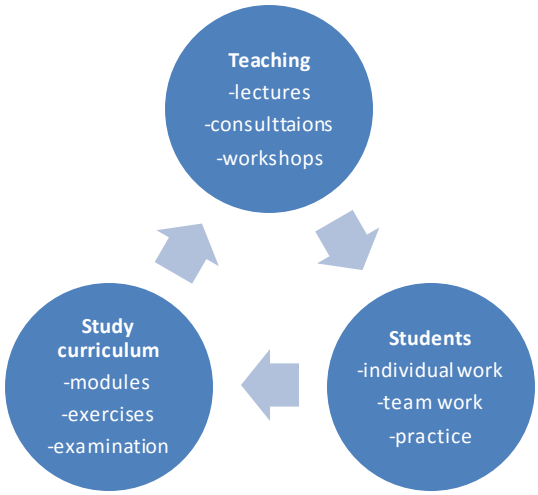


Fig3. Three pillars of academy

How partnership can be developed successfully? Of course if it is based on: legitimacy of development process, flexibility on involvement, reciprocal reliability through activities, inclusiveness and proactive role of partners, especially oriented towards treatment of "non- heard voices" and marginalized structures of the society. This can be articulated only through the process where projects are knowledge based and knowledge has a circle flow as presented in Fig.4, through different project phases from analyses to planning towards implementation.

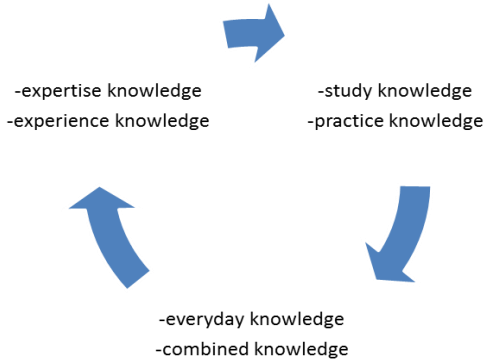


Fig4. Circle flow of knowledge, from partnership relations

Like other partnerships, partnership academy-community, is a concept values based:

- Is specific because of nature of partners
- Based on memorandum of good understanding
- Helpful for sharing knowledge and use of it
- Establishes network, not only between partners but wider
- Is with influence on changes

Considering that sustainable urban planning can be considered as development process oriented to:

- Quality of life
- Equity between people
- Ethical dimension
- Rationality and efficiency

The framework of sustainable urban development can be seen in Fig.5, where key elements of this framework can be considered as integrative elements for partnership academy-community

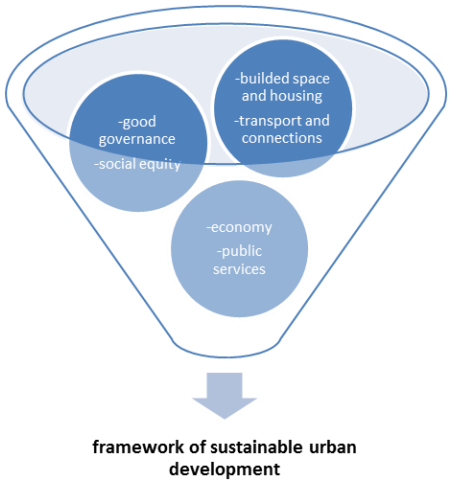


Fig. 5. Key elements of framework for sustainable urban development

Always partnerships should be based on reciprocity, integrative approach, and interrelated communication towards expected results-outputs from the process. It's understandable that cooperation between partners, starts from problem identification and challenges… to planning and implementation; carefully so that partners should feel their part of ownership in this process, so, they can be helpful for benefits of society in general through sustainable urban planning. The community proactive role in partnership brings to community empowerment in the process as presented in Fig.6, which presents also integrative approach in urban planning.

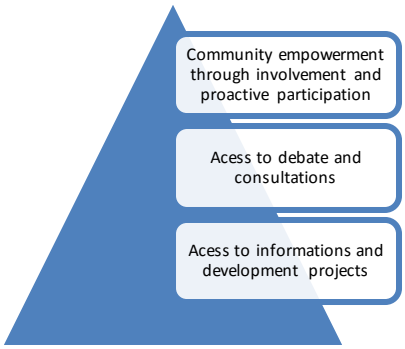


Fig.6. Pyramid of community empowerment

Conclusions

The road-map for development of partnership academy-community, in the process of sustainable urban planning is complex and with challenges, even though main interest of both sides is positive change based on scientific approach to bring contemporary urban developments in urban area with direct impacts on daily life of its citizens. Those relationships can be developed based on well-known level from professional literature as "The Golden relationships", securing sustainability of and improvement of partnership because of:

- Academy, as organization community based
- Community basic approach on development projects
- Urban sustainable development, based on clear objectives
- Making integration happened through economic, social and environmental dimension

This, in context that urban units are under rapid growth nowadays, are becoming bigger and bigger, but, people there are remaining smaller and smaller!

References

1. Charles Montgomery, "Transforming our lives through urban design", (2013)
2. Setha M. Low, Neil Smith, "The politics of public space", (2006)
3. Peter John, "Analyzing public policy", (2013)
4. Binak Beqaj, "Zhvillimi urban, planifikimi dhe dizajni", (2015)
5. Jan Gehl, "Life between buildings using public space", (2011)
6. Jan Gehl, "Cities for people", (2010)
7. Ministry for the Environment, Wellington, "The Value of Urban Design. The Economic, Environmental and Social Benefits of Urban Design". (2005)
8. Baltic University Urban Forum, "Built Environment and Revitalization", (2006)
9. John Chang, "The problematization of urban spravl in the United States", (2006)
10. EU Commission, "Making our Cities Attractive and Sustainable", (2010)
11. World Bank, "Measuring Growth and Change in Metropolitan Form", (2012)
12. World Bank, "Vleresimi i sektorit urban ne Shqiperi", (2007)

Earth buildings – reintroducing an old technique for green cities

Andrea Rieger-Jandl[1], Ulrike Herbig[2], Renate Bornberg[3]

[1,2]Inst. Baukunst-Bauforschung, TU Vienna
[3]IVA-ICRA, TU Vienna
bornberg@buta.jccs-a.org[3]

Abstract. It is widely believed that historic urban fabrics make an important contribution to foster identity and a sense of belonging for local people. To restore historic buildings, particular vernacular structures, is therefore an important contribution to achieve urban structures that deal with and respect local people with their particular way of living. One such historic element is earth construction, and in this case earth constructions of the central and eastern Europe region. Earth constructions turned out to be beneficiary for the micro climate, because of the material's ability to balance between day and night temperatures. Earth constructions are also environmental friendly because the material is at the building site and it can be maintained easily. Besides, earth buildings and villages have a distinct character, which were developed over centuries. Finally, earth constructions could play an essential role in the process of making cities green, and therefore some techniques have to be developed to bring earth constructions to big cities and make them green and environmental friendly
Unfortunately, earth constructions are declining and are used only in outlying regions. To understand this old technique, and to bring back the knowledge to local people as well as sensitize governments and stakeholders is essential to help fostering earth buildings,. This is the focus of the contribution, where earth constructions in Central and East Europe are focused on and first results will be presented.

Keywords: Earth, environmental architecture, vernacular architecture

1. Introduction

Earthen architecture[1] is an essential part of the architectural culture in many regions of the world. However, in Europe during the 20th century most earthen structures have been replaced by modern materials and due to technological, economic, and social changes, traditional knowledge related to earth construction has largely been forgotten. Architectural witnesses of this versatile building material are continuously and rapidly disappearing. Thus, expert knowledge on clay as a building material has become rare. This complicates the conservation of earthen buildings and threatens the continued existence of a centuries-old European architecture. The stock of earthen architecture, which is certainly a valuable part of the architectural heritage, seems to be unstoppably decimated by demolition, in many cases out of ignorance. Negligence and no or inappropriately conducted maintenance precede this irreversible loss. Therefore a detailed recording of the existing earthen architecture and the development of new approaches towards its renovation is important to provide a sound basis for a better handling of this heritage in the future.

[1]Earthen architecture is made out of earth and additives such as sand, gravel, organic fiber (straw, sawdust, bushes etc.), dung, oil etc. Major earth building technologies used in Europe are mud brick (adobe), rammed earth, cob and different filling techniques. Earthen constructions were and still are in use all over Europe, depending on the availability of suitable soil.

Fig. 1. An old earthen building in the White Carpathians, Slovakia. Without maintenance the buildings rapidly decay. (Photo: U. Herbig)

2. The advantage of preserving earthen architecture

The **ecological advantages** of earthen architecture are manifold: Earth constructions consume very little energy, they do not have to be transported over long distances, they are completely recyclable, and they have good humidity-balancing properties, compensate temperature fluctuations, and create a healthy micro climate. In addition, preserving existing earthen structures helps to embark the consumption of further building material and stops the exploitation of ever new land resources [1], [2], [3].

On an **economic level**, the up-keeping of earthen structures helps to stimulate regional economies, from the local construction industry to eco-tourism. The use of materials from the region supports local construction businesses and local craftsmanship can be advanced and developed further. Another important fact is the empowerment of the people to get further involved into self-building processes, and also the up-keeping and small restoration work can be done by the people themselves [4].

Fig. 2: Brantelhof, Burgenland, Austria. The well maintained earthen building is a landmark in the area. (photo: U. Herbig)

From a **cultural perspective** it is very important to conserve traditional building techniques and the knowledge about them. The preservation of historic villages and town ensembles plays a significant role regarding the formation of a collective identity. The preservation of earthen architecture, as an important part of the cultural built landscape, is essential to keep up civic pride and a sense of belonging. The interest on such unique forms of architecture from outside, e.g. via tourism, further strengthens local identities and community efforts.

3. How to raise awareness regarding earthen heritage

In Western European countries such as Spain, France, Switzerland, Germany, Great Britain and Italy quite intensive research on earthen heritage has been going on during the last decade, especially with the project `Terra Incognita - Earthen architecture in Europe´[2] [5]. In Eastern European countries many national activities have been going on promoting the preservation of knowledge about the earthen heritage e.g. by experimental research within open air museums or other cultural institutions. However, there only very few existing trans-national networks to combine knowledge generation from such research activities and to give a comprehensive picture of the state of earthen architecture within the Eastern parts of Europe.
Therefore the implementation of trans-national measures to protect the earthen heritage should be on top of the agenda. Main objectives are the
- making of an inventory of existing earthen structures
- implementation of advanced preservation measurements
- exchange of specific knowledge amongst specialists, craftsmen, users and scholars and the establishment of a (Eastern) European network

[2] `Terra Incognita´ is a European project which aims to create an inventory on the European earthen architecture. It was implemented within the frame of the European Union pro gramme Culture 2007-2013. So far the main focus is on earthen architecture in the Western parts of Europe.

Through the making of an inventory collected information can be merged. The research and documentation should include single objects as well as ensembles and should focus on the following aspects: Building typologies, building history, building technologies, the state of preservation, the use of the buildings or the research on building and raw material. The active involvement of the local population by using participatory measures, supported by PPGIS (public participation GIS) and the Internet should be promoted. In addition to documentation activities, personal inspection and aerial reconnaissance on the site and the direct contact to the objects and their users as well as the integration of existing projects will be essential.

Fig. 3: Examining historic earth building techniques at a student workshop in Sopron, Hungary (photo: A. Rieger-Jandl)

The implementation of new preservation strategies can only be tested with the help of pilot projects. Addressing professionals and users, practical knowledge has to find its way to the builder and contribute to the conservation of existing earthen heritage and the use of traditionally grown knowledge. Raising awareness regarding the preservation of architectural heritage, its conversion and re-use versus its destruction has to be a key aim. Installing a cadaster of protected areas and a catalog containing recordings for conversion and re-use will be of major importance and thus the topic has also be installed on a governmental level, locally as well as regionally.
The exchange of knowledge will be of utmost importance to raise awareness for the value of earthen architecture. The neglect of the earthen heritage over the last decades creates a need for its promotion on a scientific *and* practical level. Conferences, workshops, public presentations and the integration of the research in education programs at universities/polytechnic institutions and schools as well as the establishment of advisory and information centers or initiating practical training programs to approach the public and local users will be an important foundation. Publication tools, such as the internet, applications for smart phones, articles in (local) newspapers and documentary films will transport the knowledge. An important goal in this phase is to raise the awareness for the local clay building history through the possibility of public participation. In that way local architectural traditions which are essential for the identity of particular regions can be brought back to attention.

Conclusions

According to the arguments given above, this paper is a plea for the promotion and preservation of earthen structures in the Eastern parts of Europe. Before starting this process it will be necessary to raise awareness for the problems addressed, which can only be solved on a trans-national level through a European-wide cooperation. In summing up the facts, the following targets and activities can be identified:

- Strengthening the exchange of expertise between institutions in Eastern Europe already having extensive knowledge in the field of earthen constructions.
- Creating a powerful international and interdisciplinary oriented research team including young researchers and female scientists.

- Offering new opportunities in dealing with the building material clay, in preserving clay building traditions before their demise and supporting the use of this sustainable and ecologically valuable building material.
- Strengthening awareness for clay as building material by supporting hands-on participatory action in the course of exemplary conservation and restoration projects as well as by re-opening historic clay pits in order to support the use of natural clay resources.
- Encouraging the local population to share their knowledge on earthen constructions via an online-platform. Their contributions will be included in an inventory of local earthen building cultures.
- Extending scientific knowledge and facilitating its exchange in areas with similar historical building techniques in earth architecture.
- Collecting data on buildings, clay pits and forgotten earth building techniques on the basis of a special adapted GIS (Geographic Information System).
- To analyze the properties of clay minerals as well as to test composite clay materials mixed with straw and other aggregates.
- To support specific pilot projects, which are tailored to particular places and situations due to architectonic measures.
- By integrating the research results in education programs at universities, polytechnic institutions and schools, building with traditional materials will move back into the focus of designing.
- Perfection and optimization of tools and methods used when analysing and evaluating historical earth buildings in the participating countries.
- Perspective of collective/shared dissemination and publication of research outcomes in national and international media (scientific magazines, international conferences).

References

1. Mienke , G.: Handbuch Lehmbau, Baustoffkunde, Techniken, Lehmarchitektur. Ökobuchverlag, Staufen bei Freiburg (2012)
2. Schröder, H.: Mit Lehm ökologisch planen und bauen. Springer/ Vieweg, Berlin Heidelberg (2013)
3. Röhlen, U. C.Ziegert: Earth building Practice: Planning – Design – Building. Beuth Verlag, Berlin (2011)
4. Rieger-Jandl, A. G.Esser, U.Herbig: Warum, was, wie erhalten? Weinviertler Lehmbauten zwischen Musealisierung und Wiederbelebung“, in: Weinviertler Museumsdorf Niedersulz (ed.): Lehmbau. Tradition und Moderne, Atzenbrugg (2014)
5. www.culture-terra-incognita.org , accessed 10.11.2015

Comparative Analysis between the Istanbul House Plan Types and the Plan Types of the Ottoman Houses on the Panagia District in Kavala, Greece

Velika Ivkovska

Istanbul Technical University, Istanbul, Turkey
ivkovska@itu.edu.tr

Abstract. As part of the section on the Architectural History and the Architecture Values and Heritage, this paper will offer to the participants of the 4th IC ASPCE 2015 Durres Albania view on the development of the Ottoman House floor plans and its characteristics presented through the examples of the houses built in Istanbul between the 17th and 19th century and their comparative analysis with the Ottoman houses built in the Panagia district in the Ottoman town of Kavala, Greece. The Ottoman House has its specific characteristics and a huge value that has a special place in the universal history of the house types. It is a type of house that can be found within the territories of the Old Ottoman Empire, in the territories of *Rumeli* and *Anatolia*. The goal of the paper is to conclude that the houses built in Ottoman Kavala, and that still exist in the old district of Panagia, have typical Ottoman floor plans emulgated with local influences and can be placed among the several typical architectural floor plan types of the Ottoman House.

Keywords: Ottoman house, typology of Ottoman house floor plans, sofali house, Vernacular architecture, Ottoman house in the Balkans, Istanbul houses, Ottoman Kavala

1. Introduction

This paper focuses on the development of the Ottoman House and its characteristics presented through the examples of the houses built in Istanbul and their comparative analysis with the Ottoman houses built in the Panagia peninsula in the town of Kavala in Greece. Through an analysis of the floor plans of the houses conclusions will be derived concerning the characteristics, origins and influences on the development of the Ottoman house outside the capital of the Empery.

2. The Ottoman House

The Ottoman house, that later became to be referred to as the Turkish house, is a type of house that can be find within the territories of the Old Ottoman Empire, in the territories of Rumelia and Anatolia. By the end of the 14th century the Ottomans, conquered the European territory of Rumelia[3]. In these territories the Ottoman house was established and started its development.[4] It is believed that its origins are set in Anatolia and then spread to Europe throughout the territory of the newly conquered Rumelia.[5] The origins of the Ottoman house are still uncertain and matter of researches. The Turks, who were conquering these territories and originated from Middle Asia, were nomadic

3 Kurran A. 2012. Selçuklular'dan Cumhuriyet'e Türkiye'de mimarlık - architecture in Turkey from the Seljuks to republic. Türkiye İş Bankası Kültür Yayınları. Istanbul. p.240-260

4 Sedad Hakki Eldem in his book Turk Evi plan tipleri gives a detailed description of the development of the Ottoman house and its specific floor plans

5 The territory of Rumelia was the region of today's Bulgaria, Macedonia, Serbia, Bosnia and Herzegovina, some parts of today's Albania and Greece

tribes who lived in tents[6]. After they arrived, in what once was Byzantine Kingdom, they faced an already existing architectural structures and an existing culture on the land that before was home of the Ancient Greeks art and architecture. The question of how the nomadic tribe's tent evolved into a hard material house is open even today. First the house was consisted of one space, the room, and later started to grow and slowely two, tree and four rooms were combined together forming the unity of the house- *ev* but the functions of the rooms were still kept as in the single roomed house. This is one of the characteristic of the Ottoman house, the *oda* or the room. Each separate room contained all the daily functions of the household, unlike the Western houses, where each room had its own defined single function, one for sitting, one for sleeping, one for dining.

3. The Floor Plan Typology of the Ottoman House

A charachteristic of Ottoman town morphology was that the urban tissue was composed of not very large garden within the plot. The house plan was generated within the plot but encroached on the street, thus conditioning its architecture. The peculiarity of the Ottoman linkage of street patterns to building type consisted in its development on an axis perpendicular to the street, articulating the volumes in a free pattern from the street inwards. In the Ottoman house only the ground floor adapted to the site, invariably edging up to the street front, even when it was irregular.7 The concept of the room was something that defined the Ottoman house, that later as it continued to develop, it added other necessary features that also became elements of it. The story of the house is one of the elements specific for the Ottoman house. The house has the ground floor that is usually built in stone with entrance and small, or sometimes no windows at all, and the first floor or sometimes the top floor, in case of two storie houses, where the everyday life was occuring. The stairs are another inseparable element of the Ottoman house. Up until the 18th and 19th century the stairs were located out of the external side of the hall. Later they were included in the floor plan inside the hall or between the rooms and started influencing the plan, gaining more importance and became more wide and spacious.8 One very important element of the Ottoman house is the hall called sofa . The rooms always open into the hall (sofa). If the room was to be compared with an individual house then the hall can be compared with the street and all the houses open onto it. Depending on the position of the hall and the way the rooms open onto it we can determine the floor types of the Ottoman house. This is how the four Ottoman house floor types are distincted: house without a hall; house with an outern hall; house with an inner hall; house with a central hall.[Tab.1] The Ottoman's house classification is made according to their plan and not according to their order in time or to topographic and climate conditions. The reason for this is that these types could not be attributed to certain periods or to certain regions, being independent of time and place. If a classification based on regional conditions9 had to be drawn up, it would have to be made according to the degree of progress and advancement that the towns and villages, in which the houses were situated, had reached.10 These four floor type plans developed further on but keep the basic classification of the plan by the position of the hall. The various plan compositions were executed with divisions such as the Selamlık and Harem11, junctions that allowed increasment of the number of halls in the plan and also by adding pavilions (kiosks) at one or both ends of the hall.

[6] The word oda which means a room originated from the word otağ meaning tent

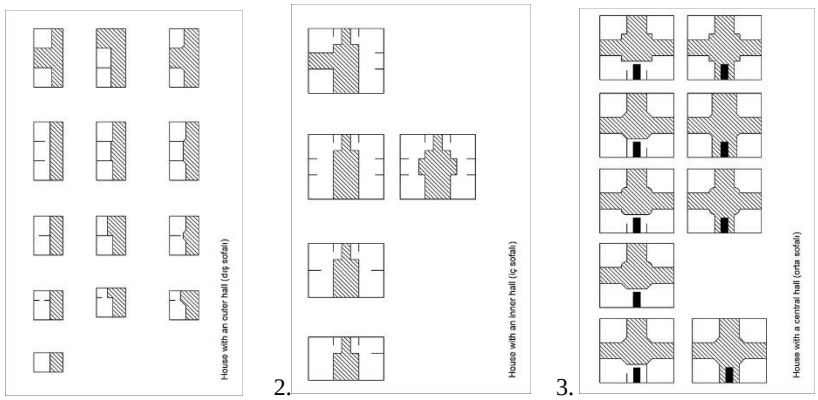
[7] Cerasi M. 1998. *The Formation of the Ottoman House Types: A comparative study in interaction with neighboring cultures*. Muqarnas Vol.15. BRILL. p.119

[8] Eldem S. H. 1954. *Türk Evi Plan Tipleri*. Istanbul Teknik Üniversitesi, Mimarlık Fakültesiç Istanbul. p.219

[9] In his book Türk *Evi Osmanlı Dönemi* , Vol.1 S.E. Hakki gives a detailed explanation of the regional classification of the Ottoman house. There, he classifies the houses in seven groups. For more details on that see the refereed book p.30-32

[10] Eldem S. H. 1954. *Türk Evi Plan Tipleri*. Istanbul Teknik Üniversitesi, Mimarlık Fakültesiç Istanbul. p.220

[11] Bertram C. 2008. *Imagining the Turkish house*. University of Texas Press. Austin. p.30,31,250

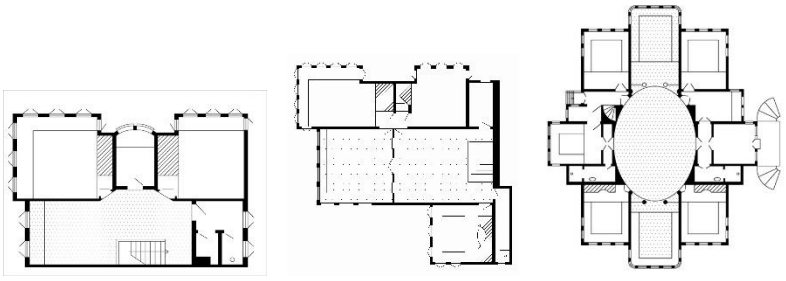


Tab. 1 House plan types wıth 1.outer hall; 2.inner hall; 3.central hall (redrawn from Eldem S. H. Türk Evi Osmanlı Dönemi. Cilt.1)

4. Istanbul houses plan types in the 18th and 19th Century

The regional classification of the Ottoman houses happened as a result of the different topographical, social and climate conditions. The Ottoman House found its classic being from Marmara and Rumelia regions and from places that were under the influence zones of these regions. Out of these two central regions, Marmara has dominated Rumelia, and Istanbul has dominated Anatolia. Istanbul and the Marmara region have special importance among the other six main house types regions.[12] The Istanbul House can be considered as a typical Turkish House while the house types of the other regions can be described as regional provincial types. Edirne comes also in the same group as Istanbul with the difference that the Edirne House type influence had spread towards Rumelia while Istanbul's influence embraced whole Anatolia.[13] The majority of the buildings from the end of the 18th and 19th century built in these territories belong to the inner hall and central hall types. It is believed that very few of the buildings possessed an open hall. Central and axial halls were more popular. It is easy to understand why the earlier plan types in Istanbul were easily abandoned and made space for domination of the inner and central hall type.

The development of the Ottoman house can be followed in three periods. The first period studies the oldest form of the Ottoman house and starts somewhere in the 16th century. During the 17th century the houses were generally built with an open hall. The houses who had the sitting area on the first floor usually had the stairs on the outside of the façade and accessed the floor through the hall. This stairs were sometimes located within the hall. The house in the Istanbul's neighborhood Halicioglu [Tab.2] is a typical example of the Outern Hall floor type and the house type from the first period that also included some elements of the second period. Numerous are the examples of this house type in Istanbul.



Tab. 2 Halicioglu neighborhood (Source: redrawn from Eldem S. H. Türk Evi Plan Tipleri)
Tab. 3 House in Bebek, Istanbul (Source: redrawn from Eldem S. H. *Türk Evi Plan Tipleri*)

[12] See Hakki E.S. Turk Evi Osmanli Doneminde. p.31
[13] Ibid. p.31,32

Tab. 4 Bebek, Istanbul. Plan of the Nispetiye Pavilion. End of 18th century (Source: redrawn from Eldem S. H. *Türk Evi Plan Tipleri*)

The houses built in the 17th century had the outer hall type that was typical for the first period. Unfortunately very few of these houses exist today. Some of them were demolished and some of them were lost by the time. The plan had its additions like pavilions that were erected at one [Table.3] or both ends of the hall. The houses of the second period were typical for the whole 18th century. The house plan changed into the house with inner and central hall plan and the house with an open hall became unusual. This kind of hall was typical for Istanbul and spreads to the Marmara region. When the hall became enclosed freer arrangement of space was allowed. The first period house existed alongside the second period house for quite a time.[14]

The final development of the Ottoman house took place in the 19th century. Most common floor type plan that was used in the third period was the inner hall plan. The halls started getting bigger in space and the stairs were given an important place in the plan. In this century baroque started to take its place within the house. Baroque curves were being presented through the oval hall and the curved doors that opened onto it. The inner elliptical hall was being popular since it was presenting social status and a symbol of a life –style in the metropolis. [Tab.4] This style was very much present in the Balkans even beyond the Empire style that replaced it in Istanbul when the elliptic halls started to disappear but were still present in the provinces.

5. Historical Development of Ottoman Kavala

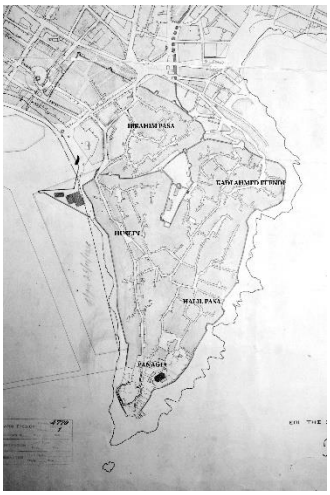
The region of Rumelia was conquered by the Ottomans in ca. 1387. From that year up until the 16th century, when Kavala became a vibrant port city due to the activities of the Ottoman Grand Vizier Ibrahim Pasha and the two sultans Selim I and Suleiman, we poses no source which fully establishes that there was a town in existence at its site. The earliest mention of a village/town named Kavala was found in an Ottoman tax register (tahrir defter) completed in the year 1478 (h.883) .[15]This means that ever since the date of the Ottoman occupation over these territories until the date of this tax register there is almost a one century gap in determining whether there was any sort of settlement on the site of the present day Kavala.

The Panagia district is the old historic nucleus of Kavala. Its boundaries are defined by natural and artificial features as the cliffs, the harbor, the city wall and the aqueduct. The district consists of a number of localities, whose individual characters are a result of historical evolution, the configuration of the terrain and the way they are incorporated into the urban area of Kavala as a whole.[16] Inside the old nucleus five defined localities can be determined. Even though the Panagia district may be described as a unified urban unit, with a close examination of the settlement there is an existence of distinct sub districts. [Tab.5]

[14] Eldem S. H. 1984. *Türk Evi Osmanlı Dönemi*. Cilt.1. Türkiye Anıt Çevre Turizm Değerlerini Koruma Vakfı. p.135-147

[15] Lowry W.H. 2008. *The shaping of the Ottoman Balkans 1350-1550*. Bahcesehir University Publications. Istanbul

[16] Kavala Intra Muros: Spatial readings and Architectural Proposals, Demos Kavala, 1992



Tab. 5 Urban Plan of the Panagia district, Kavala from 1923 (Courtesy of the Municipality of Kavala, Sector for Urban Planning) (Source: Author's archives, 2015)

The residential enclaves in the Panagia district are of various shapes and sizes. An examination on how the buildings are positioned in the urban fabric shows that they are organized in two ways: either as free standing units or in linear disposition along an axis. The internal development of the fabric which is now brought about by the neo-traditional buildings which are being erected without reference to historical typology is leading to a gradual change in the original composition. The relations between the buildings determine the overall profile of the district, most important of all being the direction of the buildings main axes.[17] [Fig.1]

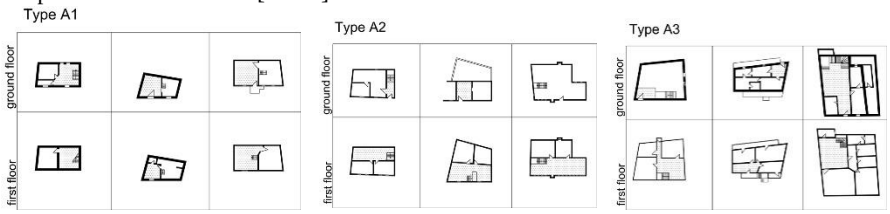
Fig.1 The map was designed following the framework features from 1962

A typological and morphological examination of the buildings makes it possible to assess their particular qualities and characteristics. A research conducted by the University of Aristotle lead to certain conclusions about the typology of the houses. By a close examination of the plans three basic types were set. Types A, B and C.

[17] Ibid, p.63


Fig.2 House in Panagia district on Mehmed Ali Street (Source: Author's archives)
Fig.3 House in Panagia district on Polidou Street (Source: Author's archives)

The type A is a house with two rooms; one closed one semy-open. The most simple type in the Panayia district is the two storey building with a closed balcony - sitting room and a vertical access in a form of a staircase (Type A1).This balcony is actually the outer hall that we find in the first period of the Ottoman houses in Istanbul. The other more common is the A2 type with broader front, usually with 2 rooms next to each other and an enclosed area (balcony-sitting room) where the stairs are located. The A3 type is with even more broad front and has 3 or more rooms in a row fronted by a spacious sitting room. From the floor plan analysis of the so called A type we can conclude that this type of a house has an outer hall which is closed and from which we access the room or the rooms. The stairs are placed inside this hall. [Tab.6]

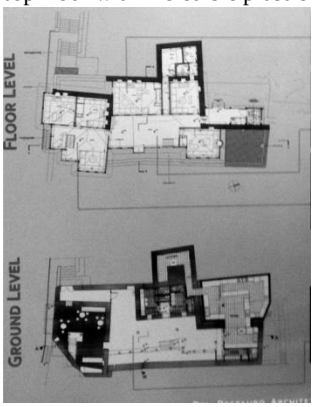


Tab.6 Type A house plans (Source: redrawn from Kavala Intra Muros: Spatial readings and Architectural Proposals, Demos Kavala, 1992)

Type B is essentially a product of evolution of the parceling system and successive division of urban land. The buildings are two stores, narrow-fronted structures presenting a limited area towards communal spaces. [Tab.7] The type C is probably more recent and is more urban in character. It comprises two-story, box shaped or broad-fronted buildings with more morphological features. The one feature in common to all variations of this type is the internal central sitting room with the rooms positioned symmetrically on either side of it. The type C presents the inner hall floor plan as we presented in the examples from the second period of the development of the Ottoman house in Istanbul. The long inner hall spreads in the middle of the house and the position of the stairs is sometimes at one end of it or in the middle. [Tab.7]

Tab. 7 Type B and C type plans (Source: Kavala Intra Muros: Spatial readings and Architectural Proposals, Demos Kavala, 1992)

Given the examples from the plan types in Ottoman Kavala we notice that the central hall plan doesn't appear in the typology of the houses in the town. If the style itself presented nobility and social development than we can conclude that the town, until the tobacco industrial explosion, kept its provincial character.
The Mehmed Ali's house, the founder of the Egyptian dynasty's house can be taken and presented separately because of its owner's importance not just to Kavala also to the Ottoman period and the Egyptians which last dynasty he ruled. The house was owned by his maternal grandfather and Mehmed Ali lived here after his parent's deaths.[18] Probably in the eighteenth century Mehmed Ali's house was one of the towns very important and obviously few mansion houses. Typologically it is a traditional broad fronted two story residence with a linear layout of rooms and a balcony cumsitting room on the first floor and auxiliary areas and covered courtyard below. [Tab.8] The house of Mehmed Ali is one of the few remaining residences in Greece which preserve the separate men's and women's quarters (selamlik and harem respectively), which were some of the chief characteristic of the Turkish Houses of the well situated families. Additions and alterations have not affected the basic typological coherence of the building, which is now a museum. [19] The house was restored in 2001.[20] This house presents a typical Ottoman mansion. It is built on the steep terrain on the east side. Lying on a solid rock over which a stone ground floor was built above which lies the beautiful light wooden top floor with incredible plasticity of the bay windows. [Fig.4]



Tab.8 Floor plans of the Mehmed Ali's house for its reconstruction in archives, 2014)

Fig.4 Mehmed Ali's House (Source: Author's 2001(Source: Imaret Hotel)

Conclusion

The Ottoman vernacular style in general had undergone three major stages of development. It is known very little of the domestic forms from the 15th and 16th centuries. This is why an analysis of the development of the Ottoman house types cannot be taken further back than the 17th century. The development can be followed in three phases that correspond to three distinct types. The first phase

[18] Lowry W.H. Ersunal I. 2011. "*Remembering One's Roots* "Mehmed Ali Pasa of Egypt's links to the Macedonian town of Kavala: Architectural Monuments, Inscriptions & Documents. Bahcesehir University Press, Istanbul. p.1-10

[19] Kavala Intra Muros: Spatial readings and Architectural Proposals, Municipality Kavala, 1992, p.65

[20] Anna Misirian Tzouma is native of Kavala and the owner and manager of Imaret A.S and the Imaret Hotel. It took six yearlong efforts to gain permission from the Egyptian's Government's Waqf Administration to fully restore the Imaret and use the monument as a hospitality and culture venue. In 2001 a contract was signed which allowed the restoration of Mehmed Ali's complex to begin but the agreement also stipulated that restoration of Mehmed Ali's home must be undertaken too. (in Lowry W.H. Ersunal I. 2011. "*Remembering One's Roots* "Mehmed Ali Pasa of Egypt's links to the Macedonian town of Kavala: Architectural Monuments, Inscriptions & Documents. Bahcesehir University Press, Istanbul. p.23)

is the 17th century house, the second the 18th century and the third, the 19th century. These phases it is believed that have their roots in Istanbul and then spread over the Marmara region and had their secondary influences in the further geographical territories of the Ottoman Empery. Some of the types from previous periods still continued to live parallel with the contemporary style, but mostly these older house types prevailed in the provinces. That is why this three period division of the types by centuries can only be applicable to Istanbul.

In the town of Kavala, from analyzing the houses floor plans, we can follow the development of the house and determine few types of floor plans. Some of them correspond with the earlier development of the area due to their lack of space and modest development in its interiors. As for the houses with wider floor plans we can come into conclusion that as first they were built probably in the later centuries of the Ottoman rule, when the tobacco industry was in its bloom, so it allowed the rich owners to be able to build wider houses and build them in a more wider land plots that allowed expanding the floor plans, that unlike the other types who only had major sun and light income at the upper floors, and were not limited in their floors. The specific of the terrain and the location of the settlement made direct impact on the floor types of the houses that became a mixture of the Ottoman houses with implementation of local traditions and directed by their positioning on the terrain. The richness of the architectural elements that can be seen in this location are of exceptional importance since they show the ways how the builders in those times were solving problems in order to design and built houses that will provide not just the basic needs for shelter but also commodity, view and light. The Ottoman house in Istanbul had its development stages through the centuries which we can follow as far as the 17th century. The Istanbul house had its 3 major phases of development that happened in the 3 following centuries respectively. Sometimes the previous style lived together with the newly developed but slowly started disappearing and leaving completely space for the newly formed style. This was not the case with the provinces though. Kavala being also one of the Ottoman provinces, just like most of the towns in Rumelia, still kept its later styles. This is why the division of the style development by centuries can only be applied to Istanbul but not the other provinces of the Ottoman Empery.

Istanbul, being the metropolis had its life style and specific vernacular architecture that developed with the influence of the society, the income and with the whole glory of the capital itself. In the case of the town of Kavala the most respective noble from the Ottoman period and not considering the late 19th century house development in Kavala, was Mohamed Ali, the founder of the Egyptian dynasty. His house is the only one in Kavala built as a mansion with the specific architectural characteristics of a wealthy family. The other houses in the old peninsula that are preserved, but yet were a matter of interventions, kept its "provincial" characteristics. Being very densely populated the plots were very small, sometimes narrow and also positioned on the sloppy terrain that added to the difficulty of having wider or at least clearer forms of plots. This was not the case with the houses that were built by the middle and the end of the 19th century when the tobacco industry started to flourish in Kavala, when many foreign traders settled in the town and built their houses and brought with them the western influences. But it is important to mention that these new houses were built in the new area outside of the walled, overcrowded Panagia district.

In the Panagia district all the Ottoman House elements are present and visible, the urban layer of the peninsula kept its Ottoman organic structure with interventions made in the later centuries as necessary to the new life styles, the development of the town and the industrialization, but yet those urban interventions are noticed only in widening the main streets of the peninsula that existed in the Ottoman era. It is not negotiable that the Panagia district in Kavala was a typical Ottoman town with its urban and architectural specifics. The town was built on a land where a Byzantine town was existing which, after got taken by the Three Beys *(Üç Beyler)* in 1387, was burned to ground and there was no evidence of a settlement nearly for a century. This means that Kavala was a fresh, new Ottoman town build on an empty plot or area and no local or previous existing influences could have been possible to impact the house development due to the fact that there was no settlement and no life for nearly a century.

Acknowledgements

"This paper has been presented with the support of the Turkish Cultural Foundation. The contents of the publication are the sole responsibility of the author, Velika Ivkovska, and can in no way be taken to reflect the views of the Turkish Cultural Foundation."

References

1. Akin, N. Balkanlarda Osmanlı Dönemi Konutları. Literatur, Istanbul
2. Ayverdi E. H. Avrupa'da Osmanlı Mimari Eserleri (Bulgaristan, Yunanistan, Arnavutluk) IV.Cilt. Istanbul (2001)
3. Bechhoefer, W. Visions of Place. University of Maryland (2010)
4. Bertram, C. Imagining the Turkish house. University of Texas Press. Austin (2008)
5. Celebi, E.1968. Travels. Vol 1, Vol 2. London
6. Cerasi, M. The Formation of the Ottoman House Types: A comparative study in interaction with neighboring cultures. Muqarnas Vol.15. BRILL (1998)
7. Doğan, K. Türk Hayatlı Evi. Eren Yayıncılık. Istanbul (1995)
8. Günay, R. İstanbul'un Kaybolan Ahşap konutları.YEM. Istanbul (2014)
9. Eldem, S. H. Türk Evi Osmanlı Dönemi. Cilt.1. Türkiye Anıt Çevre Turizm Değerlerini Koruma Vakfı (1984)
10. Eldem, S. H. Türk Evi Plan Tipleri. Istanbul Teknik Üniversitesi, Mimarlık Fakültesi. Istanbul (1954)
11. Kurran, A. Selçuklular'dan Cumhuriyet'e Türkiye'de mimarlık - architecture in Turkey from the Seljuks to republic. Türkiye İş Bankası Kültür Yayınları. Istanbul (2012)
12. Lowry, W.H. The Shaping of the Ottoman Balkans 1350-1550. Bahcesehir University Press. Istanbul (2008)
13. Lowry, W.H., Ersunal I. "Remembering One's Roots"Mehmed Ali Pasa of Egypt's links to the Macedonian town of Kavala: Architectural Monuments, Inscriptions & Documents. Bahcesehir University Press. Istanbul (2011)
14. Lowry, W.H. In the footsteps of Evliya Celebi. Bahcesehir University Press. Istanbul (2012)
15. Schreiner, P. Die Byzantinischen Kleinchroniken, Vol.XII.Vienna (1977)
16. Στεφανιδου, Α. Η πολη-λιμανι της Καβαλας κατα την περιοδο της τουρκοκρατιας, Πολεοδομικη και ιστορικη διερευνηση (1391-1912). Ιστορικο και Λογοτεχνικο Αρχειο. Καβαλας (2007)

Bulletins

Kavala Intra Muros: Spatial readings and Architectural Proposals, Municipality Kavala, (1992)
Know how Networks, Research Committee AUTH- School of Architecture, Kavala Intra Muros: mobility (2006)
Kavala one destination, a kaleidoscope of experiences, Gazette of Municipality of Kavala

The phenomena of Urban Sprawl – study case of city of Prishtina

Ilirjana Mejzini

UBT- Higher Education Institution
ilirjana.mejzini@ubt-uni.net

Abstract. Urban sprawl is a phenomena that affected the entire world, in particular the capital cities. There are different cases and forms of the city extensions, which influence the community in many ways, like: social behaviour, economic prosperity, irrational land use, infrastructure disorder, energy inefficiency as well as polluted environment.
This paper explores typical examples of urban sprawl evident in European cities and the core reasons of its appearance. The analyses will focus on the rapid urban extension of Prishtina; it's over population and all consequences affecting daily life.
The aim of the paper is to highlight the most dangerous factors resulting in Prishtina's chaotic city development, in order to raise awareness among decision makers and other stakeholders to prevent further urban sprawl and find any potential possibilities for efficient and sustain urban solutions.

Keywords: urban sprawl, consequences in society, core of the city, land use, infrastructure, environment.

1. Introduction

Capital cities represent the biggest drivers of development; it's where infrastructure is more advanced, a higher density of productive population is present, a larger selection of schools, cinemas, theatres is possible… and simply where "everything happens". This of course has triggered migration of the rural population to the capitals, and is something which presently occurs and will continue in the future. These migrations result in the enlargement of existing habitats or in the urbanization of peripheral parts of the city, also known as urban sprawl.
Urban sprawl is a phenomenon which all cities face in all parts of the world. The definition of urban sprawl as "huge patches of once green countryside turned into vast, smog-filled deserts that are neither city, suburb nor country", is a motive for urban planners to study this phenomenon with the objective of finding better solutions to the problem. Initially in this paper, an explanation of how urban sprawl is perceived, is provided, together with the main reasons why this phenomenon is present. Moreover, the main features characterizing urban sprawl and their consequences to the society, economy and environment are elaborated. Considering that Prishtina is a typical example of urban sprawl, a detailed study case is provided in a separate chapter. All possible factors that resulted in the urban chaos of Prishtina are analyzed. To trace the roots of the cause, the challenges facing the the city's governance over the years are briefly explained. As a consequence of various problems accumulated, the urban sprawl phenomenon was inevitable. The city not only expanded, but its urban areas actually exceeded city borders and spread to cadastral parcels of neighboring cities.

With the aim of investigating solutions, the last chapter elaborates on advanced and promising studies of effective urban expansion. Further, the mechanisms to halt urban sprawl are explained, together with modern trends of planning toward sustainable development of cities.

2. The meaning of urban sprawl

2.1 Definition

The development of capital cities is a continual process determined by economic trends and modern way of life. This attracts populations of smaller towns and villages who view the capital as a place of more opportunity. On the other hand, how is it possible for a large city to absorb such huge increases in inhabitants? Without doubt the only viable solution is the city expansion.
Due to large migration fluxes, many metropolitan cities are faced with rapid urbanization, where the city expands in multiple directions. The city centers almost always become over-populated, while the density decreases as you move away. An inadequate visual image is one from an aerial photo at night, where the lights in the suburbs are less and further apart, yet as the center is approached they become denser until a huge bright area is created. The expansion of cities as it would be visible through this aerial image is known as urban sprawl. In common use, sprawl has become a pejorative term that seems to take a variety of meanings; quickly and cheaply built neighborhoods at the edge of metropolitan areas, architecturally monotonous residential subdivisions, or ugly feeder roads lined with strip malls. "Urban sprawl" was used for the first time by William H. Whyte in early 1958 in an article published in Fortune magazine. He observed that "huge patches of once green country side had been turned into vast, smog-filled deserts that are neither city, suburb nor country". In addition he warned about the great expansion of metropolitan areas where subdivisions of one city where beginning to meet up with the subdivisions of another. Furthermore, describing a particular form of urbanization, the term also relates to the social and environmental consequences associated with this development. Sprawl refers to a mixture of land uses occurring in an unplanned pattern and that is generally identified with outward sub urban growth of the city.
As population in a city grows beyond capacity, the local communities continue to spread farther and farther from city centers. However, regardless of how a city expands, the connection to its center remains crucial for all members of society. The urbanization of a city towards the rural suburbs is characterized by more spread-out infrastructure, larger distances from the city center, and much smaller density compared to urban areas. Apart from differences in density, these zones result in environmental and spatial issues, and together form a puzzle with concerning consequences that symbolizes the urban sprawl phenomenon.

2.2 Features that characterize the urban sprawl phenomenon

Figure 1 provides details for the specific characteristics of the urban sprawl phenomenon. The figure displays various categories of how a city centre developed and expanded towards rural areas, as:

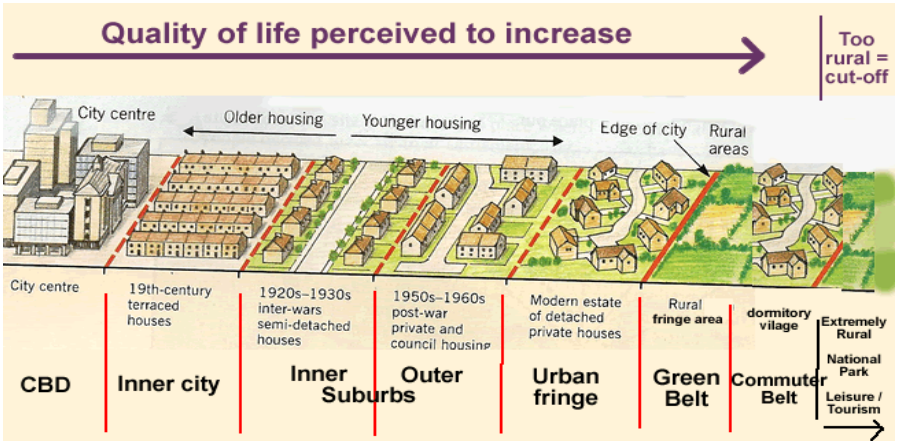
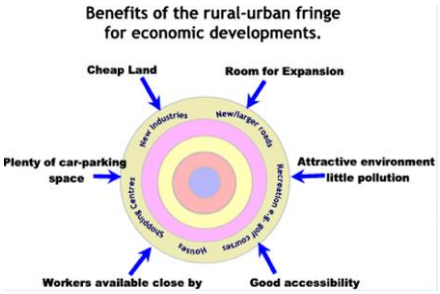


Fig.1 The extension categories of urban sprawl

- City center, which dates back to when the urban area first appeared.
- Inner city, squeezed older housing, populated during 19th century
- Suburbs (inner and outer younger housing) populated during the 20s-60s of the 20th century
- Urban fringe, up to the edge of the city, modern estate
- Rural areas, green belt (rural fringe area) and commuter belt (dormitory village)
- Extremely rural - National Parks, leisure or tourism

At first glance it is perceived that the further away from the center one goes, the air is cleaner and general living conditions are better. Therefore urban sprawl is also caused by people in high income groups who have stronger preferences towards larger homes, more bedrooms, bigger balconies and bigger lawns. Generally, people look out for low-density residential areas where they can create a home according to their preferences. In addition, there are lower costs for land and houses, compared to higher prices as one gets closer to the city centers.



.

There are also other benefits of the rural-urban fringe for economic development such as:

- Room for expansion
- Attractive environment with little pollution
- New larger roads
- Plenty of car-parking space
- Good accessibility for huge recreational centers, shopping malls, innovative and high tech. industries

However, if seen through deeper empirical analysis, various issues can be observed that could result in huge changes to social, economic and environmental aspect of human life.
Development towards the suburbs results in more sporadic buildings which lead to less population density. The bigger the urbanization, the less there will be green areas. Areas of land that could be used for agriculture and forestry are gradually converted into construction areas which limit the cultivation of organic food. Another aspect is the poorer infrastructure compared to that of the center, where inhabitants are heavily reliant on commuting to fulfill their daily needs. The dependency on automotive vehicles results in higher expenses. Further, the excessive use of automotive vehicles no doubt increases CO_2 emission and pollution of the area.
Moreover, further expansion of urban areas results in extremely extended land-use which may lead to an ecosystem imbalance and have negative impacts to normal living conditions.
To summarize the points raised above, the following list covers the main occurrences leading up to urban sprawl:

- huge neighborhoods only with residential buildings
- very low population density
- infrastructure extension
- extended land-use and loss of forests and agricultural land
- vehicle-dependent communities and larger transport expenses
- Increased Emission of CO2
- Ecosystem degradation

The Urban sprawl phenomenon can be considered a puzzle composed of all of the above. Bearing in mind all the consequences to nature and human society, it is inevitable to search for solutions to tackle this phenomenon.

3. Case study of Prishtina

3.1 What caused the urban sprawl of Prishtina

Mass migration - Prishtina is an example of city enlargement. It represents the difficulties of the transformation process from a socialist to a market driven economy which can be identified in cities all over the Balkans, as well as reinvention of itself after a long period of oppression and the war of 98/99. Development demands in the post war Prishtina intensified when the rural population began streaming into the city. Within a brief period of time, Prishtina doubled its population, resulting in the speedy rebuilding of the city. The majority of postwar Prishtina inhabitants engaged in creation of new spaces for housing purpose, and some for their family businesses. Some engaged in building of more enhanced residences to improve their life style.
Lack of urban plans - The migration right after the conflict was that massive, that the need for construction resulted in chaotic urban development. Due to the lack of rule of law and incompetent management in the late 90s, the General Plan of Prishtina of 1985 was neglected completely. The local institutions of Kosovo had just been founded and considering the problems facing the post-war country, it became extremely difficult to draft new plans to accommodate the expansion of the city.
Low price of land - Considering that administration was also at its early phases, becoming a legal land estate owner was almost impossible. Over 70% of the city suburbs were once private or public agricultural land, but its conversion into land for construction was made possible by the Yugoslav administration through illegal procedures. Land, because it fell under construction parcels, became very cheap and becoming a land owner wasn't very difficult.
Low quality buildings - Due to a lack of construction standards and urban plans, unlicensed construction and buildings hardly complying with urban standards became very common. In almost every parcel, the maximum possible layout was built, and basic principles of window opening, roof style and distance between buildings were almost entirely ignored.
Expensive prices of existing properties – Arbitrary prices of existing housing also had an effect on the expansion of the urban zone. The buildings in urban areas, built before 1989, all had complete documentation. However, due to enormous request for housing, prices were usually set without taking the estate aspect in to too much consideration. Therefore, the most feasible solution seemed to be new buildings which unavoidably extended urban areas in all directions.

3.2 Urban extension of Prishtina in the past

Not only Prishtina but almost all cities and towns of Kosovo are characterized by uncontrolled urban development in suburb areas. Considering the lack of consistent administration, every new government would inherit varying jurisdiction. After WW2, Prishtina extended based on new plans which ignored the traditional urban core and cultural and historical image build throughout centuries. Up until 1989, when the disintegration of Yugoslavia began, only a small portion of the city center was regulated under urban plans, while the surrounding areas were urbanized in an arbitrary and uncontrolled manner. The use of land was far from efficient, considering that only around a quarter of the urban area contended collective housing. Like the traditional areas, the new neighborhoods mostly consisted of individual housing.
The year 1999 found Prishtina in a desperate state after years of occupation. Not only had anything been built, but the existing buildings were neither adopted nor renovated to meet the inhabitants' needs. This stagnation on one hand, and the ever increasing requirements of the community, brought Prishtina to a reality where almost the whole city was turned into a construction site. Further, even the most rural places of Prishtina began to be urbanized not only from their inhabitants, but also the population migrating from all parts of Kosovo. Within a period of 15 years, the existing urban area trebled to contribute to a typical urban sprawl with all the negative aspects that associate it.

3.3 Characteristics of Prishtina's urban sprawl

Urban developments that resulted in the expansion of urban areas mostly came from private rather than public investment. Public investment focused on collective housing and was largely based on an urban plan. Considering they were in limited numbers, they were mostly built in convenient parts of the suburbs that were close to the center and had good access to the existing infrastructure. Private investment however, manifested in huge numbers which made it difficult to plan location and also ensure they all possessed licenses due to insufficient urban plans.
A characteristic of private investment was that the moment a piece of land was secured; investment would be realized, regardless of access to infrastructure, the distance to the center, or the density. The investment were based only in possessed financial capacity, often in middle of agricultural land, without basic infrastructure, or any access to existing road net. This phenomenon was also seen in the cases of capital investments in industrial buildings and large blocks of collective buildings.
In many cases, after the urbanization of a suburb area, there were efforts to draft an urban plan with the aim of adapting to the situation at hand. This demonstrates that a key characteristic of urban sprawl in Prishtina was the fact that urbanization would happen before any actual planning. Therefore, the main decision-makers of Prishtina's urban extensions were and continue to be businessmen in construction. Regretfully, this is done with minimum consideration to other planning factors such as: effective land use, social welfare or rational use of infrastructure, let alone attention to green environment.
With urbanization of land, the infrastructure would typically be extended from the center through existing networks but without actually increasing capacity. This would result in serious problems such as sewage issues due to the networks limited capacity and unmaintained facilities.
As a result of the aforementioned chaotic expansions, the urban sprawl of Prishtina is different to other categories of urban sprawl. Further, it is rather difficult to differentiate a beginning and an end between the city and the expansion to suburban and rural areas. The urban unit of Prishtina itself, with its numerous expansions is fairly spread out, where parts of this expansion have almost merged with neighboring towns and villages; the international village adjacent to Ajvali, the NIC neighborhood in Cagllaviva or Marigona between Prishtina, Fushe-Kosova and Lipjan.

Fig.3 *Mono-functional "NIC Residence"* ***Fig.4*** *Multi-functional "Marigona Residnce"*

New and modern neighborhoods are built with sophisticated building standards, but very little attention is dedicated to urban adaption and the social welfare of the community. With the exception of Marigona neighborhood, which is built based on modern standards of multi-functional planning, the other neighborhoods are simply housing residents, also known as mono-functional.
However, their distance of about 10km from Prishtina makes them serious contributors to urban sprawl through: car-dependent communities, extraordinary extended infrastructure, non-efficient land-use, limitation of agricultural land, and far from environmentally friendly city development.

4. Challenges for overcoming urban sprawl

4.1 Contemporary planning

In contrast of old planning in the past, which concentrated on improving the physical aspects of buildings and streets, modern city planning is increasingly concerned with the social and economic aspects of city living. The process of city planning is a highly complex, step-by-step procedure, usually involving a series of surveys and studies, development of a land-use plan and transportation plan, preparation of a budget, and approval of a unified master plan by various agencies or legislative bodies. City planners are usually part of an urban planning board or governmental agency that must take into account the characteristics and long-range welfare of the people of a particular urban community—their employment opportunities, income levels, need for transportation, schools, shopping areas, hospitals, parks and recreational facilities. They must face the problems of traffic, congestion, and pollution; they must also consider the availability of police, fire, and sanitation services, the limitations posed by zoning and other regulations, and the problems of funding. In recent years, residents of many communities have demanded greater participation in the planning of their own neighborhoods, and some planners have worked closely with community groups during various stages of the planning process.

Principles of intelligent urbanism – is a theory of urban planning composed of a set of axioms intended to guide the formulation of city plans and urban designs. They are intended to reconcile and integrate diverse urban planning and management concerns, by including economic, social and environmental sustainability. The term was coined by Prof. Christopher Charles Benninger.

The axioms for intelligent urbanism contain these principles: balance with nature and tradition; appropriate technology; conviviality (places for individuals, friendship, householders, neighborhood and communities); efficiency; regional integration and institutional integrity, Benninger. Ch (2001).

4.2 Urban consolidation – Adaptive re-use of areas within the urban zone

Urban consolidation has been strongly tied to the green movement, which argues that urban sprawl leads to longer commutes and therefore more carbon emissions. Through urban consolidation, planners aim to pass laws limiting urban sprawl, as well providing incentives for developers to build and restore land within the downtown core. The methods of urban consolidation would limit urban sprawl by using existing areas more rationally and by adapting them for future re-use. The advantages this brings are numerous:

1. Economic aspect – lower cost since there is less need for infrastructure extension;
2. Social aspect – the community benefits from the proximity to the center and isn't isolated in less dense areas;
3. Environmental aspect – less carbon emission as a result of more walking distance services.

The fulfillment of the three aforementioned aspects is a valid reason for planners to consider this an effective method. However, further investigation into alternative mechanism should be made, considering the fact that more complex solutions may be required for already dense zones. In available parcels in the center, it is not recommended to build very large buildings as it may cause over-population and potential disproportion with existing buildings. Further, the existing infrastructure would be unable to accommodate this large addition. During the adaption of existing zones for re-use it is vital that the existing urban harmony is preserved.

For adaptive re-use of urban zones it is very important that all stakeholders contribute in the process of planning, in particular the community that lives there. In this way, it will be easier for planners to identify the needs of the community and guide the adaption of the zone in the right direction. It is also essential that all relevant resources are taken into account, in particular built heritage. Its conservation and adaption would enable their use for the good of the community and also enable the preservation of historical and culture values for future generations.

Conclusion

The analysis of the urban sprawl phenomenon made it possible to identify numerous consequences for living species and nature. It can be concluded that the the farther the urban expansion, the larger the impact of pollution, energy inefficiency and CO2 emission.
On the one hand, as a result of the study of the causes of urban sprawl, it was evident that the lack of application of spatial planning principles and adequate mechanisms to prevent it, only helped the phenomenon expand. This expansion leads to inefficient land-use and loss of agricultural land which could gradually affect the ecosystem equilibrium.
The third chapter elaborated on the case study of the city of Prishtina, as an appropriate example where all major negative effects of urban sprawl are evident due to the urban chaos throughout the city. Further, the general circumstances present in Kosovo, and in particular Prishtina, that prevented previous planning were highlighted. As expected, this inefficieny in planning resulted in concerning consequences such as:

- Loss of agricultural land - resulting from sporadic inhabitance (while the overall density is very large in Kosovo);
- High emission of CO2 - resulting from the creation of neighborhoods located a good distance away from the center.

Adequate solutions to tackle urban sprawl and limit its consequences have been investigated from international think tanks and most credible universities worldwide. Profesor Benninger's analysis concluded that intelligent urbanism would bring a balance in nature and tradition; appropriate technology; conviviality (places for individuals, friendship, householders, neighborhood and communities); efficiency; regional integration and institutional integrity. In the case of Prishtina, intelligent urbanism would undoubtebly help to decrease urban sprawl and at the same time, boost the consolidation of entire city in all aspects of sustainable development.
For adaptive re-use of urban zones it is crucial that all stakeholders are involved from the beginning of the planning process, in particular the community that lives there. In this way, it will be easier for planners to identify the needs of the community and guide the adaption of the zone in the right direction. It is also essential that all relevant resources are taken into account, in particular built heritage. Its conservation and adaption would enable their use for the good of the community and also enable the preservation of historical and culture values for future generations.

References

1. Bhatta, B (2010), *Analysis of Urban Growth and Sprawl*
2. Rafferty, J.P. (2006), *Urban Sprawl*
3. Hather, C. (2008), *Urban consolidation – Its impact on sense of place*
4. Lehman, S. (2011), *Transforming the City for Sustainability: The Principles of Green Urbanism*
5. Powell, K. (1999), *Architecture Reborn: Converting Old Buildings for New Uses*
6. El-Hissi, Sh. J. (2010), *Urban Consolidation*
7. Beder, Sh. (1996), The *Nature of Sustainable Development*, 2nd ed. Scribe, pp. 161-3
8. Kaji, H.; Kanegae,; H. Ishibashi, K.; Hara, N. (2003), *Compact City and Developing Countries*
9. Mejzini, I.A. (2012), *The advantages of cross-border cooperation towards sustainable developments of Western Balkans*, European Magazine, pg. 27
10. Vockler, K.; Jerliu, F. (2012), *The City Transition: Archis Interventions in Prishtina*, European Magazine, pg. 32

Analysis of hotels - Case study Kosovo

Mimoza Sylejmani[1], Lulzim Beqiri[1], Rineta Jashari[1]

1, UBT - Higher Education Institution; Prishtine, Republic of Kosovo
{lbeqiri1, mimoza.sylejmani1, rineta.jashari1}@ubt-uni.net

Abstract. The research deals with the analysis of the Hotels, where as a case study is taken Kosovo. Focus study were the cities with the greatest number of people, namely those which are visited more by tourists. The research is based on analytical method, which helps in the final results. Analyzed in terms of functional objects, architectural, access to the facility, their capacity and conditions that they offer guests. The classification of buildings is done in two groups;
a) Those built before 1999 and
b) Those built after 1999.
Analysis show that cases of hotels built before 1999, which once met all the requirements in terms of functional, architectural and urban planning, today some of them lack any of the basic elements, characteristic of a hotel.
Furthermore, from analysis few hotels built after 1999, meet the functional elements in terms of interior space, but on the other hand they lack in urban and architectural aspects.

Keywords: Location, architecture, supply, capacity, function.

1. Introduction

During the design of hotel buildings every time there has existed the effort that they have to be positioned in the city center, where circulation of citizens is more pronounced. As a result of overcrowding in the city of Pristina, the possibility of building such an object was minimized.
Adaptation of buildings of different characters in hotel facilities became part of our reality, giving a new breath to this type of residential facilities, without contained in itself the elegance and comfort, these elements characteristic of an object of this kind.
The need to build something beautiful which in itself will contain the necessary elements for a stay cozy, encouraged the investor for the construction of these facilities on the outskirts of our city. This allowing in this way the parking lot sufficient for clients, as opposed in the cases mentioned above, but concurrently removing this type of facilities from the city center. Hotel facilities built before 1999, during the periodic renovations they lost the key appearance in the interior as well as exterior, these changes in some cases positive, while in some cases have lost the values of the object. The aim of the research has been to identify shortcomings under these facilities.

2. The methodology

Methods which are used are:
1. The comparative method and
2. Analytical method
These methods have helped in achieving the final results during this research.

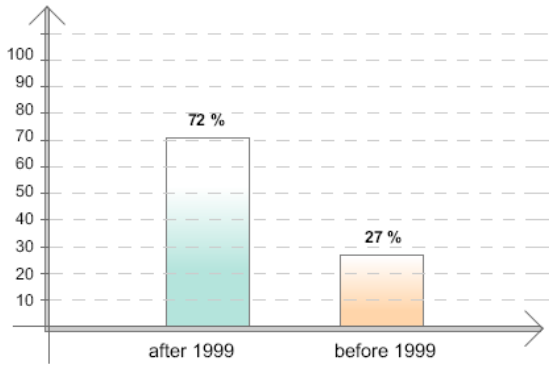


Figure 1. Analysis of hotels build before and after war 1999.
(Source; Author's figure in October 2015)

In the diagram is shown number of hotels analyzed before and after the war in percentage.
The largest number of hotels are built in cities and on the highway roads, while a smaller number were constructed in mountainous parts of the country as Hotel Sharri, Magra Austria etc.

2.1 The comparative method

During the research there were analyzed there considerable number of hotel facilities built in Kosovo. Amongst them we have presented two examples of these objects built before and after 1999. The facilities were compared in architectonic terms, whereas the key point of the research were: the access in object, the dimension of sleep units and analysis of constructive spaces.
- **Hotel Dukagjini** was built in 1956 in the city of Peja. The building is located 300 m away from the bus station and 70 km away from Pristina Airport. It is one of characteristic hotels built in our country, situated along the White River, just few steps away from the business area, theater, bars and other buildings of cultural heritage. The building is made from circumstantial materials such as stone and wood, offering thus a warmth to guests, but during occasionally renovations, among these materials are introduced other materials such as: plastic, aluminum and glass, by losing the authenticity of the concerned object.
- **Golden Hotel,** was built in 2013 in Pristina. The hotel is located about 20 minutes from the city center. It has G + 2 story height, and ample space for parking.

Figure 2. Hotel Dukagjini - Peja
(Source; Author's photography in October 2015)

Figure 6. Hotel Golden – Pristina
(Source; Author's photography in in May 2015)

Figure 3. Main entrance in Hotel Dukagjini (Source; Author's photography in October 2015)

Figure 7. Vertical communication (Source; Author's photography in May 2015)

Figura4.Interior of the room - Hotel Golde (Source; Author's photography in October 2015)

Figure8. Interior of the room - Hotel Dukagjini (Source; Author's photography in May 2015)

Figure 5. Interior hall-Hotel Dukagjini (Source; Author's photography in October 2015)

Figure 9.Interior hall -Hotel Golden (Source; Author's photography in May 2015)

Today the development of the technology offers great opportunities in both constructive and aesthetic aspect. Further, today the use of different systems constructive enables large static spaces, therefore the elimination of the pillars in the necessary spaces in functional terms which appear as obstacles can be achieved more easily, which this technology is not noticed that it is applied in new hotelier buildings.

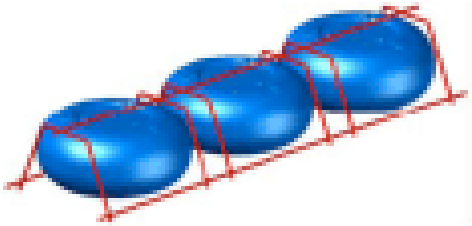


Figure 10. Slim -Line-Cobiax
(Source; Cobiax Engineering Manual 2010)

Figure 11. The relieved slab
Source; Author's photography in March 2012)

2.2 The analytical method

Over the time, many of the hotels have changed their structure, by downgrading the values that they had before. This degradation in most cases comes at the time of their renovation by private investors, as a result of using inadequate materials and improper combinations.

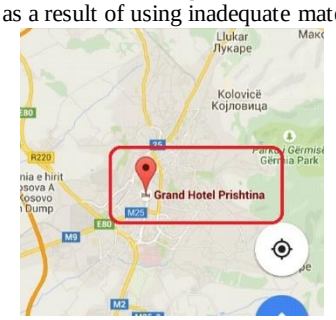


Figure 12. Location of Grand Hotel
(Source; Google Map 2015)

Figure 13. Grand Hotel
(Source; Author's photography in November 2015)

Grand Hotel which is located in the center of the city of Pristina during external renovation changed its appearance, causing reactions and dissatisfaction on the part of citizens. Therefore, today one part of the hotel with the rest of it do not correspond with each other. In this case the investor worked zealous in the so-called "ugliness of our center", is one of our citizens' comments.

Figure 14. Swiss Diamond Hotel
(Source; Author's photography in October 2015)

Figure 15. Main entrance in Swiss hotel
(Source; Author's photography in October 2015)

During the time, some of the hotels have lost any of the advantages that had once, as a result of changes that time has brought. Aforetime, the access to the hotel today so-called Swiss Diamond Hotel could be realized by two parallel streets, offering a high comfort of access to the building. Meanwhile, today as a result of changes in urbanistic aspect, one of the streets has become Main Square, by imposing access to the hotel only by his rear.

Conclusion

The aim of this paper was to identify difference in accommodation-living space and comfort of hotel spaces dedicated to visitor and we are confident to present through this paper findings in this relation. Based on the analysis done and data integration to this research , we came to the conclusion that residential hotel facilities built before 1999 offers higher commodity and conditions for guests compared with those built after 1999 in functional terms, while in the aesthetic aspect were competing. Those findings we do based on survey and analyses completed for this research and as well compare to the standards related to interior living space of standard hotels. Today, the development of technology offer great opportunities in both the constructive and aesthetic aspect, however, we noticed that these advantages are not exploited in the cases mentioned above. There are some indicators that leads us to the conclusion that some of the hotels were adapted, as their initial function was dedicated for another function. Furthermore having in consideration post conflict period, missing of development planes and professional building companies indirectly influenced the comfort of hotel spaces. The post conflict time reflected on hotels ownership, as before conflict hotels were socially owned that went through privatization process and therefore private owner, through refurbishment process affected a lot hotels values in interior and exterior. On the whole, such buildings in case of privatization were reconstructed, but during this process became inadequate combinations of materials were done causing the degradation of their values. The analyses clearly identified that before and after 1999 in a very few cases was treated access of visitors with special needs. Approach to hotels for visitors with special needs, their vertical and horizontal communication can be clearly seen as non-treated or in minor level treated before and after 1999. Main elements are ramps for people with special needs and elevators with inadequate dimensions, but in some cases even don't exist, which can make it difficult or without enabling them access in hotels. Through this paper as well was identified size reduction at bedrooms unit that indirectly increased number of visitors (business aim approach) but reduced common places as communication, restaurants, and hotel lobby etc. therefore in most of the cases those were minimized. Above mentioned factor, scanning of current situation and comparing to space demand at the hotels, expressed though commodity, and confronting the space reduction, followed with construction elements and materials used unprofessionally, it is necessary to have a professional approach to this problem by trying to set up local standards, based on international standards, and implement local regulation and law related to hotel design. Creating or adhering one technical regulations, without which the designers and investors will not be allowed to construct such characteristic buildings, would help improving the situation in which construction of hotels and hotel spaces is today.

References

1. New Hotels - Alejandro Bahamon
2. Design Hotels - Architectural Design
4. Engineering Manual Issue 2010, Cobiax Technologies, www.cobiax.com
5. https://www.google.com/maps/@42.6602342,21.1599785,18.25z (fig.12) 01.11.2015
5. New Hotel: Architecture and Design (15 Jun 2001) - by David Collins
6. 101 Hotel-Lobbies, Bars & Restaurants (7 December 2013) by Corinna Kretschmar Joehnk and Peter Joehnk
7. Hotel Architecture (Aug 2011) by Orange Yan
8. Hotel Design, Planning, and Development (Second Edition) (by Richard H. Penner, Lawrence Adams and Stephani K A Robson
9. Detail in Contemporary Hotel Design (10 September 2013) by Drew Plunkett and Olga Reid

Architects role in change influenced by technology and increasing urban data (BIM, GIS and CODES) from global and local perspective

Ferhat Bejtullahu[1], Violeta Nushi[2], Enis Jakupi[3]

[1]Fakulteti i Arkitekturës dhe Planifikimit Hapësinorë; UBT
Lagjja Kalabria p.n.; Prishtinë, Kosovë
[2]Fakulteti i Ndërtimtarisë dhe Arkitekturës; Universiteti i Prishtinës 'Hasan Prishtina'
Bregu i Diellit, p.n.; Prishtinë, Kosovë
[3]Fakulteti i Shkencave të Zbatura; Universiteti Shtetëror i Tetovës
Rr. Ilindenit, p.n.; Tetovë, Maqedoni
ferhatbej@ubt-uni.net.com[1], violeta.nushi@uni-pr.edu[2], e.jakupi78@hotmail.com[3]

Abstract. Architects are highly dependent from technology and the need to have integrated tools that also allows them to create models. The main objective of this research is to identify architects role in change influenced by technology and increasing urban data (BIM, GIS and CODES). Architects role in given context is analyzed from global and local perspective. Specific objective of this research is to investigate the use of BIM and urban data from perspective an architect, analyze reduced architects' influence, owners crush design fees and possibilities to take back design control. Literature review, daily spontaneous interviews with participants in the planning and design phase of Prishtina projects and three interviews with experts in information technology have been conducted. Understanding role in change influenced by technology and increasing urban data would minimize misunderstandings and provide architects and each participant in construction industry with clear responsibilities.

Key-words: Influence, Architects, Technology, Change

1. Introduction

As architects and planners, we accept a particular responsibility and have an exclusive opportunity to lead the world in the search for long-term, practical solutions that take advantage of our existing urban assets in a sustainable, smart way. Architects primary role and desire is to design. Providing services of design and construction of buildings and the space creating within the site surrounding the buildings, architects have as their principal purpose human occupancy or use - place creating.

Many design firms are moving towards compensation models based on the full value created, rather than on hours spent. Many architects chose to move into real estate (property) development, corporate facilities planning, project management, construction management, interior design or other related fields. This diversity together with the development of industrialized buildings has contributed to modified work processes, shifts in roles and new ways of communicating. Both the capacity of the new technology and the organizational change are important in order to implement the technology successfully (Day, 1996).

By having urban data (BIM, GIS and CODES) requirements provided instantly, it empowers architects to study many scenarios with the knowledge of how it aligns with city planning. This technology gives architects ability to be more intuitive (which most prefer when designing) with results that are more contextual using computer to do what it does best while allowing the architects more time to do what they do best which is innovation, creativity, and making buildings that improve our communities and peoples' lives.

Architectural and urban design produces spaces and places to experience and live in; participants in every phase of the construction project have to reach professional knowledge of each design phase. Institutions responsible for construction industry, have to design detailed a work plan for each role explaining how the urban data systems and BIM should be used, why and what expected outcome is.

Collaboration is also a key requirement of our system. Collaboration around a shared model allows each expert to maintain their specialized domain model, while providing stakeholders with a holistic view of the entire project during the early design stages. Our tools provide decision support by computing key metrics such as construction cost and life-cycle operating cost in near real-time.
Real estate developers, land-use specialists, and architects were spending considerable time gathering and consolidating data from a multitude of sources to understand development potential and constraints. Furthermore, this process is repeated for every candidate site by every interested developer. The evolving use of technical platforms and BIM to increase the quality, shorten the project time and come up with cheaper solutions (Tweed, 2001) is main reason for choosing this topic with aim of giving contribution in understanding architects role in this process.
Literature review, spontaneous discussions and interviews are done to evaluate the influence and impact of BIM, urban data and technology on the architects' role and work process in global and local context. Evaluating how this change affects the collaboration and communication between architects and other actors within the project and evaluate how architects use BIM and urban data to attain architectural values, style and design quality enabled conclusions and recommendations.

2. Objectıves and Metodology

Main objective of this research is to identify architects role in change influenced by technology and increasing urban data (BIM, GIS and CODES). Another objective is to identify how technology and increasing urban data affect role of architects in the practical reality.
Specific objectives are to analyze reduced architects' influence, owners crush design fees and possibilities to take back design control.
Having in mind objectives mentioned above, the following research questions are addressed:
• How use of BIM and a urban data impact on the changing architect's?
• How do BIM, GIS and CODES affect the collaboration and communication between architects and other participants within the project in global and local conditions?
• How can the architects and institutions take back design control, architectural values, style and design quality?
Methodology used in this research is chosen having in mind the research question. Different alternatives were considered on how to gather the empirical data. The literature on BIM, GIS and CODES is bigger than the scope of this chapter. Face-to-face interviews allowed to make changes in the order of the questions and to add sub-questions to get new inputs and a deeper explanation and understanding of the interviewees experience in the matter. Survey is used to ask how the role of the architect looks like today and how it will change with the implementation of BIM, GIS and CODES. Three researchers and experts were interviewed. They were selected based on their knowledge and expertise in this field. All of the three interviewees have a long experience in architectural practice; two of them have more than 15 years of experience in industrial building.

3. GENERAL INFORMATION

3.1 Background and context

Under pressure coming from construction industry and technology in recent decades we have seen the rise of specializations within the architecture profession. Owners squeeze design fees down to nearly unsustainable levels. As a result, the required time to fully explore detail complexities has disappeared. Construction documents as a whole are nowhere as complete as they were in past decades. Many architects selected to move into real estate (property) development, corporate facilities planning, project management, construction management, interior design or other related fields. Context is a primary consideration in architectural design. By creating a data-rich virtual environment, our tools can help architects assess the fitness of a proposed design in relation to its context. This contextual awareness is especially valuable when performing energy modeling, daylighting analysis, and traffic simulation.

Identity of a virtual place depends only on the creativity of the designer (Relph, 2007). Usually, in practice imagined spaces have to accept the conditions of real places if they are to be agreed correctly - harmonized. The software industry has been evolving and influencing architects at an exponential rate since its inception three decades ago. How can software engineering return the favor to architecture and help improve the scale economies of our industry? How can we amplify innovations in order to meet the twin challenges of urbanization and sustainability? Seeking answers to these questions motivates as to undertake this research in local and international level.

With emerging technologies rapidly changing our daily lives, the questions related to the architect's roles and responsibilities are also changing. Emerging technology can help streamline the design protocol while also providing a more intelligent fight to hold design which is sometimes lost to value engineering and questions asked too late in the process.

Kosova as new state is in the process of creating urban data (BIM, GIS and CODES) requirements system. We have data from firms trained and certified by prestigious and well-known standards and institutions to offer high quality services with a qualified and diverse staff certified by ISO 9001:2008 for geodetic services, GIS and Software Development as well as Project Management. Licensed from Kosova Cadastral Agency for cadastral and property rights services and from MAFRD for compilation of forest management plans.

Kosova is in the creation process of the technical regulations known as the "Unified Building Code of Republic of Kosova." This Code establishes technical requirements for the design, construction, alteration, repair, reconstruction, and demolition of buildings and other construction objects within the Republic of Kosova.

The purpose of the Code is to establish the minimum requirements to safeguard the public health, safety and general welfare through the necessary resistance of the structure of means of egress facilities, equilibrium and stability, sanitation, management of construction waste, adequate light and ventilation, energy efficiency and savings measures, and safety to life and property from fire and other hazards attributed to the built environment and to provide safety to fire fighters and emergency responders during emergency operations, as well as any other technical requirement that is considered a relevant technical issue by its nature.

While in Kosova are missing BIM technologies. Many architects are using BIM software's and producing high performance building designs, but there are missing BIM consultancy specialist that work with a wide variety of clients across the construction industry, using technology to improve the process of designing, building and operating buildings.

Architects in Kosova need integrated BIM in a process of institutional consolidation of planning and construction industry using technologies to have an integrated approach numerous essays and interviews with leading innovators in the field of technology and urban design.

3.2 Observable evidence of technology and increasing urban data

As BIM (Building Information Modeling) have broader acceptance in the architecture and engineering of individual and public buildings, perhaps it is time to consider the next scale: spatial planning in the city. Just like buildings virtual models help us design and understand embed information, virtual city simulations could have an application in real city planning, allowing us to go from 2D GIS to three dimensional information modeling that includes terrain, infrastructure, buildings and public spaces.

The role of an architect is to analyze the current state and produce design proposals and give advice for the future based on the information available today. To be able to imagine a new more improved design the architect needs to know relationships between structural elements, stated by laws of physic and logic (Baldwin, C., & Clark, K., 2000) In order to deliver the best result the architect collects and evaluates information from different sources, rearranges and produces new information. In addition, the architect evaluates the demands from the customer and simulates the expected impacts that the design will have (Kalay, 2006).

Architects are required to be responsive in order to rapidly react to changing market needs and opportunities. The demand to increase efficiency, decrease costs, reduce time, and increase the turnover are causing construction companies to evaluate and re-think their role in, and way of executing construction projects.

Prefabrication has been around for a long time, and for most of that time it has been touted as the "next big thing" in architecture. Following the advent of Henry Ford's mass production process, the

concept of prefabrication became a key concept used by such iconic architects as Le Corbusier and Walter Gropius. The concept and practice of fabricating architectural elements off-site is now more important and relevant than ever.
Architects continue to pre-build off-site, out of the weather, out of harm's way, and in the most intelligent manner possible. However, the result needs to be considered, implemented, and promoted with greater sophistication. It is no longer enough to simply re-purpose standard components or to replicate mass-produced architecture. More of the same is just more of the same. Today's tools and technologies allow for the ability to conceive, develop, evaluate, coordinate, build and distribute meaningful work. This becomes the true specialty of the architect and the modern professional has more ability than ever to implement difference in the most intelligent of ways.
The race to build the first 3D-printed house has begun. Architects worldwide are competing to produce the first habitable printed structure, using technology that could transform the way buildings are made. Though they all have the same objective, the teams are investigating very different materials and fabrication methods for printing house that will be printed on site, in concrete.

3.3 The need for technology and increasing urban data

Visual models and national codes need information modelling. All information that is currently flowing around in a thousand different channels in one place, built like the architect's a model could accommodate all kinds of useful information such as use areas of buildings, use types, vacancies, lease space, hotel rooms and room availabilities, the age of buildings and if they are historically protected and much much more all the way to the condition of infrastructure or the congestion levels of roads.
In many respects it would be like GIS maps where any number of informational properties can be embedded in shape files including properties that belong in the third dimension, such as heights. Indeed, many city GIS shape files include building heights either transferred by hand from old manual data bases, building heights much like sonar had mapped the sea-floor and ocean depth.
The logical steps for cities that have good GIS maps would be the simple "extrusion" of their buildings from the combined footprint shape file combined with the height. This provides what Vancouver's 3-D modelling expert Dan Campbell calls 2.5-D, meaning 3 dimensional based on a 2D information base. Such models are not "smart" in the way that they are a real model of a building. Rather, they are like the old lump of clay in the conventional model, they have volume (which architects like to call massing) but don't know floors, have no facades, no windows and no knowledge of floor areas, energy consumption and such that represent more information than area times height equals volume.
Why all this worry when we already have Google Earth? Can't we see our cities in 3D just fine simply by clicking on Google maps and go for the 3D views? (Figure 1)

Figure 1 Image of the Google Earth model of Prishtina

Those Google models are an interesting approach because they are largely the result of crowd-sourcing as we know it from Wikipedia. People interested in their cities or in particular buildings can build stuff in Sketch-up (the Google software that revolutionized building modeling by offering a basic version free to all and making the process simpler than 3D CAD had ever been before).

3.4 Why changes

To answer this question, it is necessary to look in more detail at what architects and planners are doing now. Although the core of global and local, traditional, practices remain, many of the practices had expanded upon the type of work that would traditionally be considered the architect's field, offering a broader range of services. A 3D drawing can be viewed from almost any angle and is therefore easier to interpret than traditional 2D drawings. Additionally, BIMs include information such as detailed descriptions of parts of the building, e.g. characteristics of materials, size and location. *With* continuallv updated information, the *GIS* database has become a critical tool in the designing, planning and development. Moreover, information on construction schedules as well as on bills of quantity and cost analysis can be combined. BIM is a modern way to manage the information and design buildings in construction processes. Technical regulations known as CODE-s are dependent from developing technology too. Kosova is in the process of code creation that makes more responsible role of architects in given context.

Virtual Reality is often discussed in indirect opposition to perceived reality and hence is seen to be terrifying, or less meaningful (Champion, 2007). Cyber-architecture is another concept widely discussed in the world of 3D modeling. The development of cyber-architecture suggest the architects to abandon the design of the finished products and start developing virtual interfaces for the customer to keep on designing their own objects, spaces and events (Baltazar, 2007). Broader, the increased use of platform systems has the potential of changing the current strictly hierarchical design process into a network of design, manufacturing, marketing and organizations management, where the responsibility for design is distributed across multiple professions, organizations and geographic locations (Kalay, 2006)

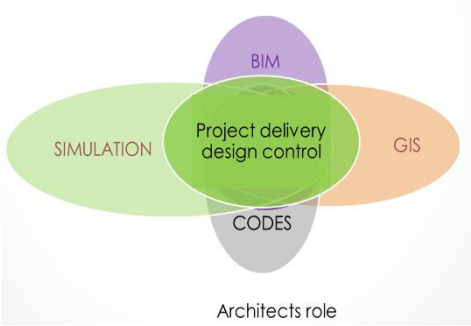
The system was developed in an engineering environment where design problems, although having a simple graphical content, were described in mathematical terminology. Architects claimed that the design situations differed completely from this way of working as they traditionally arranged volumes in space, selecting materials, constructions and environmental systems which required only very little

amount of computerization (Willey, 1976) . Today, the economic benefits of BIM are widely known in industries as the automotive industry, electronics and consumer goods manufactures. They have used "model-based digital design processes" supporting not just production planning, and engineering analysis, but supply-chain integration and visualization of the design (Bernstein, P. G., & Pittman, J. H, 2004). The construction industry however still is just starting to see the benefits and challenges an organization faces by deciding to implement BIM. One use of BIM is to provide the customer a glance of how the building will be experienced when finished. The implementation of BIM requires that the architect handle over a digital 3D model of the design done in a compatible program. All participants in the project use a common database to store drawings and exchange information with each other. (Bergmark, 2004; Norén, 2009)

4. Findings

Architects role development can be influenced by a number of factors but technology and urban data are changing it in dramatic speed. Globally architects are at a center point where the entire building industry is ready to explode in reaction to changing opportunities. Together with engineers, contractors, and building owners architects are mutually engaged to an unprecedented degree in broad initiatives aimed at improving quality and reducing the cost of designing, constructing, and operating buildings throughout their useful lives. Teamwork and leadership brings all these things together and expresses changed role of the architect.
For students and the vast majority of architects involved in the building industry and urban planning, the future remains only a vision. However, an increasing number are finding ways to implement changes in their business processes and relationships in order to realize the benefits of new technologies. As a result, the perspective point is shifting from simply what should be done to how and when it should be done.

Effects of increased use of technical platform have on the architects' roles is researched from many authors like: (Kalay, 2006) and (Baldwin, C., & Clark, K. , 2000). They describe the challenge in the modern situation in how to incorporate the architects' knowledge in construction projects.
BIM and urban data is a double-edged blade. While it allows for improved profit potential through replicating tasks and providing quicker detailing, it also is being led by new emerging architects who have not seen or experienced many of the tricks only time and experience will teach. Without thorough coordination prior to beginning construction, the level of quality and completeness becomes an issue. Role of Architect in spatial planning, urban design and construction industries are in high demand. This is because more and more buildings and cities are becoming interested performing in "green", renewal of urban spaces, and increased demand for efficiency of new and their existing spaces. It is the architectural engineer who plans, designs, and oversees how the elements of landscaping, road routing, and building use combine into creating the urban environment. In order to get architecture engineering jobs in an urban setting architect should have an educational background in architectural engineering. The increased technical complexity of construction detailing and new building technology, along with associated risk management, have led to a gradual erosion of architectural roles in favor of the subcontractor and contractor, who will continue to take on an increasingly larger part of the technical design work over the next decade. This trend has intensified as architects look to reduce their liability. The reaction is that they are also increasingly losing influence. It is clear that whichever party accepts the risk in the building process tends to drive the design.
In local context implementing dynamic leadership within a collaborative process allows expertise to be collected from individuals who might not have had input in a traditional delivery environment. There is also a need for changing project delivery methodology that will give architects opportunity in taking control and saving leadership in in planning and construction processes. New approach is needed to influence the experience, talent and input of all team members in order to obtain the best results for the owner by reducing waste and maximizing resources throughout the life cycle of the project. Collaborative process and new project delivery methodology will produce shorter delivery times than traditional practices. The result is a better project that benefits from leadership provided by the architect and applied throughout the entire building process.



In pressure from global trends the acceptance of BIM tools and methods in the in local architectural design and construction industry is starting to increase, it is time to look beyond the horizon of BIM and see how building information modelled in BIM environments can be combined with information coming from other domains. In this research the focus is made in combination of BIM with simulation, GIS, heritage, and CODE. It is time for local institutions to bring their data to the architectural designer and construction expert. Quantitative researches and institutional data in dynamic technological environment will increase role of architects and their opportunities in taking control management and technical aspects of combining BIM, GIS and CODE with other information.

Conclusıons

For architects and urban planners as for the vast majority of players in the building industry, the future remains only a vision. However, an increasing number are finding ways to implement changes in their business processes and relationships in order to realize the benefits of new technologies. As a result, the conversation is increasingly shifting from simply what should be done to how and when it should be done. Architects role in selection of a project delivery method is an important decision that defines the relationships among the owner, designer and constructor. In the future use of technological tools is chance for architect's main role in influencing these relationships and taking control.

References:

1. Baldwin, C. &. (2000). *Design Rules - the Power of Modularity.* . Bostan: Massachusetts Institute of Technology.
2. Baldwin, C., & Clark, K. . (2000). *Design Rules - the Power of Modularity.* Boston: Massachusetts Institute of Technology.
3. Baltazar, A. (2007). Towards a virtual architecture: pushing cybernetics from government to anarchy. *Kybernetes, 36 (9/10)*, 1238-1254.
4. Bernstein, P. G., & Pittman, J. H. (2004). Barriers to the Adoption of Building Information Modeling in the Building Industry . *Autodesk Inc*, at all.
5. Champion, E. (2007). When Windmills Turn Into Giants: The Conundrum of Virtual Places. . *Technè* , 10.
6. Day, A. (1996). The Maquette, the model and the computer: organizational futures for design and construction. *Engineering, Construction and Architectural Management*, 1-28.
7. Kalay, Y. (2006). The impact of information technology on design methods, products and practices . *Design Studies, 27*,, 357-380.
8. Relph, E. (2007). Spirit of place and Sense of Place in Virtual Realities. *Techne*, 10 (3).
9. Samuelson, O. (2008). The IT-barometer – a decade's development of IT use in the Swedish construction sector,. *ITcon Vol. 13*, 1-19.
10. Tweed, C. (2001). The social context of CAAD in practice. 617-629. . *Automation in Construction, 10*, , 617-629.
11. Willey, D. (1976). Approaches to computer-aided architectural sketch design. *Computer Aided Design, 8 (3)*, 181-186.

Architecture in verses of Professor Bashkim Fehmiu

Arbër Sadiki

UBT, Faculty of Architecture and Spatial Planning, Prishtina, KOSOVO
University of Belgrade, Faculty of Architecture, Belgrade, SERBIA
arber.sadiki@gmail.com

Abstract. The contribution of architect Bashkim Fehmiu as one of important personalities in Kosovo in second half of 20th century, includes many areas such as: academic as professor at the Faculty of Architecture at the University of Prishtina, administrative, as founder of Prishtina Institute of Urbanism, contribution in the urban planning as the author of many urban plans of Prishtina, and his architectural contribution as the author of several important buildings of this period. Even his work in above mentioned areas is not still investigated, analyzed, classified, documented and published, nonetheless is recognized by many people, maybe as result of short time between the period of his active contribution with nowadays.
This paper aims to initiate illumination of one another dimension of his multidimensional personality, his poetic dimension. In this paper is analyzed "Poem of Architecture" ("Poemza e arqitekturës") written in 1954 during his studies in Belgrade, unpublished until now, where he expressed his feelings, love, his views and vision on architecture.

Key words: Bashkim Fehmiu, Poem of Architecture

1. Introduction

Interrelation between literary genres and architecture is not something new. On the contrary, be it in prose, poetry or drama, architecture is always unconsciously present as a setting in which events take place or else as an artistic purpose in itself to enrich the aesthetic value of the literary genre. We find that since the beginnings of literature, beginning from Greek literature in "Odyssey" by Homer, by having Odyssey's detailed depiction of his house after returning from his journey[21]. Cicero, Virgil, and many other Roman writers, in different ways, have brought to us the image of Rome, its splendour and fall, its hope and despair. [1] No other person contributed more than Victor Hugo by his "Cathedral of Paris" to the transformation of that building into a symbol of French nation, just about when it was losing its architectural splendour.
In Albanian literature it could not be otherwise. De Rada in "Këngët e Milosaos" (Songs of Milosao), Migjeni in "Novelat e qytetit të Veriut" (Novels From the Northern City) depict the imagery of cities or further by Faik Konica in "Doktor Gjilpëra"[22] (Doctor Needle) where for the first time in the Albanian modern literature, the relationship between the city and the citizen has been portrayed, in this case, that of Durrës and Tirana in the second decade of the twentieth century. In addition Ernest Koliqi in his "Hija e maleve"[23] (Shadow of the Mountains) through profile inconsistency of citizens compared to the city, as a matter of fact through literary genre, tackled a typical subject matter of urban sociology, a theme reinforced even more in "Tregtar flamujsh"[24] (Trader of Flags) by the same author.
This paper is not aimed to contribute to the argument of this undisputable interrelation, nor to deal with the analysis of literary works whose authors are architects, e.g. Poems of Michelangelo or Albert's or those of Petraq Kolevica in the Albanian case. The aim of this paper is to draw attention

[21] Homer, 9th century BC "Odyssey", Song XXIII.
[22] "Doktor Gjilpëra", written and published in "Dielli" newspaper in 1924.
[23] "Hija e Maleve", a collection of 12 novels published in 1929 in Zadar, Croatia.
[24] "Tregtar flamujsh", collection of 16 novels, first published in 1935 in Tirana, Albania.

to those literary works, the ultimate goal of which is the architecture, and which are not many in the world literature, and moreover quite not approached in the Albanian literature.

2. "The Poem of Architecture" *("Poemza e arqitekturës)*

The multidimensional contribution of Bashkim Fehmiu; professor, architect and urban planner, in the area of architecture and urban planning, although not studied, analyzed and published yet to the preferred level, is indisputable. His contribution begins with education as a professor at the Faculty of Architecture at the University of Prishtina; management and administration, as the founder and leader, initially of Technical Service of the Municipality of Prishtina and later the Institute of Urbanism of Prishtina, as well as the author of many urban and architectural contributions as the author of many urban and architectural plans of Prishtina in the second half of the twentieth century. [2]. Given that the abovementioned contribution appears as a result of a public profession, and also by the fact that the period of time between his professional activity and the time we are discussing about is relatively short, this contribution is generally acknowledged by the public. However, in this paper we are beginning to unfold a contribution of him, totally unknown so far, a contribution to architecture by the means of poetry. From the research conducted so far in his personal library, there are many manuscripts, among which a notebook of poems with an inscription on the cover "Bashkim Fehmiu II" which implies that there is at least one notebook before that, and perhaps, why not, many after it.

The poems in that notebook were written throughout the year 1954, at the time when Professor Bashkim was in the beginning years of his studies at the Faculty of Architecture in Belgrade. In the total of 61 poems, he sings to: the new day, dawn, beauty, music, future, wine, love ... Amongst them of course, the greatest passion of the author, the passion for architecture could not dwell without its song, to which he sings in the verses of "*Poemza of arqitekturës".*

In the total of 361 verses, he expressed his love for architecture, gave his definition to it, conducted an assessment of its historical development, defined its role in society and vice versa, gives his vision on its future development.

His fiery passion for architecture is expressed whence the first lines of the poem:

"O Arqitekturë!	*"O architecture!*
O shkrim mbi shkrime!	*O mother of scripts!*
Oravizje e shkambit mbi tokë!	*Shade of rock over the earth!*
Po shkruaj për Ty	*I am writing for You*
Pse t'kam në sy!	*Because you're in my eye!*
Po kndoj për Ty,	*I am singing for You*
Pse n'mue t'kam ty,	*Because in me I have you,*
Pse vetëm Ty	*Because only You*
t'kem përqark:	*are around:*
gjatë ditës,	*all through the day,*
jetës,	*life*
si dhe mbas saj!''	*and beyond it! ''*

Although being at the beginning of his studies for architecture, he has the courage to provide his approach to it. He speaks about architecture, not in its narrow terms of engineering but as a profession that deals with the environment in correlation with human psychology.

"Arqitekturë	*"Architecture*
âsht: rruga shtëpija, qyteti!	*is: street, house, city!*
Ajo krijohet	*It is created*
për njeriun	*for man*
dhe kohën e vet	*and his time span*
paraqet at kohë	*represents that time*
dhe njeriun e saj.	*and its man.*
...	*...*

Ajo âsht pjesë	*That is part*
e jetës sonë	*of our life*
e kulturës sonë	*of our culture*
e epokës sonë '	*of our era"*

At this point, we are within the insights and definitions by Ludwig Mies van der Rohe expressed since 1924, according to whom "the architecture expresses the will of an era manifested in space".[25]
In the following verses, he speaks of the great importance of doing quality architecture, because, unlike low quality book, music and painting which can be avoided, the architecture being manifested in space, unavoidably is imposed to everyone. At this point we see the concurrence with the principles of Bruno Zevi on the need to draw attention to architecture because it is everywhere and belongs to everyone.[26]

"Librin e dobët	*"Bad book*
e hypim n'tavan!	*under the roof we take it!*
Muzikën e dobët,	*Bad music,*
nuk e dëgjojmë;	*we do not listen to it;*
Pikturën e dobët	*Bad painting*
syshë e largojmë;	*away from our sight will be taken;*
Po arqitekturën ku me e çue	*But architecture where shall be taken*
Ku? Çka me bâ me te?	*Where? Do what with?*
Aha – qe:	*A-ha – this:*
Mundemi me u bâ pengues	*We can be impediment*
të lindjes së saj,	*of its birth,*
të daljes së saj,	*of its advent,*
Në sheshin e hapët	*At the open square*
të horizontit të natyrës.''	*of nature horizon ''*

For Professor Bashkim, the architecture is closely associated with the society. It directly affects the shaping and education of it, and as such it should be created by taking into account the will of society. Architecture does not belong only to the architects therefore it cannot, and should not depend only on them.

"Duhet m'e qitë në shesh	*"You should bring forth*
problemin arqitektural,	*problem of architecture,*
E jo me e mbajtë	*And not withhold it*
n'rreth profesional!	*In professional circle!*
Sepse Arqitektura âsht	*Because architecture is*
veprimtari shoqnore	*A social activity*
Dhe si e tillë,	*And as such,*
mundet,	*it may,*
duhet	*it must*
me u kritikue.''	*be criticized*

The author ends the poem with the same fiery passion he begins it. He compares it to the basic elements of life. To him the architecture is food, water and air.

"Arqitektura âsht	*"Architecture is*
dhunti e madhe	*a great gift*
e natyrës,	

[25] Mies van der Rohe, "*Der Querschnitt"*, 1924. Translated from German by Philip Johnson. Museum of Modern Art. New York, NY: 1947

[26] Bruno Zevi (1918-2000), Italian architect, professor and writer. In 1948 he published the book *"Saper vedere l'architettura"* which was reprinted over 20 times. For the first time in English was published in 1957 in New York, by Horizon Press under the title *"Architecture as Space: How to Look at Architecture",* translated by Milton Gendel.

Ushqim i ndiesisë,
Pjellë e fantazisë
gjuhë e poezisë
trijumf i shoqnisë!
Arqitektura âsht:
buka,
uji,
ajri! .''

of nature,
Food of feeling
Fantasy offspring
language of poetry
triumph of society!
Architectures is:
food,
water,
air! ."

3. Similarities to "The Poem of the Right Angle" by Le Corbusier (1955)

Firstly it should be clarified that we cannot talk here about influence, because "The Poem of Architecture" was written in 1954, while "Poem of the Right Angle" by Le Corbusier ("Le Poeme de l'Angle Droit") even though was written during the years 1943-53, it was published in 1955. Also at the outset, it should be noted that the first case is about an author who was in the beginning of his studies for architecture while the second case is about an author at the peak of his professional maturity.

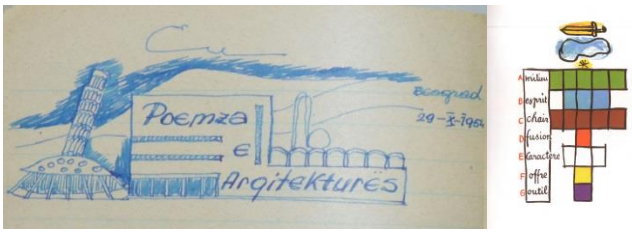


Fig.1. Illustration from "The poem of Architecture" (left) and "Poem of the Right Angle" (right)

At first, that what is common to these two poems is the topic they explore, that is the architecture. Verses are accompanied by illustrations same as in the first case as well as in the second. In both cases, the authors express the love and passion they have for architecture, they express their approaches towards architecture, its role in society and also the role of society on architecture. Le Corbusier always associates architecture with the sunlight, while the light and the sun with the taxonomy of our natural rhythm, whereas for Professor Bashkim the architecture is food, air and water.

"...the two rhythms
which regulate our destiny:
A sun rises
A sun sets A sun rises again" [27]

[27] "Le Poeme de l'angle droit" consists of a total of 19 poems accompanied with as many illustrations. All illustrations are based on the classic rules of alchemy where his compositions through color codes read the core of the content through dialectics of alchemy. Therefore the use of green at the poetry "Envirenment" a color which in codes of alchemy symbolizes the primary matter of the universe, Le Corbusier expresses visually the inseparable link between light, nature and the universe with the rhythm of daily life.

Conclusion

"Every great architect is - necessarily - a great poet.
He must be a great original interpreter of his time, his day, his age."
Frank Lloyd Wright

The approaches of the author towards architecture expressed through verses, although often influenced by world architects and theoreticians of the time, are an indicator of his orientation towards his professional development since the time he was a student.
Bashkim Fehmiu through "Poemzës së arqitekturës" (The Poem of Architecture) confirms once again the statement of the architect Frank Lloyd Right that every architect must also necessarily be a good poet. The content of the poem and its treatment by using a rich poetic language, the rhythm in the verse and the poem as a whole, imply that we are dealing with a gifted author for poetry, subsequently for architecture.
All these evidence coming to us from the time of his first years of studying architecture are the best indicator that in the years to come, thanks to his own persistent commitment, where architecture did not represent only his profession but also the mission of his life, he would become an admirable architect, urban planner, professor and intellectual of the second half of the twentieth century in Kosovo.
Similarities with the "The Poem of the Right Angle" by Le Corbusier appear as a prophecy that enunciates the future personality who in fact represents Kosovo's Le Corbusier.

References

1. Edwards, C.: Writing Rome, Textual Approaches to the City, Cambridge University Press, Cambridge (1996)
2. Sadiki, A.: *The Contribution of the Architect Bashkim Fehmiu in the Architecture of Prishtina after the Second World War*, International Conference of Applied Sciences I, 8-9 May, Tetovo (2015)

Source of images

Fig.1. Personal Archive of Professor Bashkim Fehmiu, "Mother Teresa" Boulevard, "Fehmi Agani" str., IVth floor, apartment no.5.

The legalization process challenges on Illegal constructions in Kosovo

Faton Spahiu[1], Rineta Jashari[2]

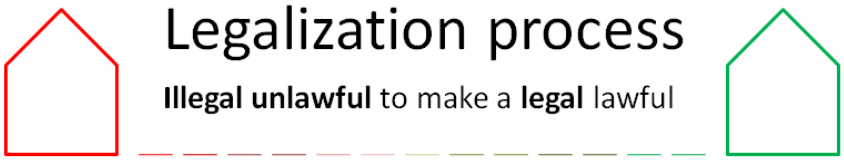
[1,2]UBT – Higher Education Institution
{faton.spahiu[1], rineta.jashari[2]}@ubt-uni.net

Abstract. A crucial point during the transition process of a country is the rule of law. This process is not easy and is often followed by negative outcomes. Illegal, uncontrolled and unplanned construction is one of them. This spreads process is usually very fast and spreads rapidly across the whole territory of the country. Similar to other countries of the Balkan Region, Kosovo has been dealing with this issue as well and has undergone a treatment process of equipping those buildings with legalizing permits. The law for constructions treatment without permit entered into force in 2014 and is implemented by the Ministry of Environment and Spatial Planning. As a result some building owners responded positively to the process and applied, however that number is not at a satisfying and in the recent months the process for legalization permits is being faced by a low number of applications. The main objective of this research is the identification of the actual challenges in the legalization process and how to turn them around to success. This will be achieved through data collection from legalization applicants and interviews with representative legalization officers from the Balkans who managed to have better results through a more simplified legalization process.

Keywords: Illegal Constructions, Legalization Process, Informal Settlements, Kosovo, the Balkans

1. Introduction

This paper deals with constructions that are built without permits and which represent opportunities to be integrated into formal settlements through a legalization process. The phenomenon of illegal constructions is not only related to Kosovo but with all countries that have emerged from different crisis. The Majority of those buildings are built without any documentation and don't even match the minimal conditions for construction standards. In order to enable the integration of those buildings into formal settlements, they need to pass through a legalization process. The essence of a legalization process is to make the construction lawful (legal) whereby it is confirmed that the prior construction has been unlawful or illegal [1].



The widespread phenomenon of illegal buildings forced the government to undertake a temporary process of legalization. The main drive for Kosovo to implement the legalization process was the signing process in Vienna in September 20, 2004 of the "Vienna Declaration on Informal Settlements in South Eastern Europe" (signed also by Albania, Macedonia, Montenegro, Serbia), which aimed to put a joint agreement between the countries for actions that (a) will regularize (legalize) and improve informal settlements in a sustainable way and (b) will prevent future illegal settlements [2]. Kosovo made steps only 9 years later, when it enforced the law for construction treatment without permit on 2014. The first part of the process began with a declaration which brought a large number of applications, however the second part of the process turned out the opposite way. The process

desperately needs to increase the number of legalization applications in order not to fail, which is also a challenge of this process. The first part of the paper includes a brief history and causes of illegal buildings in Kosovo, and the legalization process in the Balkans. The main focus of the paper is shown in the last part which highlights the process workflow in Kosovo and the problem that is faced by the process.

1.1 History and causes

Illegal construction has a long history in Kosovo, especially during the socialist period (1945-1990), however the actual boom went off after the war in 1999, when over 200,000 houses were destroyed [3]. The damages, poor infrastructure and hopes for a better perspective, led people to migrate from rural to urban areas and build, in most cases illegally. The lack of local and central institutions in parallel with the lack of commitment to manage and tackle this issue, enabled this process of non-permission building to thrive.

2. Legalization process in the Balkan

The main drive for Balkan countries to implement the legalization process was the 'Vienna Declaration on informal settlements in South Eastern Europe'. Some countries have started this process immediately with the signing of the declaration while others started later on.

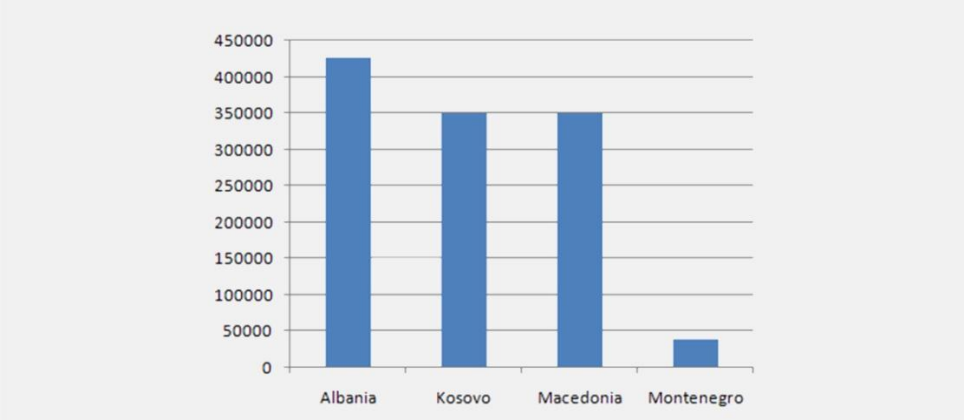


Figure 1.0 Number of submitted request in the Balkans
Source: Regional Conference on Informal Settlements (02.11.2015), Pristina

In Albania, a special agency (ALUIZNI – Agency for Legalization and Urbanization for Informal zones Integration) has been established in 2006 to carry out the legalization process. Legalization aims to activate about 6-8 billion USD of 'sleeping capital' to the formal market. Albania has simplified procedures comparing with other Balkan Countries. Around 430,000 request were submitted. However the legalization process in Albania is moving slowly and the main issues are related with the non-coordination of the institutions involved in the legalization process. There is no independent agency with experts that would deal with the constructions built in public properties, since firstly they need to legalize the property and afterwards the illegal constructions. Albania has also failed to prevent the illegal constructions through 2006 - 2015, whereby the country has seen over 100,000 new illegal sites.

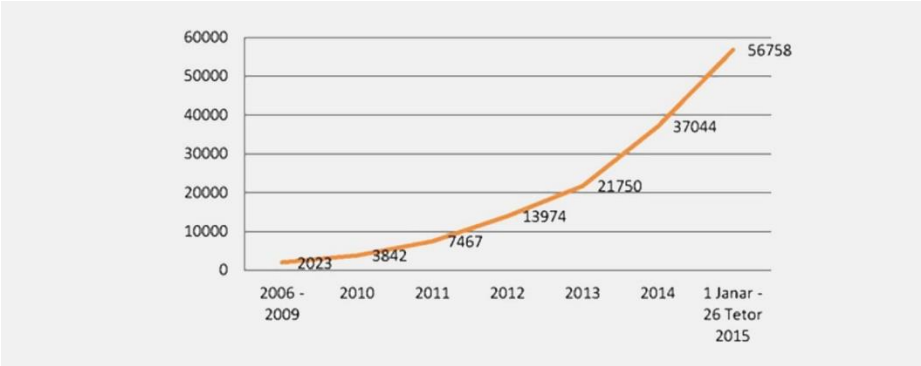


Figure 2.0 Number of Legalization Permit in Albania 2006-2015

Source: Regional Conference on Informal Settlements (02.11.2015), Pristina

The number of illegal buildings in **Montenegro** is lower compared to Kosovo, Albania and Macedonia. The fee for legalization is higher than other countries in the Balkans. Around 40,000 request were submitted. But the total numbers of illegal buildings can be estimated around 130,000.

In **Macedonia** the legalization law has been adopted in 2011. The Ministry of Transport and Communication is responsible for legalizing the facilities of importance for the Republic in accordance with the Law on Construction or other laws of facilities of health institutions for tertiary health protection and of electronic communication networks and devices. Municipalities are responsible for legalizing houses up to 10.2 meters high. Especially, the main goal is to make the process as simple and short as possible and at the same time attractive to the citizens. The symbolic charge is 1 euro per square meter for all, payable in 12 instalments. [4].The deadline for submitting requests for legalization of the illegally built building was 30 September 2011. Around 350,000 request were submitted to date. Furthermore, until today 14% of the legalization permits have been realized. [5]

3. The process in Kosovo

Kosovo has developed a law which is based on the Croatian law for illegal buildings treatment with a purpose to treat the unpermitted constructions. The right to apply for legalization of illegal buildings have all citizens whose building has been identified in the digital orthophoto made in 30 August 2013, but not limited to when it was built. Categorization of construction is based on the Law on Construction; the categorization is in the form of I, II, III of the Urban and Rural Areas.

Moreover all dwelling houses up to one hundred square Meters (100 m²) and Agricultural buildings up to four hundred square Meters (400 m²) are released from payment. All the other building have to pay municipality administrative taxes and support application for legalization along with required documents. The process begins with the identification and registration of the buildings that don't have permission and afterwards becomes published in the municipal and national registry.

All the buildings that meet the criteria's for legalization will be granted a permission from the process and register in the Cadaster, while all others that don't obtain permissions will be demolished [6]

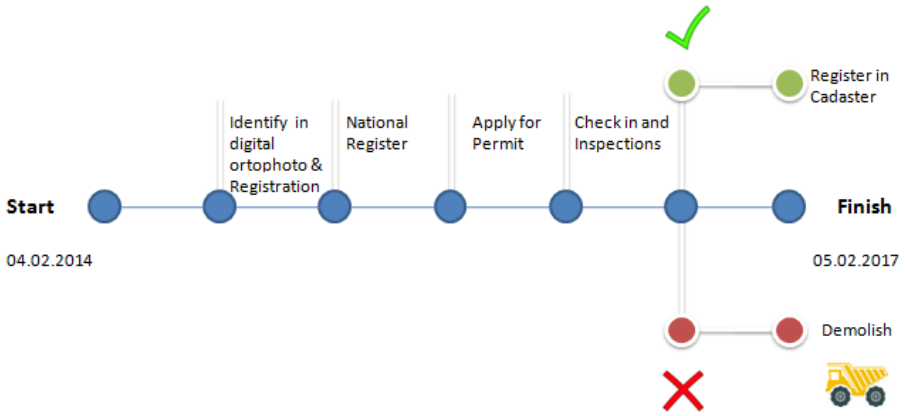


Figure 3.0 the legalization process scheme based on Law L/04-180.

3.1 Process workflow in Kosovo

The approval of the law of treating illegal constructions, marked also the registration of illegal buildings in Kosovo. The first phase of the process for the identification and registration of illegal buildings has finished enrolling over 350,000 buildings. The capital of Kosovo, Pristina resulted with the highest number of around 45,000: [7].

Figure 4.0 GIS Image, red point shows illegal buildings in Pristina
Source: Municipality of Pristina

After the registration process of illegal constructions and the publication of the National Registry, the second phase for application has started. This application permit round has brought in a low number of applicants, while most of others for various reasons don't want to continue the procedures.

4. Objective

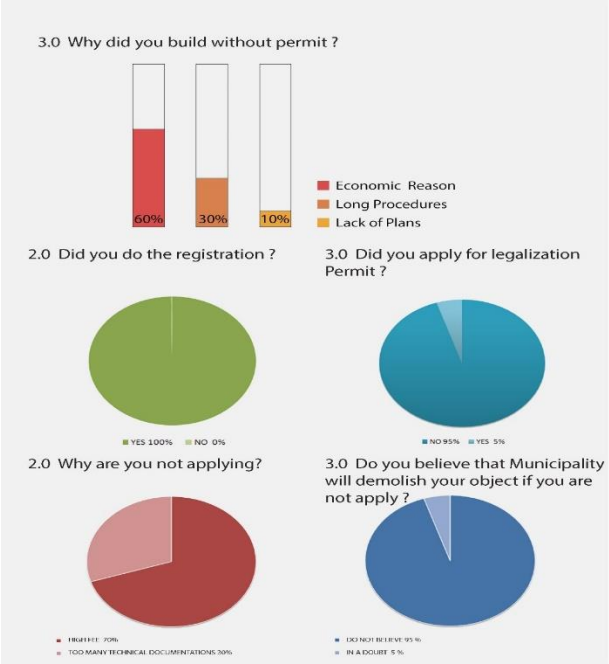
The main objective of this paper is to identify the major obstacles that building owners have when they apply for a legalization permit. Also the research will expand to advise on how to avoid long and complicated procedures, through experiences from neighboring countries and also what to be taken into consideration from the legal framework.

4.1. Method

The main methodology that was used on this research included interviews through questionnaires with a case example of 50 people applying at the Municipality of Fushe Kosovo, who were going through the process.

Some of the questions to be asked:

- Why did you build without permit?
- Did you do registration of illegal building?
- Did you apply for permit? If not, why?
- Do you believe that municipality will demolish your building?



Conclusion

The current law 04/L-188 on the treatment of illegal constructions does not give any opportunity for a successful outcome of the process. All the countries that have applied the law with a deadline, have shown a non-successful process. Changing this law is a must, and Kosovo has to do this fast since it's in a good position to learn from other Balkan countries that were part of the process for many years. A key factor to an improved performance of the legalization process would be the simplification of the legalization procedures, and the immediate attention to preventing other illegal constructions happening throughout Kosovo.

Recommendations

Stop the capitalization of social crisis through illegal construction.
Immediately halt illegal constructions throughout the country.
Lower the fees and simplify procedures to make the process easier for implementation.
Different categorization:

- Illegal Constructions which are built in urban areas should be categorized different from rural areas.

- Illegal Constructions which are built for social reason should be a categorized different from profit reason.
- Illegal Constructions which are built in accordance with the percent of land usage and construction lines of Municipality should be categorized differently from others which extend the percentage of land usage and construction lines.

Fulfillment of the conditions for legalization should be in accordance with the economic potential of the citizens and society.

References:

1. http://thelawdictionary.org/legalize/
2. Ministerial conference on informal settlements in South Eastern Europe, Vienna, 28 September – 01 October 2004. *Vienna Declaration on Informal Settlements in South Eastern Europe.* http://library.tee.gr/digital/m2267/m2267_demeti.pdf.
3. Council for Protection of Human Rights and Freedom, report on the violation of human rights and freedoms in Kosovo during 1999; Newspaper "Bota Sot", 12 June, 2000.
4. ***Study on Illegally Built Objects and Illegal Development in Montenegro*** by Chrysi Potsiou**.**
5. Regional Conference on Informal Settlements, Pristina (02.11.2015),
6. Law no.04/L-188 for Treatment of Constructions without Permit, 21.01.2014. https://gzk.rks-gov.net/ActDetail.aspx?ActID=8990.
7. Ministry of Ambient and Spatial Planning of Kosovo, 20.08.2015. http://mmph-rks.org/sq/Lajmet/Rreth-350-mije-ndertime-pa-leje-ne-Kosove-1188.

The study of the multimodal level of service for the segment of urban road "Fehmi Lladrovci" in Prishtina

Makfiret Abdullahu[1], Jetmir Berisha[2], Beni Kizolli[3]

[1] Prishtina Municipality, Department of Urban Planning, Construction and Environmental Protection
[3]Transport and traffic in the Gazi University in Ankara/Turkey,
makfiretabdullahu@gmail.com[1], {jetmirb[2], benikizolli[3]}@hotmail.com

Abstract: The purpose of this study is to present the analysis for the urban road "Fehmi Lladrovci" in the city of Prishtina, aiming to identify the geometric and the intensity of a traffic flow factors which influences to the reduction of multimodal level of service. The study is focused in urban roads categories for the level like road "Fehmi Lladrovci" is, this road is one of the main roads of the city. Integral parts of this study are the models applied to calculation of multimodal level of service for each modes of traffic as vehicles, pedestrians, bicycles and public transport based on NCHRP's report and HCM 2010 manual. The impact of factors affecting multimodal level of service for all modes of road traffic are important elements and they affect the quality of level of service through urban roads. There are a lot of numbers of the participants moving on the road "Fehmi Lladrovci" which is located near the central zone, where along its extended collective housing with business premises. Based on the results obtained from this study recommendations for modifications are made for changing the width of the road, in order to increase the multimodal level of service to all modes of road traffic.

Keywords: multimodal level of service, the geometric factors, modes of traffic.

1. Introduction

Street "Fehmi Lladrovci" is located near the center of Pristina, which is a segment of the central city ring through which pass a large number of participants of traffic which extends through local collective housing business. Based on the importance and participation in relation to the city traffic we are determined to do a study to identify the multimodal level of service. This analysis for segment of urban street "Fehmi Lladrovci" has resulted in the identification of factors affecting the flow of traffic, especially road geometric factors and the intensity of traffic flow factor. For this paper are applied the models for the calculation of multimodal level of service based on the NCHRP[28] report and the HCM[29] 2010 manual. Results are recommendations for modification to change the cross section of the road within the existing width, in order to increase the multimodal level of service to all modes of composition of traffic.

2. Models applied for calculation of the multimodal level of service

For calculating the multimodal level of service are applied models which determine the multimodal level of service for vehicles, pedestrians, bicycles and public transport. Applied models are based on models published by the NCHRP report and HCM 2010 manual. These models include only the

[28] NCHRP – National Cooperative Highway Research Program - addresses issues integral to the state Departments of Transportation (DOTs) and transportation professionals at all levels of government and the private sector.

[29] HCM – Highway Capacity Manual - significantly enhance how engineers and planners assess the traffic and environmental effects of highway projects.

calculation of multimodal level of service for segment of the road "Fehmi Lladrovci" between the two junctions that are roundabouts but that does not include the calculation of the intersections.
Calculating the level of service for vehicles is applied by two methods, the first by NCHRP's report which takes into account the geometric conditions of the road but not the intensity of traffic flow for vehicles and the percentage of commercial vehicles. While the second method which is under manual HCM 2010 takes into account important factors such as intensity of traffic flow, the capacity of the road, traffic density and geometric dimensions of the road.
Calculating the level of service for vehicles is done by the following equations:

Mean Auto LOS = 3.8 - 0.530(Stops) - 0.155(Median) + 0.355(Left-Turn Lane) + 0.098(Trees) + 0.205(Pavement Quality)
(1)
De=Vp/S (au/km/lane)
(2)
$S = BFFS - f_{LW} - f_{LC} - f_M - f_A$
(3)
Where:
Mean Auto LOS level of service for vehicles according to the NCHRP report.
De density of traffic for vehicles according to HCM 2010 manual
Vp Intensity of traffic flow
Speed limit

Calculating the level of service for pedestrians, bicycles adn public transport is made according to equations of NCHRP's report. The following equations are used for calculation of the multimodal level of service to the road segment:
$PLOS = -1.2276 \ln (f_{LV} \times Wt + 0.5Wl + fp \times \%OSP + f_b \times W_b + f_{sw} \times W_s) + 0.0091 (V/(4*PHF*L)) + 0.0004 SPD^2 + 6.0468$
(4)
$BSeg = 0.507 Ln (V/(4*PHF*L)) + 0.199Fs*(1 + 10.38HV)2 + 7.066(1/PC)2 - 0.005(We)2 + 0.760$
(5)
$Transit\ LOS\ Score = 6.0 - 1.50 * TransitWaitRideScore + 0.15 * PedLOS$
(6)
Where:
PLOS the level of service for pedestrians
Bseg level of service for bicycles
Transit LOS Score level of service for public transport
In Table 1, numerical interval is given depending on the results obtained from the application of the relevant equations identified level of service for the type of movement which is dedicated equations applied by NCHRP's. In Table 2, numerical interval is provided dependingon the density of traffic is defined level of service for vehicles which applies the HCM 2010 manual.

Table 1. Determining the multimodal level of service to all modes of traffic by NCHRP

MLS	Numerical Intervals
A	≤ 2.00
B	$> 2.00 \leq 2.75$
C	$> 2.75 \leq 3.50$
D	$> 3.50 \leq 4.25$
E	$> 4.25 \leq 5.00$
F	> 5.00

Table 2. Intervals of traffic density in determining the level of service for vehicles according to HCM 2010.

Level of Service	A	B	C	D	E	F
Density (AU/km/lane)	0 – 11	> 11 - 18	>18 - 26	>26 - 35	>35 - 45	>45

3. The analysis for traffic data and geometric conditions of the road

The models applied for calculating the multimodal level of service required to analyze the traffic capacity for participants and geometric dimensions of the road being studied. Size image of the movement is made for three days of the week: Wednesday, Thursday and Friday, and is averaged traffic capacity. To be closer to identifying the level of service for segment of the road "Fehmi Lladrovci" recordings were made in three intervals of the day and in both directions of movement as indicated in Table 3.

Table 3. Traffic Capacity for the road "Fehmi Lladrovci"

Time interval	**7:00 to 8:00**	**7:00 to 8:00**	**12:00 to 13:00**	**12:00 to 13:00**	**16:00 to 17:00**	**16:00 to 17:00**
Types of traffic						
A. komerc.	23	18	34	27	32	45
BUS	47	36	41	42	48	40
Ped/seat. L4	0.4	0.44	0.6	0.6	0.52	0.64
Pedestrians	551	197	217	295	213	272
Bicycles	0	0	0	0	0	0
AU	1231	1476	1030	1002	1150	1242
% AR	0.06	0.04	0.07	0.07	0.07	0.07

Street "Fehmi Lladrovci" has a symmetry of cross section profile of the road holding a traffic separator, two lanes for direction movement traffic and sidewalks on both sides of the road, which owns total road width of 25 m. In Figure 1 is shown the contents of the cross section profile of the road with its dimensions.

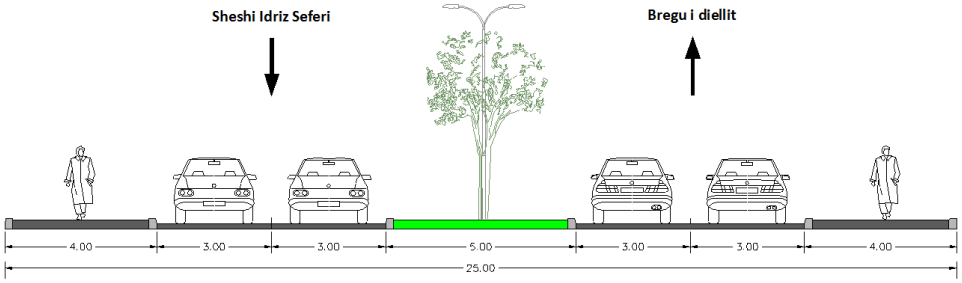


Fig. 1. Cross section of the road "Fehmi Lladrovci".

4. Calculation of multimodal level of service for the segment of the road

By applying the equations mentioned above is calculated the level of service for segment of the road "Fehmi Lladrovci", where each variable in which required equations are applied to the data segment of the road, which due to the volume of the present paper is not all descriptions of variables in order to see performance results benefited from these calculations. Calculations were made for two cases, in the first case calculation is made for multimodal level of service for current profile that owns the road, and in the second calculation is made multimodal level service for all of the recommended route which possesses the same actual road width but has a different disposition in relation to the current

situation. From this analysis the profile reshuffle was intended to achieve optimal value service to all modes of traffic. In tabular form and schematic will be presented the results obtained for the current cross section profile and the cross section profile of the recommended route in which are identified the changes for multimodal level of service.

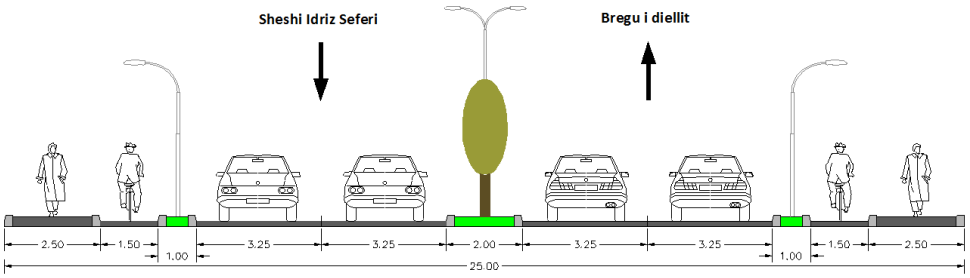


Fig. 2. Recommended cross section profile for the road "Fehmi Lladrovci".

Table 4. Multimodal level of service to the direction of "Bregu i diellit".

Street "Fehmi Lladrovci"	Vehicles		Public transport	Bicycles	Pedestrians
	NCHRP	HCM2010			
LOS	**C**	**B**	**A**	**F**	**C**
Current Profile	**3.72**	**17.47**	**1.89**	**5.06**	**3.25**
LOS	**C**	**B**	**A**	**A**	**B**
Recommended profile	**3.52**	**17.47**	**1.80**	**1.84**	**2.62**

Table 5. Multimodal level of service to the direction of "Sheshi Idriz Seferi".

Street "Fehmi Lladrovci"	Vehicles		Public transport	Bicycles	Pedestrians
	NCHRP	HCM2010			
LOS	**C**	**C**	**A**	**E**	**C**
Current profile	**3.72**	**19.71**	**1.91**	**4.99**	**3.38**
LOS	**C**	**C**	**A**	**A**	**B**
Recommended profile	**3.52**	**18.97**	**1.82**	**1.77**	**2.75**

In figure 3 is made in the presentation of the results obtained for multimodal level of service at which observed changes in the level of service under the current profile and the profile of the recommended route. Within the presentation of the level of service for vehicles is presented only the result calculated by HCM2010 which model takes into account parameters geometric path and intensity of traffic, as opposed to the model according to NCHRP's not taking into consideration the parameters of intensity of traffic for vehicles.

Fig. 3 Schematic representation of multimodal level of service for the urrent profile and the profile of recommended road "Fehmi Lladrovci" in Pristina.

Conclusion

In results obtained was identified multimodal level of service for current road conditions and for recommended cross section profile of the road. From these results are noticed changes that the same width of cross section and same intensity of traffic is at best take advantage of the service to the recommended cross section road profile. From this profile are created more favorable conditions for the moves with all modes of traffic in particular integration path for bicycles and physically separating the roadside. This analysis of the profile of the segment of the road "Fehmi Lladrovci" can serve as elements for the planning of this profile across the central ring of the city as one of the main roads with heavy traffic, by which will create optimal conditions and opportunity the selection of the model for the movements. For urban roads category and importance as the road "Fehmi Lladrovci" in order to create the conditions to all participants in traffic, a need planning their content such possessing besides paths for vehicles and sidewalks have also bicycles path, necessary services for public transport and depending on the intensity of the flow lines also possess special lane for public transport. Therefore, as an influential factor in the increase of multimodal level of service are creating conditions geometric of the road in order to accommodate all participants in traffic with the contents urban areas with the possibility of selecting the model for traffic depending on the needs and desires, through which achieved reduction of the use of motor vehicles, positive impacts on the environment, traffic more attractive and safer.

References

1. NCHRP (National Cooperative Highway Research Program), Field Test Results of the Multimodal Level of Service Analysis for Urban Streets, January 2010
2. NCHRP (National Cooperative Highway Research Program), Report 616, Multimodal Level of Service Analysis for Urban Streets, Transportation Research Board (may 2008)
3. HCM 2010, Urban Street Concepts: Pedestrian, Bicycle, and Transit.
4. Dr.sc. Nijazi Ibrahimi, Mr.sc. Mevlan Bixhaku: "Kapaciteti dhe niveli i shërbimit i infrastrukturës rrugore", Prishtinë 2010,
5. MSc. Makfiret Abdullahu "Analiza e nivelit multimodal të shërbimit për rrugët urbane B, Muharrem Fejza dhe Fehmi Lladrovci në Prishtinë".
6. Dr.sc. Shkelqim Zeqo Planet Urbane të transportit, Tiranë 2008
7. James Oliver Ensley "Application of Highway Capacity Manual 2010 Level-of-Service Methodologies for Planning Deficiency Analysis" " Master's Thesis, University of Tennessee, 2012.
8. The 2010 Highway Capacity Manual (2010 Highway Capacity Manual, June 2011)
9. Quality/Level of Service Handbook, state of Florida department of transportation 2013.
10. Complete Streets and Multimodal Level of Service, Bill Cisco, P.E. Dowling Associates, Inc

Architectural Characteristics of Urban Dwellings in Kosovo

Verona Ymeri Hoxha

Vienna University of Technology, Vienna - Austria
e1429838@student.tuwien.ac.at

Abstract. This seminar paper is a research on the theoretical framework of architectural history of 18th and 19th century urban dwellings in Kosovo. Special effort is placed on the particular type of urban dwelling in Kosovo known as "banesa qytetare" [urban house] which has been a subject of study for especially Emin Riza and Flamur Doli in between the 1993 and 2013.
Commencing with thorough description of "banesa" in terms of architectural characteristics, "banesa-s" typology and chronological derivation of its typology as well as spatial distribution, followed by composition of volumes that correspond to types of "banesa", and significant features that give naming to the particular type. The material scope will cover "banesa-s" drawings and historic writings, of various researchers. Further analysis will include the ongoing debate on the origin of "banesa" in Kosovo in comparison with' similar' dwellings on the region with special emphasis on the "Ottoman house" in the Balkans.

Keywords: Banesa in Kosovo from 18th-19th century, architectural composition of banesa, typologies of banesa, banesa with porch [hajat], banesa with gallery [çardak], banesa with side gallery [qoshk], urban kulla.

1. Introduction

Living space has always been a subject of interest for humans as far as history goes; primarily as a necessity, in terms of it being used as a shelter, only to be developed further and become individual's or group of people's expression of creativity and intelligence, especially in functionality of the design. In Kosovo, these designs have reached an outstanding level of development, especially during 18th and 19th century, and even today after being exposed to a countless number of wars and different social systems, they are still being utilized and as such have managed to survive.
This paper identifies the theoretical framework on existing studies and debates on urban dwellings [banesa] in Kosovo during 18th and 19th century.
Architecture of old houses of Kosovo belongs to the architecture that independently prevailed upon profane construction in Balkans. It reaches its most artistic value
especially in housing, which, after centuries of development, a complete harmony among function, structure and form is achieved.1
Through this paper special emphasis will be placed on architectural analysis of urban
dwellings [banesa-s] in terms of what is their typology, chronological development, their space configuration, what construction materials were used and what indicated
their usage and of course by whom were these dwellings built?
This paper is based on a rich literature, covering both theoretical and technical research on traditional architecture in Kosovo in general and urban dwellings [banesa-
s] specifically, which emerged mostly after the WWII. This indicates that the awareness of the urban dwellings [banesa] preservation has started very late in the 20th century, and by the time their documentation started, a large number of them were destroyed or went through changes, to accommodate the new way of living, which
unfortunately covered/removed their original parts.
Nevertheless, those that have managed to survive were mainly documented by former
Yugoslavian architects such as Kojić, Petrović, Lukić, etc., whose work was further developed by two main architects and historians of Albanian and Kosovar traditional architecture: Emin Riza and Flamur Doli.

Riza was the first one to use the term banesa for the traditional dwellings in Kosovo and Albania although it is not yet unified and apart from the ones that cite him, the most common term is urban house, or just house. The term banesa was also adopted
for this paper, as it is in author's opinion the most suitable term, and even today the space of living is known as banesa in Albanian language. Therefore, from now on the urban dwellings in Kosovo will be referred to as banesa.
This paper is a literature based research with a critical review on the existing literature on the urban dwellings in the territory of Kosovo from the 18th and 19th century. Subsequently, the paper will study the urban dwelling examples by taking into account their space configuration, construction materials, analysis of the typologies, chronological development and their regional distribution.

2. Typology, chronology and distribution of banesa in Kosovo

There is no unified terminology that is used to refer to these traditional dwellings; they have had many appellations among which the most suitable one, in author's opinion, is the one used by Riza2 according to whom the Kosovar urban house from the 18th and 19th century, is considered the whole scope of constructed urban dwellings, which is regarded as such because the base of the habitat's economy was craftsmanship and trade, differing from villages, where the main economy was agriculture and farming.
Urban dwelling [banesa] is a traditional dwelling built by craftsmen who gained their knowledge purely based on experience.3 It has folkloric quality because it was built by uneducated folkloric craftsmen together with orderer's4 instructions who were no more than casual citizens with no professional knowledge apart from what their memories could recall.5
Banesa in Kosovo is more often than not, treated as part of the larger family; depending on the author's point of view, it is grouped among either Albanian living territories or Balkan region and sometimes it goes as far as wherever the Ottomans lived. Emin Riza who spent his entire life studying these dwellings, groups banesa into two higher categories, which according to him are specific to only regions mostly inhabited by Albanians. These two main categories are: urban dwellings (banesa qytetare) and rural dwellings (banesa fshatare).6

1 Kojić, Branislav (1949); Stara gradska i seoska arhitetura u Srbiji, Beograd, 1949, pg. 33
2 RIZA, Emin (2006); PERLA, Fondacioni Kulturor "Saadi Shirazi", Tiranë, pg.82
3 DOLI, Flamur (1993); Shkolla Kosovare e Mjeshtrit Popullor Shqiptar, Prishtinë 1993, pg.14
Banesa's typology proposed and used by Riza, elaborated more by Doli with small changes (more specific to the city of study), are the ones that fully comply with banesa's characteristics that accentuate their identity therefore uniqueness. According to Riza there are five main types of banesa in Kosovo which are: 1) banesa with porch [hajat]; 2) banesa with gallery [çardak]; 3) banesa with side gallery [qoshk]; 4) urban towers [kullas]; and 5) special cases.7 These typologies are adopted for this paper with small change where urban tower [kulla] is treated as special case. Although, urban kulla does not represent one of the typical typologies with improvised area distribution, characteristic of the special cases, in terms of it being built in the city when it doesn't serve its original purpose as a fortification house makes it part of the special cases group.
Urban banesa in Kosovo from the 18th and 19th century are categorized into four main types:

1) Banesa with porch [hajat]
2) Banesa with gallery [çardak];
3) Banesa with side gallery [qoshk]and
4) Special cases, houses with special distribution of spaces.

Banesa typology simultaneously indicates the chronological order of its construction; as the number of types increases, banesa evolves into more advanced forms. Banesa with porch [hajat] is the most ancient type built early in the 18th century, examples of which were found even in the 17th century, followed by banesa with gallery [çardak] which in terms of the feature giving its name are very similar since both have the porch but the second one was provided with additional feature that of gallery [çardak]. For banesa with gallery [çardak] Doli (1993) gives two sub-types that are also characterized by the timeframe of their construction: banesa with open gallery [çardak] and banesa with closed gallery [çardak]. For both these categorizations he broadens the typology into sub-

sub types. One of the sub-sub types of Doli is actually the third type of Riza's typology of banesa, banesa with side gallery [qoshk].
Urban kulla is the most recent type of houses built in Kosovo mostly during the second half of the 19th century. Kulla as a living facility, with its high fortifying features, was more disseminated in rural areas where its functionality as such was effectively applied.8 However, in urban extent it was a very rare module but with high value for increasing the diversity of banesa's typology.

2.1 Banesa with porch [hajat]

The first type of banesa in Kosovo is banesa with porch [hajat]. This type, being the oldest from other types, dates back from the 18th century and it gets its name from the characteristic feature in its main façade the porch [hajat]. Porch [hajat] is the space, which is opened in the front and randomly on one or two sides. It is covered by the extended roof that is supported by a number of wooden columns on its front. Apart from its' main function which is to link other spaces in the house, it was also utilized for living, an elevated area usually covered with planks, known as side gallery [qoshk]. Based on the disposition of the porch [hajat] Riza separates this type into three sub- types: banesa with porch [hajat] in the whole front, on the side and in the centre. The first sub-type is very rare, but it is believed that it was built in the early 18th century, while examples of the other two can still be found mainly in the city of Gjakova.9
4 Orderer is someone who has ordered the house to be built by craftsman.
6, 7 RIZA, Emin (2006); PERLA, Fondacioni Kulturor "Saadi Shirazi", Tiranë, pg. 82-83
6 RIZA, Emin (2013); Arkitektura popullore dhe vleresimi i saj, Tiranë 2013, pg.17
Banesa with porch [hajat] is characterized with large gardens outlined by long walls. Of course this characteristic is only common in situation when the orderer came from the rich background; whereas, small land lots meant smaller house therefore smaller surrounding walls.10
This type of banesa is typically composed by two sections, one in the front and one in the back. Section in the back contains the living space where is included the so-called fire space. The frontal part depending on the disposition of porch [hajat] consists of either porch [hajat] as the single feature or it being accompanied by other living spaces.11 Common utilization of porch [hajat] apart from being a communication unit of the house was also as a working area for preparation of agricultural products, or other house holding activities. As mentioned previously, another common usage of porch [hajat] was for living, mainly during hot seasons. During this period, the whole family moved their activities in this section of the house, which facilitated a vibrant connection with nature. This solution reflects pure intelligence of its makers especially when considering that this section of the house was in general oriented towards South, Southwest or Southeast. Nevertheless, there are cases when they are oriented towards North, when the land was more or less limited.
Below are given typical examples that have managed to survive and have been preserved only by being utilized by their owners.

Figure 1 - House of Tahir Bakalli in the old part of the city of Gjakova

8 DRANCOLLI, Fejaz (2001); Kulla Shqiptare, Prishtinë 2001, pg.38
9 RIZA, Emin, HALITI, Njazi (2006); Banesa Qytetare Kosovare e shek XVIII-XIX, Prishtinë 2006, pg.89
10 RIZA, Emin (2009); Qyteti dhe Banesa Qytetare Shqiptare shek.XV-XIX, Tiranë 2009, pg.183-187

2.2 Banesa with gallery [çardak]

The second type of banesa in Kosovo is banesa with gallery [çardak]. This type of banesa is one of the most widespread types in the cities of Kosovo and it represents a classic example of open space banesa. Preserved examples, date back from the second half of the 18th and the beginning of the 19th century. According to Riza (2009), examples of this type of banesa were found dating back on the 15th century, before the ottoman occupation. However, since there are no evidences, it is hard to give exact definition on its' chronology.
Banesa with gallery [çardak] is found nearly in all cities of Kosovo, especially in the city of Prizren, Mitrovica, Gjakova, and Prishtina. Its simplicity in design shows the direct relation to its' predecessor, banesa with porch [hajat]. Similar with banesa with
porch [hajat], banesa's with gallery [çardak] layout is separated into two sections,
frontal and section on the back. The difference is that banesa with gallery [çardak] has two storeys, which have a clear functional separation; the ground floor which in most cases is not used for living and the first floor where gallery [çardak] is situated in the frontal part while living area is situated in the back. Gallery [çardak] is a composition volume of banesa, which can be open in side, two or even three sides. It stands on the top of porch [hajat]; . It stands on the top of porch [hajat]; its cover is supported by wooden columns that arise from porch [hajat]. Porch [hajat] is linked to gallery [çardak] through one-way wooden stairs.12
Banesa with gallery [çardak], is oriented in the same direction as banesa with porch [hajat], with its main view directed to the south. Among many functions of gallery [çardak], being used as a working area for preparation of agricultural products, as communication area, it also played a very important role for hot seasons.13 Kosovar families moved their activities in this section of the house, which with its remarkable construction solution made the summer days quite pleasant. As Bozdogan comments on her paper on "Turkish house" where by citing Le Corbusier's Voyage d'Orient, his impression on "Turkish house" gardens, which in our case have much similarities with banesa-s gardens in Kosovo, she emphasizes the relaxing environment of these courtyards, with their "greenery, sunlight and air (as afforded by trees and gardens) and lightness of structures (timber frame and infill)".14
It was very common for gallery [çardak] to have many sections with different levels, which also made visible separation of space utilization, for example, the area, that was used for living similar to banesa with porch [hajat], was slightly elevated from the platform used for communication.
Depending on the architectural features of gallery [çardak], Doli gives two sub-types of this banesa, with opened gallery [çardak] and closed gallery [çardak]. This categorization of sub-types occurs in chronological order; their classification appears from the different time of when they were built. Banesa with opened gallery [çardak] is the earliest version of this type of banesa, which according to Doli is a characteristic of the particular social-economic status of the region in general and families in specific.

12 RIZA, Emin (2006); PERLA, Fondacioni Kulturor "Saadi Shirazi", Tiranë, pg. 85
13 RIZA, Emin (2009); Qyteti dhe Banesa Qytetare Shqiptare shek.XV-XIX, Tiranë 2009, pg.208
14 Bozdogan, S.Vernacular Architecture and Identity Politics: The case of "Turkish House", volume VII, no.11, 1996, pg.171

The sub-type of banesa, with opened gallery [çardak], is characterized with features common for village houses. This occurrence is due to the orderers' pragmatism, who have recently moved from the rural parts of the country, hence their habits have not yet been adjusted to the urban life. Open gallery [çardak] in this case was the best solution for its users who were still cultivating their lands.
However, the derivation of banesa-s typology with closed gallery [çardak], Riza explains slightly different, according to whom another cause of it would be the cold climate especially in highlands.16
According to Riza banesa with gallery [çardak] has three sub-types. Depending on the disposition of the gallery [çardak], banesa can be with frontal gallery [çardak] (gallery [çardak] covers the main façade), with gallery [çardak] on one side and with gallery [çardak] on the center.17 However, in Riza's sub-classification of the sub-types we have the initial sub-types of Doli. Both sub-types, banesa with gallery [çardak] on the side and banesa with gallery [çardak] on the center have two sub-sub types, banesa with opened and closed gallery [çardak] on the center and banesa with opened and closed gallery [çardak] on the side. In both cases, these categorizations of the sub- types given from Doli and Riza, end up with the matching number of sub-types. The difference is that Riza presents a clear classification of the sub-typology while Doli provides us with examples, which indicate the sub-types of banesa.

Figure 2 - Example of Banesa with closed çardak. The House of Musa- efendi Sheherzade is located in the plain area of the city, in the "Old Saray" street, built by the end of the 18th century.

15 DOLI, Flamur (1993); Shkolla Kosovare e Mjeshtrit Popullor Shqiptar, Prishtinë 1993, pg.36
16 RIZA, Emin (2013); Arkitektura popullore dhe vleresimi i saj, Tiranë 2013, pg.37

2.3 Banesa with side gallery [qoshk]

The third type of urban banesa is the one named by Riza (2006) as banesa with side gallery [qoshk]. Although the term 'side gallery' is adapted by translated publications, in one's opinion this is not the correct translation considering the architectural characteristics of this feature. The 'side gallery' [qoshk] is the space of banesa which extrudes from contour of the frontal facades which is more often than not positioned in the centre not on the side as the translation indicates.
Banesa with side gallery [qoshk] is more or less the sub-type of banesa with open or closed central gallery [çardak] presented by Doli (1993). As a composing element of banesa with side gallery [qoshk] is a preferred area for living. Banesa with side gallery [qoshk], although not as common as other previous types of banesa-s, saves its connection with the outside world through this particular feature, from which it gets its name. Examples of it could be found in most of the cities of Kosovo but the richest and most advanced ones are in Gjakova.18 Banesa with side gallery [qoshk] were built either as a one storey or two storey building. In general its layout remains simple, composed by three main sections, the central part, communication area in which are positioned stairs in cases of two

storey buildings, and two side livings blocks. Examples of banesa with side gallery [qoshk] with two storeys are more common. This type of banesa compared to two previous types, makes a clear break from the architectural furniture and ornaments of other functional elements. Its simple façade with closed shelter, large number of windows, always painted, enlivens with this extended volume that emerges in the center of it. This type of banesa has a very rational solution that matched flawlessly to the new economical standards that developed during the time it characterizes, mainly in the second half of the 19th century and the beginning of 20th century.19

Figure 3 - Example of Banesa with open qoshk (ground floor+first floor); House of Emin Gjinolli (Ethnological Museum) located at the core of the old city of Prishtina, built in the beginning of the 19th Century

18 RIZA, Emin (2009); Qyteti dhe Banesa Qytetare Shqiptare shek.XV-XIX, Tiranë 2009, pg.282

Figure 4 - Example of Banesa with closed qoshk (ground floor+first floor); House of Xhafer Deva built in the 19th Century located in the old core of the city of Mitrovica

2.4 Special cases

Typological classification of urban banesa, naturally, cannot cover all the built examples of banesa-s during 18th and 19th century. Always trying to keep the characteristic composition, both the orderer and the craftsmen, with limitations in space, were forced to improvise, and the products are these so-called special cases of banesa. Examples of this type of banesa-s are the ones located in sub-castle
neighborhood in the city of Prizren, which having in mind the design scheme of the relevant typology; create different solutions of volume composition attached to the narrow land. This occurrence is very common for the cities of Kosovo, nevertheless they do not influence the fundamental characteristic of the past traditional architecture, quite the reverse, they emphasize it even more. 20
Another type of banesa that is part of the special cases is urban kulla, which is also one the latest versions of banesa built mostly on the late 19th century. Urban kulla represents a rather interesting occurrence as it is quite unique on its design compared to other banesa-s in Balkans. This type of banesa which is very rare for the cities of Kosovo, mostly found in Peja and Gjakova, has a very specific solution of the kulla type in general. Kulla as fortification is very common in villages of Kosovo and north Albania, therefore, in one's opinion it is considered to be part of the special cases, since it does not represent typical features of rural kulla itself.21

20 RIZA, Emin (2006); PERLA, Fondacioni Kulturor "Saadi Shirazi", Tiranë, pg. 87
21 The reasons behind this remain to be researched further as part of doctoral dissertation.
versions of banesa; It is typically built in three storeys, but there are examples of one and two storey kulla-s.22
According to Drançolli (2001), the biggest utilization of these banesa-s was mainly
for security reasons or as guesthouses. They were, more often than not, built as a secondary house, which composed and fortified the garden walls of the rich families in Gjakova and Peja. Typical construction material for kulla is stone for walls and wood for structure and the well known element of kulla, divanhane [characteristic feature of kulla, with similar function to gallery [çardak]. Kulla-s distribution of spaces is done through functional separation of storeys. The ground floor was usually used as barn [ahri] or storage area, upper floors were used for living, finishing with guest room [oda] situated on the highest floor together with divanhane.

Figure 5 - Example of kulla built in the 19th Century; The kulla of Hysni Koshi is located in the big market complex in the city of Gjakova

Figure 6 - Example of kulla built in the late 18thbeginning of the 19th Century; The kulla of Tahsum Beu near the big market complex in the city of Gjakova

22 RIZA, Emin, HALITI, Njazi (2006); Banesa Qytetare Kosovare e shek XVIII-XIX, Prishtinë 2006, pg.190-194

3. "Turkish house" vs. banesa in Kosovo

There have been a countless number of debate publications concerning the origin of banesa-s architecture in Kosovo and Balkan region in general. For a long time, the Albanian-inhabited territory of Kosovo was, as with much of the Balkans, included within the political frame of great powers such as the Eastern Roman, Byzantine and Ottoman Empires.23

This long period of co-existence between different cultures, considering the multi ethnical social interactions in the cities during this period, one can confidently presume that each "visiting" empire influenced greatly the traditional architecture of Balkans in general and Kosovo in particular (as a topic of study). Since banesa in Kosovo derives mostly from 18th and 19th century, Ottoman Empire is the subject of interest, considering its crucial role in socio-economic status of Kosovo during 15th-19th century, always keeping an eye on imprints of its predecessors.

The meaning of the term "Ottoman house" and its successor "Turkish house" has been well established by Turkish architects, such as the architect and historian Sedad Hakki Eldem during the beginning of 20th century, whose work has been pivotal on further studies, documentation and categorization of the Turkish house.According to S. Bozdogan, another theoretician and historian of Turkish architecture, "the term "Turkish house" designates a specific house type that spread over the vast territories of the former Ottoman Empire, from the Balkans to the Arabian peninsula". Moreover, Bozdogan describes the Turkish house as follows: "timber framed with infill construction, with infill material ranging from bricks to wood, plastered over (lesser examples) and finished in wood in the more elaborate ones".24 Additionally, Bertram, enthusiastic historian of Turkish architecture, on his Imagining the Turkish House book, gives detailed description of Turkish house architectural characteristics, typology, construction materials, etc. combined information based mostly on the memories of people that used to inhabit. Even in his description, Turkish house is always referred to as timber-framed house found mainly in Istanbul, Anatolia, Greece and the Balkans. Nevertheless, his observance places him parallel to Riza, when they both agree that these houses (banesa) built in Balkans, varied according to local building materials, as well as to the wealth and size of the families they housed. However, Bertram concludes that all of them "shared a basic architectural vocabulary".25 Riza (2010), acknowledges that the social and political elite of the Ottoman administration who were ethnically Turkish, brought with them architectural styles, values and building techniques, which influenced residential buildings. Nonetheless, he limits this influence to mainly spatial composition and decoration. As he argues against the theory of importation26, encouraged by both Greeks and Turks, by paraphrasing Gunai, Riza (2010) agrees with him especially since Gunai (1998) emphasizes the importance of unique local influence that have shaped domestic vernaculars, additionally admitting that "Turkish dwellings must be understood as representative of and befitting a resident Turkish population rather than characteristic of the local

Balkan community under the Ottoman Empire"27. Following this pattern, Riza defines Albanian banesa as "banesa built by Albanians for Albanians".

24 BOSDOGAN, Sibel (1995); Politics of Vernacular: The " Turkish House", Nationalism and Postmodernity, Massachusetts Institute of Technology, 1995, pg.171
25 BERTRAM, Carel (2008); Imagining the "Turkish House", 2008, pg.20
26 The theory of importation, a recent and very common occurrence, according to which the derivation of houses typologies is purely the result of ethnical intelligence, and not the socio- economic conditions. (Riza, E. 2006)
27 The quote was cited from translation done by CHwB Kosovo Office, Traditional Architecture and Documentation Methodologies; report series no.15/2010, pg.78
28 The quote was cited from translation done by CHwB Kosovo Office, Traditional Architecture and Documentation Methodologies; report series no.15/2010, pg. 80

Another important debated subject is the authenticity of guest room [oda]. Guest room [oda] as an important architectural characteristic feature of banesa in Kosovo from 18th and 19th century, occurs as such in Turkish house as well. "It has been argued that the origin of the guest room [oda] lies in the Turkish tent, but this has been dismissed as conjecture."28According to Riza, by the time the Ottomans arrived in Constantinople in 1453, together with banesa in general, guest room [oda] has been well established. Its ornamentals during 18th and 19 century with obvious oriental features, brought to us by Turks, regardless of the religion cannot be considered Turkish creation. The lack of furniture, and the existence of architectural furniture, apparently derives from Arabs, who are known to favor sitting on improvised planes.29 Moreover, the special effort put in guest room [oda e miqve], especially in decorations and its prominent role in banesa volume composition, Riza relates to Albanian culture of hospitality (as expressed in Article 96/602 in the Code of Lek Dukagjini: "The Albanian house is the house of God and friend"). 30 Albanians are known to pay special attention to guests, therefore, guest room and when possible guesthouse was one of the most important and expensive parts of the house.

Conclusion

Traditional architecture of urban dwellings in Kosovo is ultimately a subject that needs to be studied further and in more detail. This paper has only shown a glimpse of what exists of it, nonetheless, it has defined the typologies of the urban dwellings, the interrelation between typology and chronological development, the derivation of space distribution to typologies and terrain topography, the relation between material usage and construction methods to climate conditions, etc. as well as the close relationship of the orderers and craftsmen who together form the mastermind behind these extraordinary creations. Both Riza and Doli provide us with an immense number of examples of documented dwellings, some of which I have managed to find and visit briefly. Most of the banesas that I have seen, belong to typologies that derive from more recent years since those are mainly the ones that have survived. Such types are the banesa with open galley [çardak], a very good example of which is the Kosovo Institute for Monument Protection located in Pristina, or banesa with closed side galley [qoshk], the house of Shuaip Pasha, located in Prizren, or city towers [kulla] such as Kulla e Haxhi Zekës in the city of Peja, as well as a countless number of special cases located mostly in Prizren. Considering the established arguments set in chapter 2, regardless the countless attempts to politicize the authenticity of banesa, the studies conducted by those who were genuinely seeking the end of ongoing argument on the origin of banesa, one can only continue to agree and disagree with those arguments. Nonetheless, the most persuasive conclusion is that banesa is a composition of Ottoman architecture mixed with the mere professionalism gained through experience of the Kosovar craftsmen combined with the taste of its orderer. Considering its architectural composing features separately and as part of the entire volume of banesa, its spatial vertical and horizontal distribution of spaces within this volume, its particular emphasis on guest room [oda], relates directly to the Albanian way of living, which nevertheless was greatly influenced by the Ottomans. However, banesa in Kosova is considered to be a great achievement on development and elaboration of the particular architectural style that purely reflects the psychological-ethnological condition of its inhabitants. If analyzed properly, considering the existing rich theoretical framework, one can see the imprints of different factors, regardless of which, the pureness of its creators design prevails upon others.

28 The quote was cited from translation done by CHwB Kosovo Office, Traditional Architecture and Documentation Methodologies; report series no.15/2010, pg. 80

References

1. Architecture traditionelle des pays balkanique, Edition Melissa.
2. BERTRAM, Carel (2008); Imagining the "Turkish House", 2008.
3. BOSDOGAN, Sibel (1996); Vernacular Architecture and Identity Politics: The case of "Turkish House", volume VII, no.11, 1996.
4. BOSDOGAN, Sibel (1995); Politics of Vernacular: The "Turkish House", Nationalism and Postmodernity, Massachusetts Institute of Technology, 1995.
5. CHwB KOSOVO OFFICE (Report no. 15/2010), Traditional Architecture and Documentation Metodologies, Prishtinë 2010.
6. DOLI, Flamur (1993); Shkolla Kosovare e Mjeshtrit Popullor Shqiptar, Prishtinë 1993.
7. DOLI, Flamur (2001); Arkitektura tradicionale popullore e Kosoves, Prishtinë 2001.
8. DOLI, Flamur (2009);Arkitektura Vernakulare Kosoves, Prishtinë 2009.
9. DRANCOLLI, Fejaz (2001); Kulla Shqiptare, Prishtinë 2001.
10. RIZA, Emin (1997); Historia e Arkitektures Shqiptare, Tiranë 1997.
11. RIZA, Emin (2006); PERLA, Fondacioni Kulturor "Saadi Shirazi", Tiranë.
12. RIZA, Emin, HALITI, Njazi (2006); Banesa Qytetare Kosovare e shek XVIII-XIX, Prishtinë 2006.
13. RIZA, Emin (2009); Qyteti dhe Banesa Qytetare Shqiptare shek.XV-XIX, Tiranë 2009.
14. RIZA, Emin (2010); Banesa Popullore Shqiptare, Tiranë 2010.
15. RIZA, Emin (2013); Arkitektura popullore dhe vleresimi i saj, Tiranë 2013.
16. KOJIĆ, Branislav (1949); Stara gradska i seoska arhitetura u Srbiji, Beograd, 1949.

Christian Basilica, Serbian Orthodox Church or Ottoman Mosque? Some remarks on national monuments of sacral architecture.

Caroline Jaeger-Klein

History of Architecture Vienna University of Technology
jaeger-klein@tuwien.ac.at

Abstract. The territories of Kosovo do hold quite a number of historic sacral monuments that several national entities call "their" architectural heritage. Can we really speak of a single nations' heritage in territories where, through the course of history, the politically leading or majority nation was shifted in place? To which nation does immoveable heritage belong, if the nation is no longer dwelling around the monument? Who takes care of such national heritage? Is heritage "national"? How can a national state administrate and manage architectural heritage that is not considered to be "his" national heritage?
Questions like those are current status for Kosovo nowadays. Answers are getting more urgent as the new state has to complete his new legislation within this or the next year(s). Kosovo hardly knows about all of his built heritage, as many of the information collected in the past is scattered in different national archives refusing exchange of information and documents. And finally, hasn't the term "national" heritage anyhow been replaced by "world heritage" within the last decades? But again, how can the care and protection of this heritage be managed in future, by national states and their national heritage organizations or by the international community and its official organizations?
The paper is not trying to answer those questions but to show irrelevant the terminus of national heritage nowadays became. Therefore it will dig into the history of several buildings, ensembles and towns in Kosovo and trace back their architectural history, like for Novo Brdo and Gracanica, Prizren, Decani and Peja. Additionally it will show that this is not a unique situation for a specific region, but that similar cases have happened elsewhere in Europe, too.

Keywords: Architectural Heritage, Care and Protection of Monuments, Christian Basilica, documentation and Inventory, National Monument, Ottoman Mosque, Sacral Architecture, Serbian Orthodox Church

1. Introduction

"Wo historische Wahrheit und Consequenz in einem Kunstwerke aufgegeben wird, wo man verstecken und bemänteln will, was seine Folgen vor aller Welt Augen weit verbreitet hat, da kann man unmöglich noch auf unbefangene Theilnahme und allgemeines Interesse Rechnung machen. Ein solches Werk wird, als das Geschöpf einer selbstsüchtigen und eitlen Zeit, mit dieser untergehen"[1]
The great German architect Karl Friedrich Schinkel protested such against the plans of the year 1818 to restore the Marienburg into a propagandistic German national monument. With that restoration of a former castle of the German Order in Eastern Prussia, the still very young Germany struggled hard to give itself identity. What Schinkel very clearly had foreseen is that only a history, which was not manipulated, will last.
Historic developments like this remind us on the current discussion between Albanians and Serbians on the monumental architectural heritage of Kosovo. Are the monastery churches of Deçani and Graçanica, the Patriarchate of Peja and the Church of the Virgin of Ljeviša in Prizren really Serbian monuments in their categorization as enlisted into UNESCO World Heritage under the number 724 in 2004 (Deçani) and
724 bis in 2006 (Serbian Medieval Monuments)? The official title indicates that those buildings were built as sacral buildings of the Serbs, but with the recent shifts in the political landscapes of Balkans

now belong to the territories of Kosovo, which even makes them "endangered" heritage of the world on the "red list" of UNESCO.
Serious building archaeology from independent institutions like CHwB, but also older research undertaken still in the Yugoslavian republic and recent publications by a new generation of Albanian scholars proof very clearly that those listed Serbian Medieval Monuments mostly are based on top or in the vicinity of older Byzantine or Early Christian basilicas. During the times of the formation of the Serbian nation in the 13th and 14th centuries, those sacral buildings, for political reasons, were transformed into Serbian orthodox monuments. When the Ottomans took over the territories in the 15th and 16th centuries, those orthodox, as well as some other catholic churches of the region again were transformed, now into mosques. After the collapse of the Ottoman Empire, the communist politics of Tito's Yugoslavia had no great interest to reclaim those buildings for whatever church community. Therefore, scientific research was reasonably neutral. But with the beginning of the Balkan wars at the end of the 20th centry and for Kosovo in particular cumulating with the riots in spring of 2004, the issue of national heritage went out of control. Now it is on time to get back to the neutral truth and to pure knowledge beyond all ideologies.
The academic youth of Kosovo is ready for it, as current publications like
Monument, Volume I by Artan Krasniqi, published in Prishtina in 2014, show. In 2012
Edi Shukriu already tried to contribute with Kisha E Shen Prendes Prizren, unfortunately only available in Albanian language. Fejaz Drançolli went the same direction with Monumental Heritage in Kosova in 2011, alighting in content, but still weak in the English translation. With this paper I would like to thank them all and others, but in particular CHwB, for their contribution to a future for the national monuments of Kosovo.

2. Complex Histories

2.1 Serbian Medieval Monuments in Kosovo

According to the official UNESCO brief description "the Dečani Monastery was built in the mid-14th century for the Serbian King Stefan Dečanski, and it is also his mausoleum. The church represents the last important phase of Byzantine- Romanesque architecture in the Balkan region." The ICOMOS evaluation states that "Dečani Monastery is considered one of the most important monuments of Serbian culture and history. The main characteristics of the ensemble relate to a prototype attributed to the so-called Ras School, a style formed in Serbia in the 12th century." Beyond that strong Serbian context, the international experts confess: "The plan and spatial arrangement of the church are Orthodox, while the exterior appearance is based on Romanesque tradition. … The construction lasted 8 years (1327-1335), and the master builder was Fra Vita, a Franciscan from Kotor."[2]

Fig. 1. Dečani Monastery Church: A fascinating contradiction between the Dalmatian coast architecture in the catholic tradition and its Serbian orthodox interior (author's photography in May 2015).

For the other three sites, summed up under "Serbian Medieval Monuments", the official brief description gives the following: "A group of three churches, the Patriarchate of Peć Monastery, Graçanica Monastery and the Church of the Virgin of Ljeviša, mainly built in the 13th and 14th

centuries reflect with Dečani Monastery the high points of the discrete Byzantine-Romanesque ecclesiastical culture that developed in the Balkans in the 13th century under the Nemanja dynasty, …" As outstanding universal value the following combination of values is given: "The three churches reflect a high point in the development of the discrete Balkan Palaiologos Renaissance style, a fusion of the eastern orthodox Byzantine styles with western Romanesque influences, fostered by both the Serbian church and state at the height of its influence. In architectural form, [they] show the development of this style from the first appearance of the cross-in-square plan with five domes at Ljeviša, to its unique manifestation at Peć, with three separate churches united by a narthex, and its accomplished culmination at Graçanica. …" [3]

Hence, all those sites had a more complex history before and after their high period (Serbian Medieval). Jahja Drançolli explains for Graçanica that not only visibly the monument's foundations are made with antique quarry stones from the 2 kilometers remote Roman city of Ulpiana. "It is known that Ulpiana was a prominent episcopal center under the jurisdiction of the Roman papacy in the 4th century. Material and written sources claim that a Cathedral church, the residency of the Ulpiana episcopate, existed in the area". After earthquake destruction in 518 a new cathedral church was constructed … [4]. On the ruins of this 6th-century early Christian, three- naved basilica the 13th century church of Theotokos was built, which then the Serbian King Milutin (1282-1321) replaced by the monastery church which we see nowadays at Graçanica. "The plan, spatial arrangement, decorative wall treatment and wall paintings together have made it an emblematic structure for Balkan architecture of the 14th century reflecting the spirit of the Byzantine tradition but slightly modified by western influence."[3].

Fig. 2. Left: Remains of the cathedral church at Ulpiana; Right: Foundation wall of the monastery church of Graçanica (author's photography in May 2015).

According to the Albanian scholars, also two tales are told about the Peć (Peja) Patriarchate. In 1979 Mark Krasniqi wrote about the centuries-long protection of this building complex of the Serbian Archbishop by the Rugova highlanders, quoting Serbian historians and chroniclers as proof. Nowadays the Patriarchate is surrounded with a brand new, three meters high wall. Besides, the entire church complex seems to be reconstructed on top of the foundations of paleo-Christian buildings of the 4th to 6th centuries AD [4], at least "around the churches and in caves in the Rugovo gorge, many smaller churches and hermitages developed: the Slavic name Peć means >cave<. One of the remaining hermitages, Marko's cave, is included in the Buffer Zone" [3] of the World Heritage Site.

Finally, also for the third Serbian-Medieval Monuments enlisted as world heritage, the Church of the Virgin of Ljeviša (Kisha e Shën Prendës), the Serbian legacy is rather weak. "The plan is the starting point for a new architectural style in the Balkans, transitional between basilica and cross-domed styles ..." [3], ICOMOS expertise evaluated in 2006. Edi Shukriu in the meantime has published the reconstructions of Slobodan Nenadovic which show a classical and extent three nave basilica from the 9th or 10th century which obviously was destroyed at the end of the 12th century through Stefan Nemanjic. [5] "The church gained its present appearance after reconstruction in the early 14th century. [3]

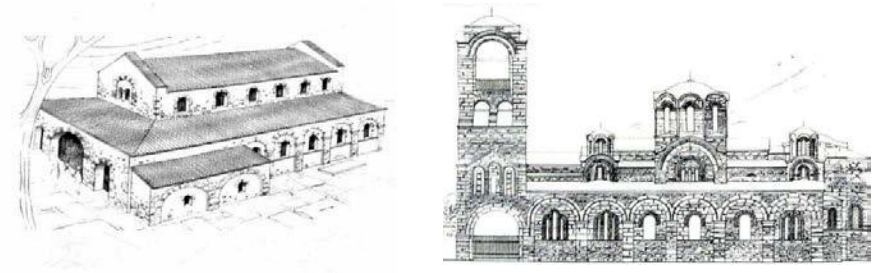


Fig. 3. Left: Prizren, Church of the Virgin of Ljeviša (Kisha e Shën Prendës), reconstruction by Slobodan Nenadovic of the 9th/10th century byzantine basilica on its site; Right: Southern elevation of the 14th century church (Edi Shukriu, Kisha e Shën Prendës Prizren, 2012).

Some times before 1756, after Turkish re-conquest, the Church of the Virgin of Ljeviša was turned into a mosque and substantial readjustments were made: apertures were closed, a minaret added to the bell tower, the walls plastered inside and in order to gain a form key the paintings were first >nicked<… After the liberation of Prizren from the Turks, the church once again became a Christian place of workshop and was restored in 1918. Despite the substantial readjustments described above – only 30% of the original wall paintings survived – ICOMOS confirmed its authenticity in 2006. [3]

2.2 The Catholic churches of Novobërdë and their minarets

"When Novobërdë (Novo Brdo), was a city, London was a village", goes the saying about the incredibly rich silver mining town of the middle ages, 35 kilometers southeast of Prishtina. With the sophisticated knowledge of Saxonian mining experts and incorporated into the extent trading empire of the republic of Ragusa, Novobërdë grew in the 14th and 15th centuries to a good size town of 30.000 to 45.000 inhabitants. Its mint produced coins known as >Grossi di Novoberda< causing rapid economic development within the region. [4, 6]
For its Saxonian miners, other German craftsmen, the traders from Ragusa and various catholic settlers Novobërdë provided at least two catholic churches, one parish church and the cathedral Saint Nicholas, constructed in the 14th century, and reconstructed during the first half of the 15th. A survey report, written by the Kosova branch of CHwB in 2008, gives accurate dimensions, 30.7 meters by 23.42 meters for the cathedral. The church was converted into a mosque in 1466, when a minaret was added. The locals as well as some experts think that the cathedral with the minaret was exploited for political games in Belgrade to >prove< the allegations that Serb Orthodox churches were converted into mosques during the rule of the Ottoman Empire. The medievalist Jahja Drançolli argues with an extent study of the religious structure of the population that Novobërdë never was a Serbian town [4].

Fig. 4. Left: Remains of the catholic cathedral Saint Nicholas at Novobërdë; Right: Foundation wall of the monastery church of Graçanica (author's photography in May 2015).

2.3 Church and Mosque in Parthenon

Modifications of sacral buildings for other religions than the original one are not unique nor seldom in Europe. The basilica as building type once was invented by the Romans for common jurisdiction at the forum. Still in Roman times it was adopted by Christian communities for their church services. In the late nineteenth century the basilica as building type proved its use in early industries as well lite manufacturing structure. So the basilica shifted from administrative to sacral and finally industrial use over the course of the times. [7]
Even the famous Parthenon at Acropolis in Athens had an interesting fate, before monument preservation brought him back into its "original" status. Although several times sieged and robbed he survived his first 500 years nearly unchanged. First interventions took place when he was turned into a byzantine church during the first half of the 5th century. The entrance moved to the west, whereas in the east an apse replaced the major doorway of the temple. As exonarthex the western room served the freshly installed galleries as well as the nave. The peristasis outside was enclosed with a wall of half the height and the interior was plastered and decorated with frescos (murals) and mosaics. Therefore the Parthenon survived as byzantine bishop's church without any substantial damage. Then Athens was sacked by crusaders, but later reinstalled as residence of the Roman-catholic bishops.
In 1458 the Ottoman Sultan Mohammed II conquered Athens. He was educated enough not to touch the Parthenon. It is said that he gave it back to the Orthodox Church. Hence, the Parthenon later was changed into a mosque without interference of the building substance. A minaret was erected in the southern corner of the opisthodom and the ikonostasis and the altar were replaced by mimbar and mihrab. The Turkish even saved the ceiling through an additional, structural pilaster.
In 1687 the Parthenon was heavily damaged. The Venetian fleet besieged Athens and the Turks had stored their ammunition in the temple. The exploding bombs heavily damaged the cella with the famous freeze and 28 columns of the peristasis collapsed. The final destruction was caused by Lord Elgin who >stole< the famous marbles for the British Museum in 1802-03 [8].

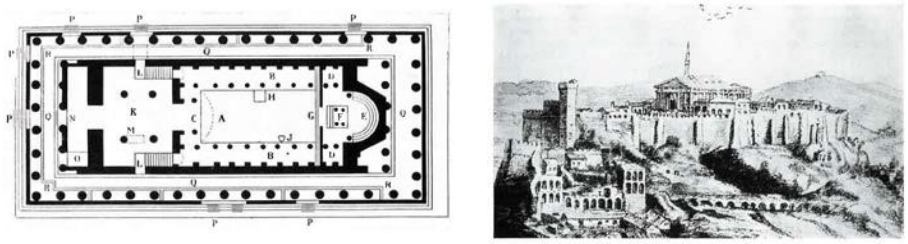


Fig. 5. Left: The Parthenon during Byzantine times, A. Michaelis, 1912; Right: The Acropolis with minaret, anonymous drawing, 1670 (Machatschek, 1961, Fig. 195 and 199).

2.4 Athena temple and dome of Syracuse

In the Sicilian town of Syracuse, in the 7th century AD the Christian dome was built into the magnificent and widely known temple of Athena, a 6 x 14 column peripteros from the 5th century BC. The temple was changed into a basilica with three naves by closing the intercolumnium of the exterior walls and opening of the cella wall into eight arcades. Inside the dome and along the Via Minerva, the columns' base, shaft, head and architrave of the antique temple still are visible [9] and articulate the uniqueness of the site.

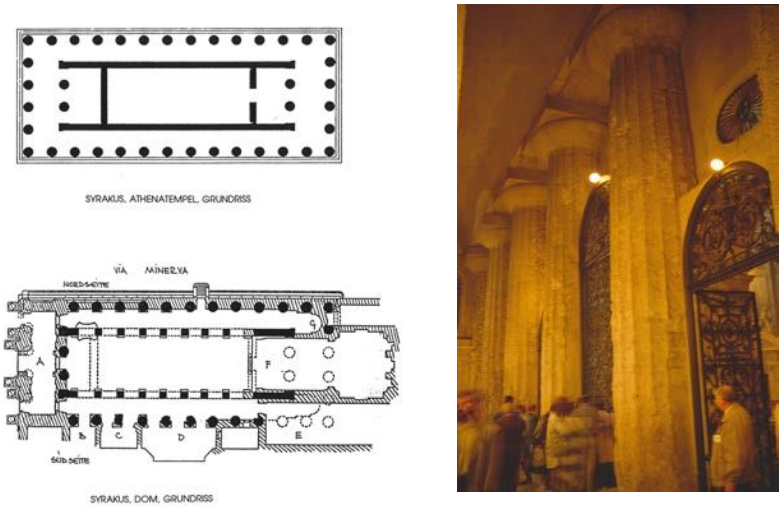


Fig. 6. Left: Plan of the antique temple of Athena and its turn into a Christian basilica; Right: Main entrance into the dome nowadays (Hannes Toifel, Caroline Jaeger-Klein, May 1990).

Conclusion

If we compare the times, when Germany tried to shape its identity by national monuments, with the current discussion in Kosovo over its >Serbian< monuments, we might learn something. The connotation of >gothic< was very negative, as long as the Gothic was considered to be the style of barbarians. When prominent writers like Johann Wolfgang von Goethe and Friedrich Schlegel pushed Gothic as truly German architecture, all of a sudden the image of the style shifted. The fancy side of the story is that the monuments used as models for German national architecture nowadays are situated no longer on German grounds. The minster of Strassburg (Strasbourg) today belongs to France, the Marienburg (Malbork) to Poland, and of course, both sites are proudly listed as national heritage of the two national states as well as UNESCO World Heritage, the Marienburg since 1997, the Strassburg minster in the zone of the Grande Île du Strasbourg since 1988.
Of course, the national state of the territory is responsible with its local administration for care and maintenance of such monuments, even if they were – at certain times – considered to be essential heritage of another nation. Kosovo has to learn this lesson quickly for its >Serbian< medieval monuments.

References

1. Huse, Norbert: Denkmalpflege. Deutsche Texte aus drei Jahrhunderten, München (2006).
2. UNESCO World Heritage List No. 724, Paris (2004), 120-123.
3. UNESCO World Heritage List No. 724 bis, Paris (2006), 141-148.
4. Krasniqi, Artan: Monument, Vëllimi I, Prishtina (2014), 63.
5. Shukriu, Edi: Kisha e Shën Prendës Prizren, Prishtina (2012).
6. Wenzel, Susanne: Das Kosovo entdecken, Berlin (2005), 63-66, 96-97.
7. Jaeger-Klein, Caroline: “Conversions in Urban History", in Baum, Martina / Kees Christiansen (ed.): City as Loft. Adaptive Reuse as a Resource for Sustainable Urban Development, Zürich, 2012, 59 - 66.
8. Machatschek, Alois: “Der Parthenon von Athen – Schicksal und Denkmalpflege”, in Österreichisches Bundesdenkmalamt (ed.): Österreichische Zeitschrift für Kunst und Denkmalpflege, XXI/1967 Wien 169-178.
9. Scharf, Helmut: Sizilien, Zürich und München (1986), 175f.

Traditional aspect and community socialization through public urban space- Study case Peja

Vlora Aliu[1], Binak Beqaj[2]

UBT - Higher Education Institution
{vlora.aliu[1], bbeqaj[2]}@ubt-uni.net

Abstract. It's to be considered as an important issue, the issue of public space identification and social relation-ships of the community with them. It's the fact that social aspect of the people living in urban areas is considered as main aspect identified with:

- Inclusiveness and equity for different community categories
- Sustainable integration of urban development and
- Tradition

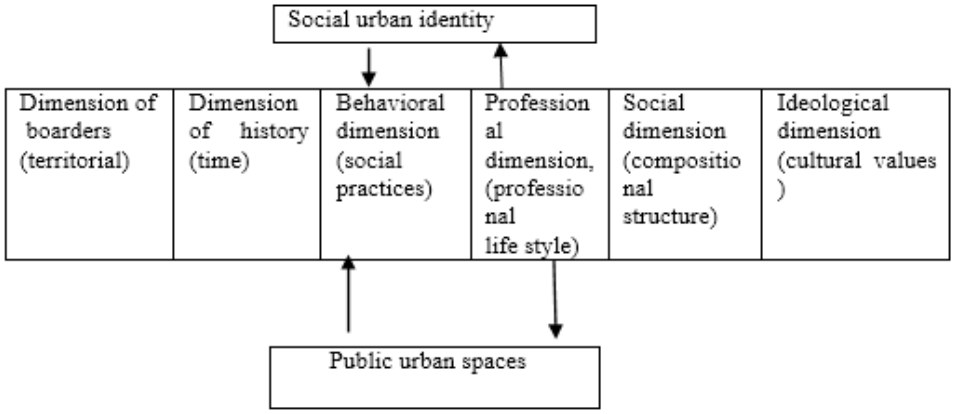
Considering this, the aim is to insist on development of those public spaces and definition of their role on social, societal and traditional aspect for the community.
Knowing that Peja as important urban area in Kosova, as city under modern development, is in the phase of developing new identity, so, actuality there is adoption in between transformation and integration. The aim of this paper is to present inter-relation between public spaces and social activities developed there, towards promotion of social, cultural and integral values for citizens.

Keywords: public space, social, urban, planning, societal, cultural, historic, traditional, integral

1. Introduction

In urban areas, there are different types of public spaces (parks, streets, squares, urban surrounding of buildings ...); that with the designation and content of its own (buildings, road inventory, green spaces, bridges, public art displays such as fountains, sculptures…) and through their level of usability have influential role in shaping the social identity, namely the development of social activities there.
Defining this, it should be started with daily experience of citizens in urban areas, in relation to mutual features and social interfaces of people with these mentioned public spaces.
The behavior of people in these areas varies depending on the area where citizens live, to which group they belong: group age , social, professional… therefore the frequented public spaces by the citizens may be internal or external , then depending on the knowledge, tradition, culture and the dimensions of citizens behavior, public spaces can be characterized as symbolic spaces as elements of social urban identity for citizens and all this depends on the extent of how much this urban social identity is incorporated in the behavior of individual and collective identity to the community. These are explained in the table Tab 1, as follows:

Table. 1. Analysis of social identity (source: Sergio Valera)



2. Case study - Research

Some of public spaces in the city of Peja, has been selected as a research subjects. The city of Peja is located in the western part of Kosova with specific features, historical heritage, cultural, industrial, trading, and touristic values.

The research methodology has multidimensional approach:

- Socio-historical development (documentary analysis)
- Quantitative (collection and processing of data)
- Qualitative (group discussion on the content of the information)

Research methodology is based on variables in identifying of public spaces:

1. The name of the public space
2. Their limits
3. Differences and functional similarities
4. The most representative city spaces
5. Interconnection of public spaces with the representative city spaces
6. The representative spaces for the future development
7. The most frequented spaces

Selected for This research are the main part of the city center of Peja, geographically located in the western part of Kosovo, with the following specific features: historic, heritage, cultural, trading, tourist, economic - social.

The areas that were explored are:

1. Center
2. Street " Mbretërasha Teuta " (ongoing)
3. City Square Haxhi Zeka
4. City Square “Skënderbe”
5. Small city park
6. “Promenade “

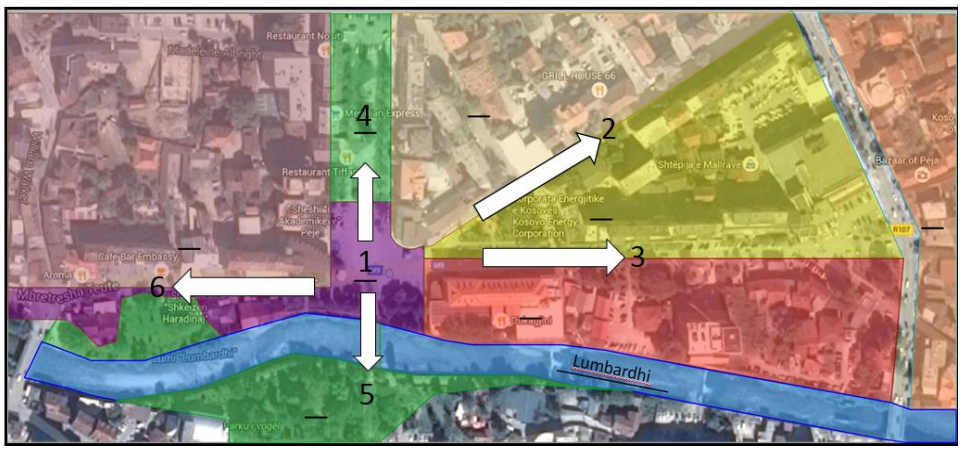


Fig.1. Focused city areas for research – composing the center of the city of Peja

The dominated functions identified from the research and analysis of selected areas were taken as:

- Promenade
- Children playground
- Square
- Connecting joint communication
- Gastronomy

Case study, public space-Center

Fig.2 Analysis of the center of Peja layout (plans, photographs - authors)

Public space in the center of the city, as the main feature has it "square", which according to research stream that is frequented by middle-age structure and children's, as is presented in Table 2.

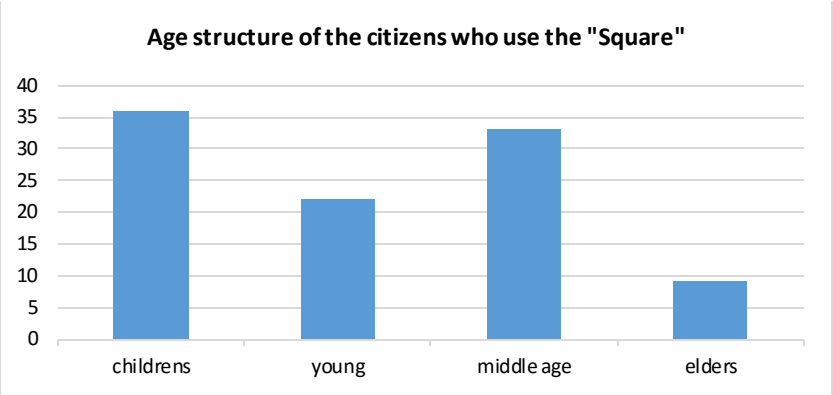


Table 2. Analysis of the structure and age of the citizens (research September 2015)

The position of the "square" is the nexus main city attractive position, which borders with river Lumbardh and administrative buildings which also overlaps with other areas as city's minipark, with old trading center, hotel Dukagjini and with city promenade. Besides this center is known with representative units like hotels, bridge, memorials...

Case study, public space-street "Mbretëresha Teuta"

Fig.3 Analysis of the road "Mbretëresha Teuta" (ongoing, layout plans, photographs - authors)
Street "Mbretëresha Teuta" is communication connecting node and is frequented mostly by young and middle age, as is presented in Tab.3

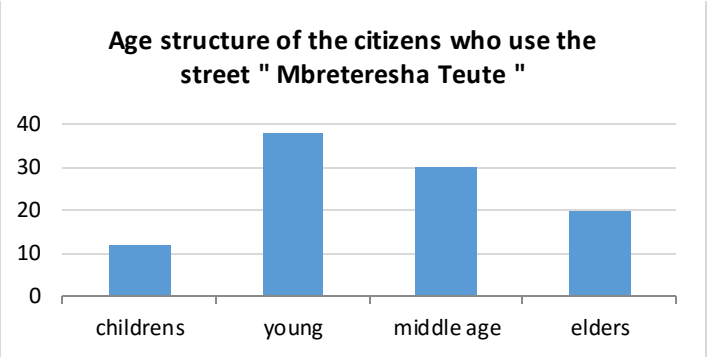


Table 3. Analysis of the structure and citizens age Street "Mbretëresha Teute" (research September 2015)

Its position is the main road that borders the square with residential buildings and has conjunction with other spaces as municipality building, roundabout, trade commercial buildings etc. The most representative units along this street are: memorial from KLA war, municipality building and, collective housing/commercial buildings.

Case study, public space-street "Haxhi Zeka"

Fig.4 Analysis of the square "Haxhi Zeka" (layout plans, photographs - authors)
Square "Haxhi Zeka" is surrounded by different buildings of collective housing and commercial units that is the main connecting street that leads to the old trade center "Qarshia e vjetër". This square is mostly frequented by middle age and old age of citizens, as is presented in Tab.4

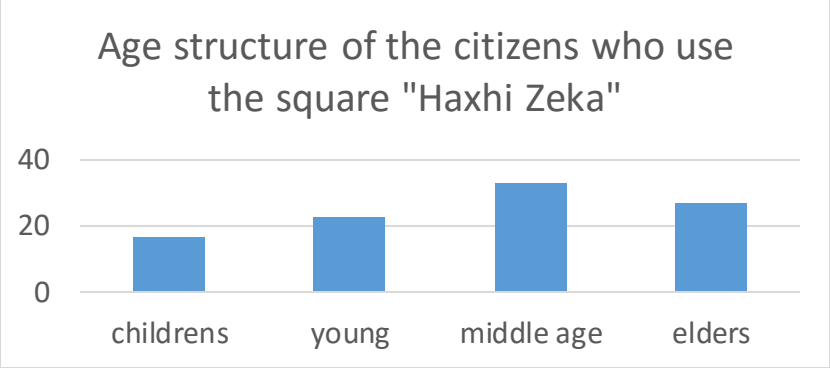


Table 4. Analysis of the structure and citizens age Street – Square"Haxhi Zeka"(research September 2015)

There prime position due to proximity with Lumbardh river, and bordering with Trade center, old trade site Interconnection, museum and with other spaces such as residential, business, catering, etc. makes this square most frequented point. The dominated buildings are those of collective housing, where buildings have an identical height and a good distance to each other.
Representative units are: Lumbardhi River and Dukagjin hotel who give the site a more attractive appearance.

Case study, public space- "Parku i vogel"

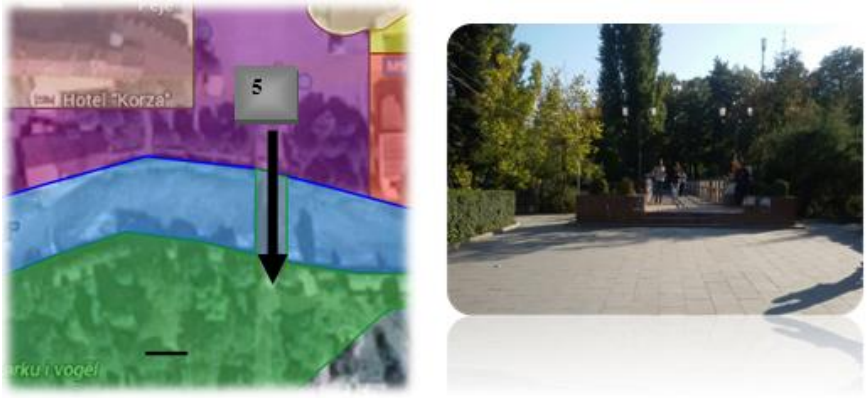


Fig.6 Analysis of the small city park (layout plans, photographs - authors)

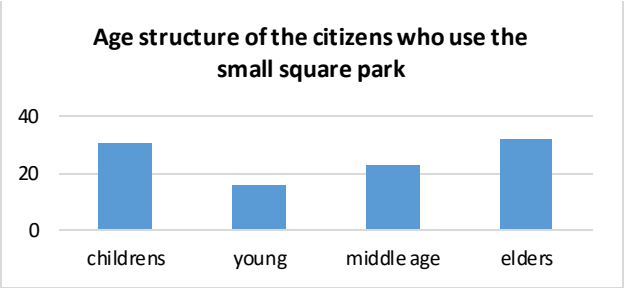


Table 6. Analysis of the structure and citizens age - a small city park (research September 2015)

The Small city park with main function greenery and space for recreation that mostly used by old age of citizens and children's. Small City Park with its position, is dominant area in the city center because it is situated alongside Lumbardh River and connected with other public spaces and city neighborhoods. The Bridge which connects square with the park is characteristical point to this park but in terms of security its flowed low maintenance decreases the feeling of security of citizens there. The park is linked with Hotel Dukagjin with square "Scanderbeg" the square "Haxhi Zeka", from the river Lumbardhi and it's characterized with different varieties of greenery and pedestrian paths.

Case study, public space-"Promenade"

Fig.7 Analysis of the road " Mbretëresha Teuta" (layout plans, photographs - authors)

The public space "Promenade", is dominated by gastronomy which is frequented mostly by young and middle age, as is presented in Tab. 7

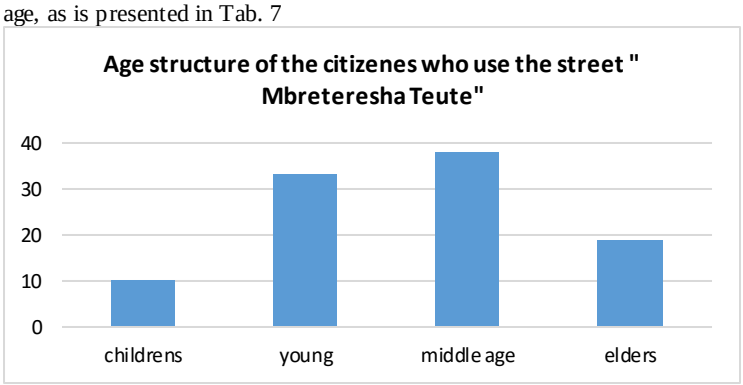


Table 7. Analysis of the structure and age citizens – "Promenade" "(research September 2015)

Gastronomy in this area, itself includes different units where teenagers and medium age of citizens can have fun and spend their leisure time. This promenade is acting as a bridge connecting other public spaces in city center. Bordered by collective residential buildings –and individual, also with Square "Scanderbeg" the Catholic Church, and with the "Sand bridge" which connects the roads frequented by vehicles
The most representative units walkability area, the greenery that affects to the urban landscape as well as cafeterias and restaurants which show a zest in this part of the city during most of the day.

Conclusions and Recommendations

Finally on terms of development of tradition and socialization of people in six public spaces selected for research and analysis, in the city of Peja, can be concluded that it is more than necessary:

1. The use and arrangement of the promenade along river Lumbardhi, in order that citizens exploit it through walking, meetings will affect the public health of the citizens. Can be developed as emblem of the city which will guide the citizens visiting other central points, also providing detailed information's for visitors. Adding some more greenery will also affect the urban/architectural landscape of area.
2. Facades of the buildings, would positively impact on the adjustment of urban landscape and will affect people's feeling of satisfaction and utilizing the use of this spaces more sensitively which also affects their feeling on urban identity.
3. Adjusting the path for cyclists is very important because the road where activities are held would get shorter and efficient. Public garages in the area will be of an important help since in the square there are a lot of activities going on.
4. There is a lack of parking lots for the residents of the area also for the visitors. Public transport in this part will help a lot connecting the public spaces and avoiding chaos in traffic, helping the citizens in performing their daily activities such as, work travel, trading, shopping through walking-green traffic.
5. Extending the boulevard to the square will create a space to be multiply used and as an interconnection with traditional and cultural aspects of the surrounding urban areas. By removing the illegal sellers it would create a better view and easier area functionality for residents. Also the removal of parking lots on this road would affect in the expansion of the square that will make it safer and more frequented area.
6. Through the establishment of "temporary market" in daily basis or certain days, it would be a good opportunity to promote local values, local products and traditions.
7. Maintenance and adding urban inventory will help more increasing the use of the areas and improving their view. Continuity of the bicycle path will help this part to decrease the air pollution and noise which is done by different vehicles.
8. Adjust the bridge which connects the square with small park will assist in the security of citizens and accessibility would be grateful. It will also affect the purity of Lumbardh and the urban landscape in this area. The small park has sufficient greenery which is maintained from time to time but it lacks the playground for children.
9. Promenade along Lumbardh would be required especially for the old age as they need a fresh climate and a sufficient space for a daily walk. The park lighting and increase of urban inventory will greatly affect that citizens spend their free time in this park as well as its accessibility would be great even in the organization of various events such as tournaments and exhibitions. Public toilets in this part are more than necessary since the awareness of citizens would be great if these exist but also maintained.
10. Since the area of gastronomy is used mainly by young people it will increase its attractiveness of information, encouraging debate and modernization of space as additional element of identity. Planning and redesign of terraces is necessary in order for citizens to have more space for developing their activities. As it lacks the lightning by improving it would create a greater security for the area. Digitization of facades would affect the

socialization of citizens which would enable the communication and interpretation of various activities such as sports, cultural, political.

Eventually these proposals for alterations in the center of Peja would create a new identity based on tradition and modernity, through synthesis of the way of the development of civic life in an urban multifunctional environment.

References

1. Charles Montgomery, "Transforming our lives through urban design", (2013)
2. Setha M. Low, Neil Smith, "The politics of public space", (2006)
3. Peter John, "Analyzing public policy", (2013)
4. Binak Beqaj, "Zhvillimi urban, planifikimi dhe dizajni", (2015)
5. Jan Gehl, "Life between buildings using public space", (2011)
6. Jan Gehl, "Cities for people", (2010)
7. Ministry for the Environment, Wellington, "The Value of Urban Design. The Economic, Environmental and Social Benefits of Urban Design". (2005)
8. Baltic University Urban Forum, "Built Environment and Revitalization", (2006)
9. John Chang, "The problematization of urban spravl in the United States", (2006)
10. EU Commission, "Making our Cities Attractive and Sustainable", (2010)
11. World Bank, "Measuring Growth and Change in Metropolitan Form", (2012)
12. World Bank, "Vleresimi i sektorit urban ne Shqiperi", (2007)
13. Sergi Valera, "Public space and Social Identity".

Systems engineering application of construction permit process and positive effects on time optimization – Case study Kosova

Lulzim Beqiri[1], Zejnulla Rexhepi[2], Gezim Sadiku[3]

[1,2,3]UBT – Higher Education Institution; Prishtine, Republic of Kosovo
{lbeqiri[1], zejnulla.rexhepi[2]}@ubt-uni.net

Abstract. Systems Engineering application to the construction industry is a permanent and continues process that bring optimization of processes that are followed with positive effects that influences positively several factor as time, cost and other related factors. Benefits through process engineering are driven forces toward process development of construction industry. This paper try to present benefits through engineering of permit process, relation of this optimization with other processes as time, cost and stakeholders benefit. The entire permit process is analyzed in Kosovo, some EU countries and as well comparison with process in Switzerland.

Keywords: Process Engineering, Permit, optimization

1. Introduction

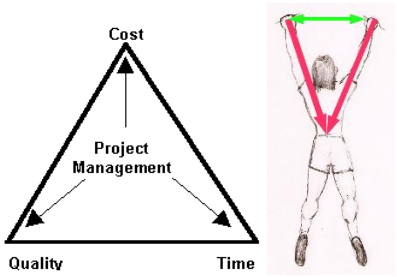
Construction industry remains still far behind on systems engineering application on it processes as main factor that bring a successful output on optimization and benefits in several aspects. Analyzing application of the systems engineering in construction (Erik W. Aslaksen ,2005) it is visible that is not applied in the level that may influence focus of all stakeholders in construction process to better understanding of systems engineering application, and trying to, as fast as possible determine factors that can have impact on systems engineering application in construction, we will try in this paper to be focused in systems engineering of a preconstruction part of construction process, in fact our focus will be from idea to the final building structure. This paper aims to present a way of reorganizing a permit process and its impact on time main factors of big interest of all stakeholders that are gathered in the triangle that connects: time, cost and quality. The model presented integrate outcomes from analyses done to the permit process in Kosova and in Swiss. Model aim to facilitate communication between stakeholders that directly have impact on triangle factor reduction, manly at first factor that is time and then cost and quality that remains not that much influenced. Model focuses mainly in time reduction and optimization as main factor, and based on stable time factor, cost and quality will be more stable and best fulfill requirements.

2. Systems engineering application in construction

Application of systems engineering is far more applied in other industries than in construction industry that is shown in the figure below. The main steps in construction process from the idea to the final building structure involves several groups of stakeholders and in this context it is a of great interest to try to apply engineering of entire process that can be done in some of the steps of entire process but as well improvement of project management as main factor in the entire process.

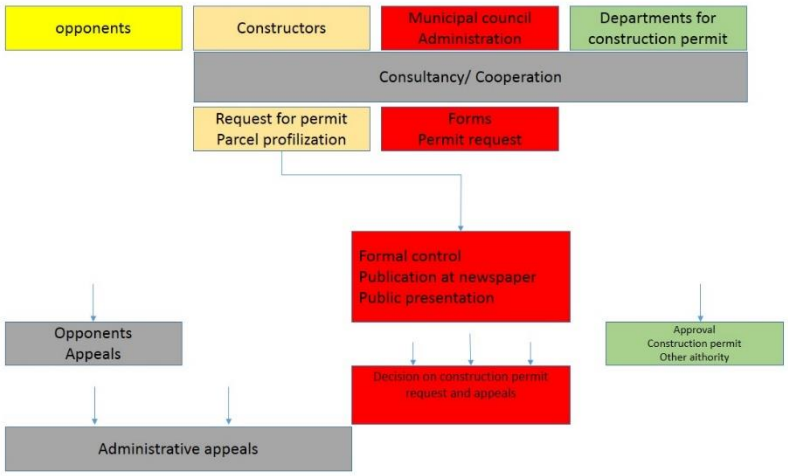
Application of Systems Engineering in Construction Industry (Erik W. Aslaksen ,2005)

Improvement of time management influences directly success of project management as will not bring additional cost and reduce quality. Each of three factors are very much related with delays that are occurred during the entire construction process and usually the pressure on project implementation makes two of three factors to have more focus by project management. The third factor will be on shoulders of the implementer as it is not possible to hold "three angles with two hand " (figure below)



3. Permit process analyses

I this analyses we did combined one case from the country that has political stability, with industrial and economic development that makes this country to be considered as developed country-Swiss, and Kosova that is country in transition, with not stable political, economic development. We did analyzed the roadmap of the entire process to get construction permit in both countries and managed to identify main steps to be improved through model provided as solution to this process. The entire process is designed and planned in favor of optimization of time, cost and quality. This is normal in developed countries as design and implementation of the systems was a log process and has a tradition. The only continues process is improvement of system, law and regulation and any other norm that regulates the process. The below scheme presents the entire process tha will be described below as well.

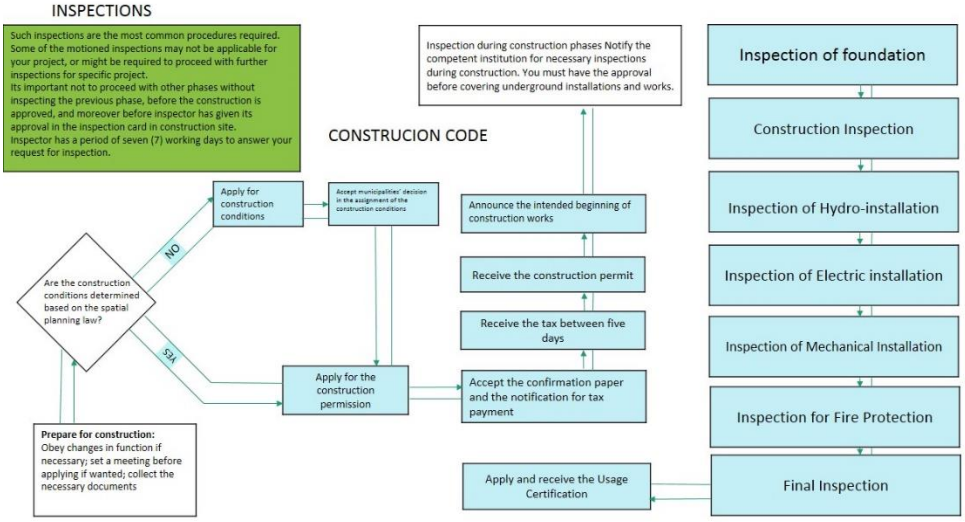


Depending on building importance such as refurbishment, small annex building, roof reconstruction, implementation of a solar and any other equipment etc., the Permit Issuing Authority (PIA) has a simple way to processed with permit of this kind of buildings. This as well has minor impact in project management and just in a few cases create possibility to have delay in any step of entire process (I case of appeal). The process steps to a construction permit are directly related to respect of laws and regulations in cantonal bases and as well in level of the municipality as end point of law and regulation implementer. Permit will be granted on time and without any delay in case when applicant respected all administrative requirement, after 30 days of appeal has been passed, building does not affect any stakeholder's interest. But those are not often cases as usually this process requires more time and stakeholders involvement. Mainly the entire permit process has some obstacle that are not technical but more related to the "power" of investor or "power" of neighbors to host the new coming construction. Normally this goes through administrative procedures that are mainly solved by respecting law and regulation by usually takes time to "satisfy" all stakeholders involved in the process. Creating time delay in the process of permit application will impact the other factors in construction process and therefore this will reflect on delay the entire process to final building structure. The process of permit becomes more complicated in some cases when you have to involve expert of relevant fields to give clarification related to impact the new construction will have in relevant field (environment, culture, etc.) . I general the entire process can be considered as process that is more dedicated to stakeholders interest but still has some improvement necessary to be applied that through engineering of the system is possible to eliminate some weakness as: law unification, regulation definition and more specification, simplification of the permit process in every new law and regulation approved by federal of cantonal government.

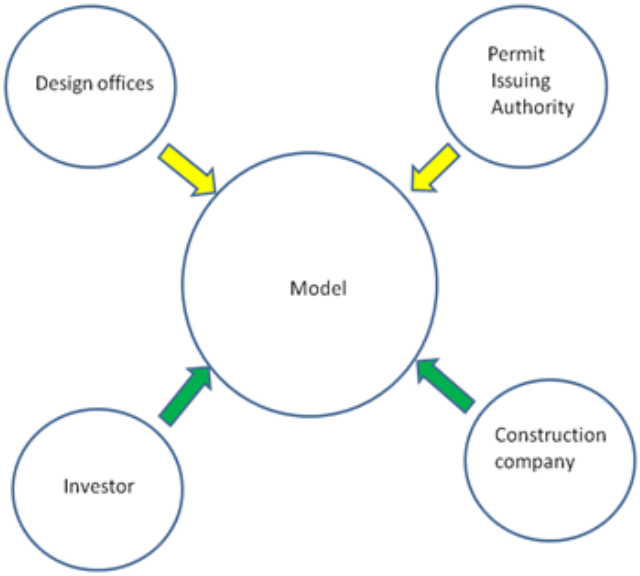
4. Permit Process analyses in Kosovo

Despite international efforts to contribute on creating a legal infrastructure that will regulate every process during transition period, the construction industry, especially permit process, is still the process that mainly create delays, generate extra cost and has impact in quality as well. Construction industry, as fast growing industry in countries after conflict and in transition as well, by inertia of fast moving, sometime violate rules and regulation created to regulate construction and all steps related to construction. Another very sensitive issue is development of residential zones beyond urban regulated areas influenced by uncontrolled migration from rural areas towards urban areas. Sometime law and regulation that are dedicate to regulate entire construction process several time are changed, adapted, or reformulated by changing several time permit process. I general this can be consider as main factor that not only has impact in permit process, but as well cannot control construction process that is main economic field that was developed after the conflict.

The permit process is as well obscured by missing accurate data from other fields related to construction (cadaster data) that makes delay, postpone or refuse the entire permit process. As mentioned above, through the rapid growth of construction industry, companies for design and construction did not managed to build a professional structure that can initiate, lead and implement entire process, including permit process. Therefore delays are not occurred in the permit process only from PIA side but as well from the side of applicants and implementation companies. Rules and regulation could not be applied in cases with not clear definition of entire process, professional applicant and very supportive system that can facilitate communication between all factors. Above are mentioned general obstacle that have impact on process improvement but it is of interest of all stakeholders to try with reforming of entire process through systems engineering that can generate benefits through reducing delays, process classification and have impact on overall benefit. Main obstacle currently are still at PIA and general planning system that needs to accelerate based on needs of construction industry in central and local level. Information provided to applicant are another obstacle as data most of the time are not according to real situation in the field. The permit process takes more time from what is determined by the law. Because on not clarity of data, the permit process some time is repeated in total or most of the application. Changing law and regulations adapting new permit processes with new requirements not necessary is facilitating permit process. Below is presented the entire permit process in Kosova. From the figure is understandable that communication in the process of permit is localized in small groups of stakeholders that are mainly factors that are affecting permit process and creating delays. To some extend communication cannot be considered as main problem on delays to permit and construction, but when it is combine with other factors mentioned above makes process very difficult and creates delays.



Based on analyses of permit process and possibilities to improve processes through systems engineering application it is necessary to create a model that improves communication, project management, avoid delays and improve performance of three main factors that are related directly to all stakeholders.

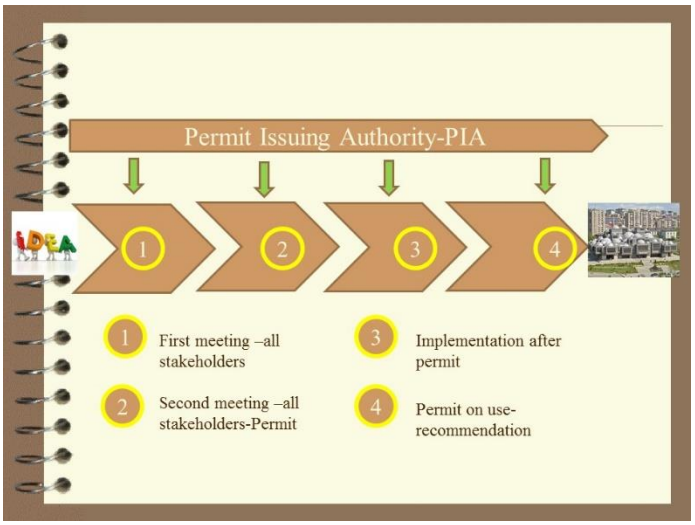


As presented above, model is designed to be an integrated point of all stakeholders, part of process from the idea to the completed building structure. The model can be considered as central point that is referring all stakeholders' interest and transforming to useful information for the rest of the stakeholders. As the process was long and with several gaps in communication, the new model manages to collect all query from the stakeholders and transform them to the useful and feedback information for the rest of the stakeholders but I the very short period of time.
Relationship listed below now are synchronized by reducing time for dealing with each stakeholder and therefore direct communication between stakeholders make possible to reduce implementation time.

1. Relation of Investors with Authorities
2. Relation of Investors with design office
3. Relation of investors with permit issuing Authority
4. Relation of investors with construction companies.

The Investor, as main stakeholder, now has new relation with all parties involved in the process, as investor will have possibility to present his idea to all of them. The model determine reducing time in this process by organizing max two meetings (depending on project complexity) with all parties involved in the process. The process from idea to the final building structure will go through following process:

- Project initiation
- First meeting of all stakeholders
- Project completing phase
- Second meeting- project presentation that may end up with permit of recommendation for small changes.
- Permit issued by PIA
- Implementation- building structure



As the Permit Issuing Authority has a main role for giving project parameters, and based on those parameters issuing permit, the first information meeting (presentation meeting) will be organized at the Permit Issuing Authority initiates by investor that has idea for building that needs to be explored and adapted to a urban, technical and other parameters. Project has to be initiated by the investor as main stakeholder in entire process and the determined investor as initial phase that is idea. The process will be initiated to PIA through the request delivered physically or online (both methods are applicable currently) This step taken from investor allow PIA to initiate a procedure for Issuing construction permit and organize a first meeting with all stakeholders in order to give explanation and parameters requested by law and standards. In this meeting all parties that will be involved in the project will get information on idea, building format and investor's requirement that are presented by PIA.

5. Experience Collection

After entire process is completed, PIA will collect reports from all stakeholders involved in the process for the sake of process improvement. In the reports all stakeholders will present, share their experiences in this case and give recommendation to PIA. All recommendation will be taken in consideration to be forwarded to the local, and country level, with intension to create a global approach in the permit issuing procedures.

Conclusion

It is difficult to decide for the best model that brings positive changes and improvement in the process from idea to the final building structure through application of the systems engineering with main focus to reduce delays and through delays reduction to have direct impact on time and cost reduction. As entire process contains from three main steps that are closely related to each other as: Idea-design; permit; and construction of final building structure, the model defined from this research aims to more develop relation between three steps and facilitate process through systems engineering application that will have direct impact on entire process and influence reduction, or effective usage of time and cost that are crucial issues of entire process. Model will as well influence development of a new approach of PIA toward interested parties for building industry and through systems engineering application will be possible to initiate "state of the art" communication always being in disposal to contribute on better performance of all stakeholders. The most important issue that model brings and promote is reduction, with intention to totally eliminate, of the delay. Integrating delays management through model application influences cost, time reduction. Model has to be developed more through "state of the art" technology application that different countries are applying and be adapted to local

requirements based on local law and standards. More important is that model influences the initiation of its application through by adapting the local procedure in order to best fit to the model and reflect positive impact of the model to the entire process.

References

1. Erik W. Aslaksen -Systems Engineering and the Construction Industry-2005
2. Carroll, A.B. and Buchholtz, A.K. (2006) Business & Society: Ethics and Stakeholder Management (6th edn). Mason: Thomson South-Western.
3. Orndoff, C.J.W. (2005) Promising new tool for stakeholder interaction. Journal of Architectural Engineering, 11(4):139–146.
4. Bundesgesetz über die Raumplanung (Raumplanungsgesetz, RPG)1 vom 22. Juni 1979 (Stand am 1. Mai 2014) - Federal Schweiz (Swiss)
5. Raumplanungsverordnung (RPV) vom 28. Juni 2000 (Stand am 1. Januar 2015) (Swiss)
6. Erläuterungen zum Bau- und Nutzungsrecht des Kantons Aargau Version 3.1 Juni 2012 / Januar 2014 (Swiss)
7. Gesetz über Raumentwicklung und Bauwesen 1) 2) (Baugesetz, BauG) Vom 19. Januar 1993 (Stand 1. Januar 2011) Kanton Argau (Swiss)
8. Bauverordnung (BauV) Vom 25. Mai 2011 (Stand 1. Januar 2015) Kanton Argau (Swiss)
9. Gesetz über die Raumplanung und das Baurecht (Baugesetz) vom 12. Mai 2003 (Stand 1. Januar 2011) Kanton Appenzell AI/AR (Swiss)
10. Bauverordnung (BauV) Vom 25. Mai 2011 (Stand 1. Januar 2013) Kanton Appenzell AI/AR (Swiss)
11. Gesetz über die Raumplanung und das öffentliche Baurecht (Baugesetz) vom 6. Juni 1972 (Stand 1. Januar 2015) Kanton St. Gallen (Swiss)
12. http://www.mmph-rks.org/ (Kosovo)
13. Law for changing of Spatial Planning Law nr. 2003-14 – nr. 03/l-106; (Kosovo)
14. Construction law – Law nr. 04/l – 110; (Kosovo)
15. Administrative direction 10/2013 (Kosovo)
16. Administrative direction nr. 09/2013 (Kosovo)
17. Administrative direction nr. 08/2013 (Kosovo)
18. Administrative direction nr. 24/2010 (Kosovo)

International Conference on Civil Engineering, Infrastructure and Environment

IC-CEIE

International Program Committee:

- E.Hajrizi (RKS), Chair
- Arayaci O. (TR)
- Ahmeti M. (RKS)
- Jzgxhiu F. (RKS)
- Dillinger Th. (A)
- Kadiu F. (AL)
- Galluzzi M. (I)
- Guralumi D. (AL)
- Ramsak M. (SLO)
- Heiduk E. (A)
- Elezi K. (MK)
- Dimitrovska Andrews, K. (SLO)

National Organizing Committee:

- E.Hajrizi (KOS), Chair
- Sinani B. (RKS)
- Krelani V.(RKS)
- Gashi B.(RKS)
- Sherifi M. (RKS)

Editors:

Edmond Hajrizi (UBT)

Effect of Steel Fiber and Polypropylene Fiber on Reinforced Concrete

Erjola Reufi[1], Jozefita Marku[2]

[1,2]Universiteti i Tiranës, Fakulteti i Shkencave të Natyrës,Departamenti Kimi Industriale
markujoz@yahoo.com[1], reufierjola@gmail.com[2]

Abstract. This paper presents the results of an experimental study that investigated, the effects of steel fibers and polypropylene fibers on the mechanical properties of concrete.
Two types of fibers used are hooked end steel fibers of 50 mm and 30 mm length with the aspect ratio of 67 (length 50 mm and diameter 0.75 mm) and 44 (length 30 mm and diameter 0.75 mm). On the other hand, three types of polypropylene fibers are used of length 12mm, 6mm and 3 mm. Steel fibers are used of 0%, 0.25%, 0.5%, and 1% by the volume of concrete and polypropylene fiber are prepared of 0 %, 0.25 %, 0.5 %, 1 % by the weight of cement.
The experimental program consisted of testing the compressive strength and split tensile strength on steel fiber- reinforced concrete and polypropylene fiber-reinforced concrete.
28 day compressive and split tensile strength ëere prepared and tested by using cubes of dimensions 10 cm X10 cm X10cm.

Keywords: Aspect Ratio, Steel Fiber, Polypropylene Fiber, Polypropylene Fiber-Reinforced

1. Introduction

Fiber reinforced concrete (FRC) is a composite material consisting of cement, sand, coarse aggregate, water and fibers. In this composite material, short discrete fibers are randomly distrubuted throughout the concrete mass. The behavioral efficiency of this composite material is far superior to that of plain concrete and many ohter construction materails of equal cost. [1], [12]
Due to this benifit, the use of FRC (Fiber Reinforced Concrete) has steadily increased during the last two decades and its current field of application includes : airport and
highway pavement, earthquake resistant and explosive resistant structures mine and tunnel linings, bredge deck etc.[2]
Review of work done by various researcher discuss the mechanism of fiber matrix interaction where various models are used to compute the bonding between the fibers and cement matrix.as the bonding of fiber and the matrix plays a major role in the composite behavior.[3],[13]
The randomly distributed short fibers are generally introduced into concrete to enhance its control crack system and mechanical properties such as toughness, impact resistance, ductility. Properties of fibers based concrete changes with varying concrete fiber materials geometry distribution, orientation and densities. [4]
When fibers is added to a concrete mix each and every individual fiber receives a coating of cement paste. This increasing bonding with cement matrices and minimized chemical reaction between fibers and cement matrices. [5]
The evaporation of concrete surfaces water is factor in creating the contract paste fracture in concrete which leads with to the formation of stress since the concrete starts to strengthness. [6]
The split tensile strength of all fibrous composite matrices was significantly higher than that of plain concrete. This is because in fibrous matrix when it cracks cause the load to be transferred from the cementitious at the crack interface.[7]

2. Materials and mix proportions

2.1 Materials

The cement used in concrete mixtures was ordinary Portland cement of 32.5 grade. Fine aggregate and coarse aggregate of river of Milot with maximum size of 25 mm are used. Natural river sand from Milot river is used with maximum size of 5mm. Two types of fibers were used for present investigation as shown in figure 2 hooked steel fibers - 50mm and 30 mm long and figure 1 polypropylene fibers with 12mm , 6mm and 3mm length.

Fig 1. Polypropylene Fiber 12 mm , 6mm and 3 mm

Fig 2. Steel Fiber 3 cm and 5 cm

2.2 Mix Design

Mix design was done as per ASTM C 1116-91. The super plasticizer dosage was adopted as 0.25 % by the weight of cement [9]

Table 1: Mix design of concrete

Mix proportion	**Specifc gravity (kg/m^3)**	**Ratio**
Sand	900	
Cement	400	Water: Cement 0.5
Coarse Aggregate 10-25 mm	670	
Coarse Aggregate 5-10 mm	300	Aggregate: Cement 2.67
Water	200	
Super plasticizer	1	Superplasticizer 0.25 % by the weight of cement
Steel Fiber SF1= 5 cm SF2= 3 cm		0.25 % , 0.5 % ,1 % by the volume of concrete
Polypropylene Fiber PP1= 12 mm PP2= 6 mm PP3= 3mm		0.25 % , 0.5 % 1 % by the weight of cement

2.3 Preparations and curing of test samples

The preparation of all test samples was prepared in a 50 l concrete mixer. The mixing procedure was used is : dry mixing of aggregate in mixer 0.5 min , dry mixing of cement and aggregate in mixer 0.5 min addition of water, mixing for 3 min , addition of superplasticizer and then fiber, mixing by mixer for 2.5 up to 3.5 min [8], [10], [11].

Compressive Strength

Compression test were carried out at the age of 28 day, on cubic specimens (100x100x100 mm) Test were done using a hydraulic press. The specimens were centered on the tray of the press then a continuous load was applied on the specimen.

The ultimate compression load for each plain concrete and fiber reinforced concrete specimen were recorded.

Split Tensile strength

Flexural Strength test at the age of 28 days were performed on plain and fiber reinforced concrete cubic specimens (100x100x100 mm)...

3. Result and conclusion

Below are represented the result of compressive and split tensile strength of steel and polypropylene reinforced concrete

Table 2 : Results of Compressive Strength of Steel Reinforced Concrete

Type of fibers	Compressive Strength N/mm^2 0% Steel Fiber	Compressive Strength N/mm^2 0.25 % steel fiber	Compressive Strength N/mm^2 0.5 % Steel fiber	Compressive Strength N/mm^2 1 % Steel Fiber
SF1 Steel Fiber 5 cm	29.52	30.4	32.7	33.5
SF2 Steel Fiber 3 cm	29.5	29.52	33.5	34.7

Table 3 : Result of tensile Strength of Steel Reinforced Concrete

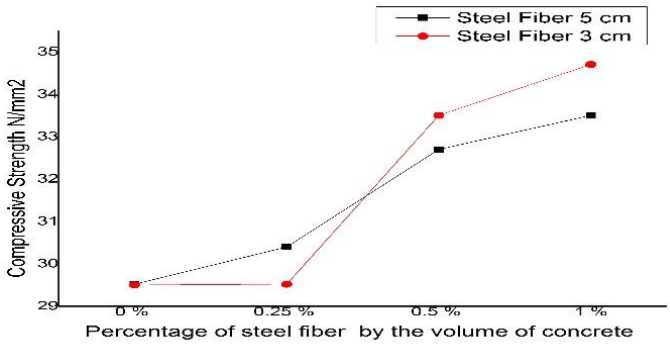
Type of fibers	Split Tensile Strength N/mm^2 0% Steel Fiber	SplitTensile Strength N/mm^2 0.25%SteelFiber	Compressive Strength N/mm^2 0.5% Steel Fiber	Compressive Strength N/mm^2 1 % Steel Fiber
SF1 Steel Fiber 5 cm	3.02	3.1	3.53	3.53
SF2 Steel Fiber 3 cm	3	3.57	3.7	3.9

Table 4: Results of Compressive Strength of Polypropylene Reinforced Concrete

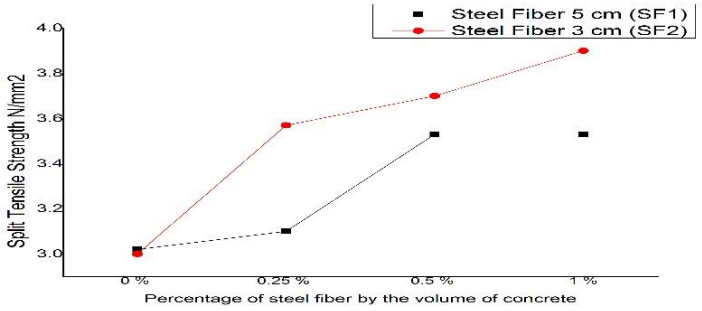
Type of PP fiber	Compressive Strength N/mm^2 0% polypropylene fiber	Compressive Strength N/mm^2 0.25% polypropylene fiber	Compressive Strength N/mm^2 0.5% polypropylene fiber	Compressive Strength N/mm^2 1% polypropylene fiber
Polypropylene 12 mm (PP1)	29.52	32.4	37.6	38.78
Polypropylene 6 mm (PP2)	29.5	27.76	35.6	31.81
Polypropylene 3mm (PP3)	29.52	18.25	34.9	29.8

Table 5: Results of Split Tensile Strength of polypropylene reinforced concrete

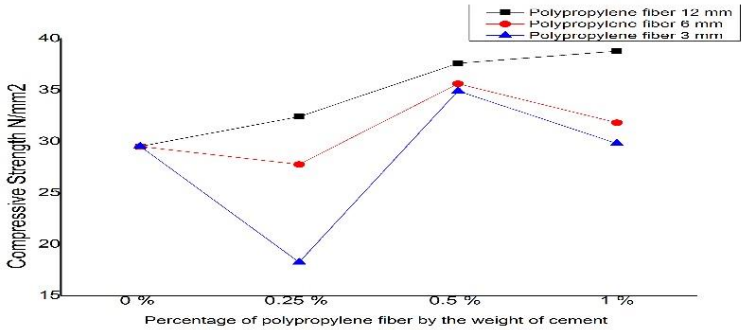
Type of PP fiber	Split Tensile N/mm^2 0% Polypropylene fiber	Split Tensile N/mm^2 0.25% Polypropylene fiber	Split Tensile N/mm^2 0.5% polypropylene fiber	Split Tensile N/mm^2 1% polypropylene fiber
Polypropylene 12 mm (PP1)	3.02	3.27	3.9	4.18
Polypropylene 6 mm (PP2)	3.02	3.21	3.8	4.19
Polypropylene 3mm (PP3)	2.99	2.8	3.29	3.6



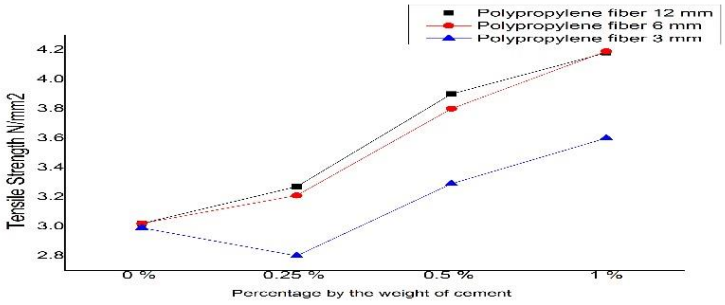
Graph 1: Comparison of compressive strength of steel reinforced concrete at room temperature



Graph 2 : Comparison of split tensile strength of steel reinforced concrete at room temperature



Graph 3 : Comparison of compressive strength of polypropylene reinforced concrete at room temperature



Graph 4: Comparison of split tensile strength of polypropylene reinforced concrete at room temperature

Conclusion

1. Among 37 different matrices considered in the present investigation , matrix having 1 % volume fraction of steel fibers 3 cm and 1% volume by cement of PP fibers 12 mm indicated the maximum increases in compressive strength .
2. Whereas matrix having 1% of steel fibers 3 cm and 1% polypropylene 12 mm had the best performance in split tensile strength .Also ratio 0.5 % polypropylene 6mm had shown good results.

3.Thus the optimum fiber ratio of 1 % by the volume of concrete of steel fiber with 3 cm length and polypropylene 1% by the weight of cement of length 12 mm have shown the best performance and offer potential advantages in improving concrete properties.

References

1. Saxena J, Saxena A : Enhacement the Strength of Conventional Concrete by using Nylon Fiber (2015) International Journal of Engineering and Science.
2. Seka.S, Kesavan D : Performance of hybrid reinforced concrete under compression and flexure (2015) NBM Construction.
3. Beötzung F, Fairbairn.E, Hoshino, Dickie : Durability of strain hardening fibre reinforced cement based composites (2011) Springer Journal.
4. Sharma.A, Parveen: Structural behavior of fibrous concrete using polypropylene ibres (2013) International Journal of Modern Engineering Research.
5. Usam.A : Materials Development of Steel and Basalt fiber reinforced concretes (2013) Norwegian University of Science and Technology.
6. Ramujee.K : Strength properties of polypropylene fiber reinforced concrete (2013) International Journal of Innovative Research in Engineering and Technology.
7. Patodi.S.C, Kulkami C.V : Perfomance Evaluation of Hybrid Fiber Reinfoced Concrete Matrix (2013) International Journal of Engineering Research and Applications.
8. Beddar M , Belgara. L : Optimizing of steel fiber reinforced concrete mix desing (2013) , Departament of Civil Engineering M.Sila University Algeria.
9. Standard Specification for fiber reinforced concrete and shotcrete, ASTM C-1116-91
10. ACI Committee 544, Guide for Specifying Proportioning, Mixing Placing and Finishing Steel Reinforced Concrete, ACI 544, 3R American Concrete Institute, Farmington Mich
11. ASTM; West Conshohocken, Pa, 1991 A.Balogh : Synthetic Fibers Concrete Construction, July 1992 pp 525-530
12. Ruby S, Geethanjali C : Influence of hybrid fiber on reinforced concrete (2014) International Journal of Advanced Structures and Geotechnical Engineering.
13. Alias M, Nor M, Ariffin J: Perfomance of hybrid steel fibers reinforced concrete subjected to air blast loading

A Study on Tibiofemoral Joint Contact Area Stresses using Finite Element Method

Anjeza Gjini[1], Altin Bidaj[2], Enio Deneko[3], Drilona Disha[4]

[1,2,3,4]Polytechnic University of Tirana, Faculty of Civil Engineering
Department of Mechanics of Structures Tirana, Albania
anjezagjini@hotmail.com[1], altinbidaj@yahoo.com[2]

Abstract. The joints of the human body act as mechanical or building structures joints. Joints connect different segments by enabling the movement of these segments. The design of a joint that provides durability or static support differs from that one which provides only movement. Joints of the human body, as organic joints, are considered more complex than other types of joints. Finite element models help to comprehend the knee structure behavior under the action of dynamic and static loads. Deformations in the articulating cartilage and the distribution of loads from meniscus provide data to understand the effect of loads in different parts of the knee. This study aims to calculate the stresses in the contact area of the tibiofemoral joint, using the finite element model. During this process, it will be an approximation of geometric shape of the femur, tibias and articulating cartilage to their real shape, taking into account the physic-mechanical characteristics of their components. The study, based on results of numerical calculations, aims to provide practical recommendations for dimensioning the tibiofemoral articulating cartilage and for the quality of the materials, to be used in knee prosthesis industry.

Keywords: Tibiofemural joint, articulation cartilage, contact area, FEM

1. Introduction

In Albania, the use of prostheses is already one of the main solutions and long-term knee problems. There is no comprehensive study on the use of the method of finite element method in this field, making the analysis, treatment and control of models made abroad and methods for which there is no evidence to the technical and financial effect that they have in Albania.
In terms of engineering, finite elements method is part of modern methods of numerical analysis. The study of this method and its application in calculation of complex structures, such as tibiofemurale node, completes the field of study and its use in the calculation of engineering structures.
The dynamics of life in developed countries has led to increased risk for knee injuries, injuries which in most cases requires local or total replacement of his prosthesis. The main factors are overweight and age damage. According to studies, in America counted on average about 700,000 cases per year of operations for total knee replacement through dentures. Expetations are that by 2030 this figure will go to 3.48 million patients / year. In European countries also counted about 230,000 cases per year. Under the same percentage they are added cases in our country.
Referring to the data obtained from INSTAT in 2014, in Albania 44% of the population is over the age of 40 years and it tends to grow in the coming years (referring 2010, figures until 2014 have increased by 4%). Also, referring to data obtained by the WHO (World Health Organisation) in 2008, shows that 20.4% of men and 23.1% of women in Albania are obese (age get in the study over 20 years).
Based on these data, the next few years is expected an increasment of the cases of damage to the knee node, taking main factors obesity and age, without adding other factors such as increased road accidents, negligence during physical activity, etc.
Prosthetic knee has more than three decades that was widely used in the world, with results generally excellente. Their study with finite element has taken 10-year-old recent development and is an area in advanced stage of development.

One of the main challenges is the increasing Orthopedic medicine movement conformity in life activities of individuals who have undergone knee replacement with prosthesis. This requires the creation of models that approach as more realistic model, taking into account all factors static, kinematic and dynamic node.

2. The Aplicated Model

Dimensions of the model are obtained relying on different studies that have been done. For this stage of the study, since the aim is to analyze the constraints arising in the area of contact between the femoral cartilage and tibias, are not considered ligaments and tendons. The modeling can be done quite easily in ABAQUS.

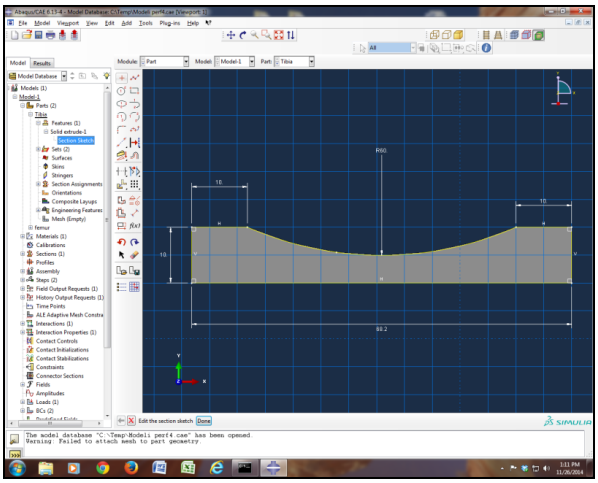


Fig. 1. Modeling of tibia cartilage

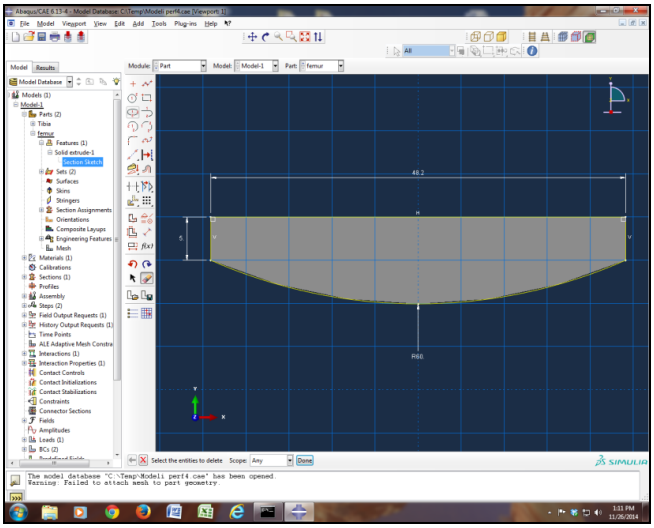


Fig. 2. Modeling of femoral cartilage

The Mash of the element is also done in ABAQUS 6.13-4, based on the geometric model tibiofemurale node structure. As shown in the figure below, the program generated 5668 tetraedrik elements linked to 10,418 nodes.

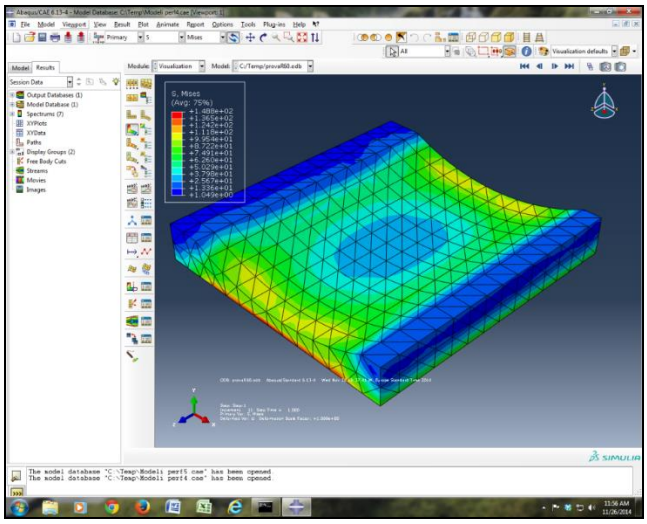


Fig. 3. Stresses in the femur-tibia contact area, R1/R2 = 1

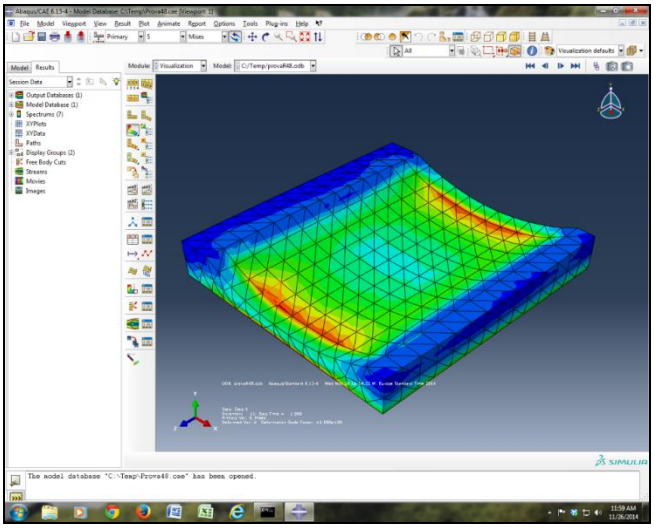


Fig. 4. Stresses in the femur-tibia contact area, R1/R2 = 1.5

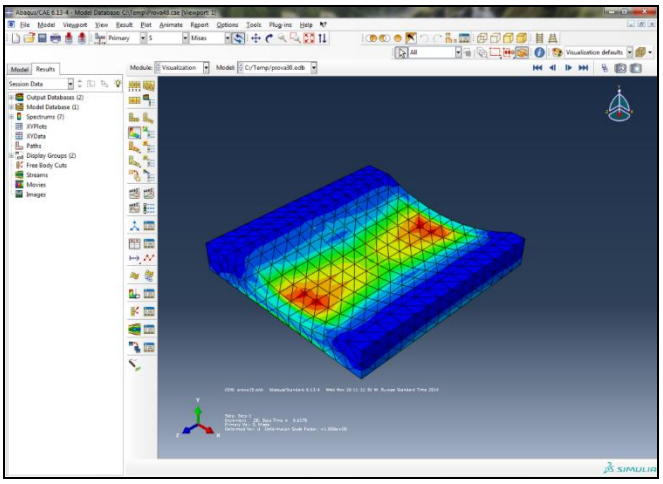


Fig. 5. Stresses in the femur-tibia contact area, R1/R2 = 2

Conclusions and Results

For this study, are taken three models to determine the stresses at the contact surface of the femoral cartilage articulation and tibias in tibiofemurale node. In each of the models is changed the femoral radius of curvature (R1), while the radius of tibias was kept constant (R2).

As it is seen from the results, with increased contact area between the tibias and femoral cartilage, reduced strains and vice versa. (as shown in Fig. 4)

From this study, it shows that, during the modeling and production of prostheses that femur and tibias, particularly cartilage articulation, have found a relationship between the size of these elements in the area of contact, to derive constraints as small during transmission Charging tibiofemurale node.

Solving static and dynamic problems for different structures by software, enables the modeling and study of more complex models of the human body. This development has provided solutions not only for studies in engineering or the medical field, but also in other interdisciplinary fields such as biomechanical.

With the growth of various accidents and not the movement of the body (for professional reasons, but not only) it has increased the need to use more and more of the implants, which should be designed with features physical and mechanical related and adaptable to the body biological.

One of the main objectives in the design of knee implants is to align the femur and tibias in order to increase the degree of conformity during movement.

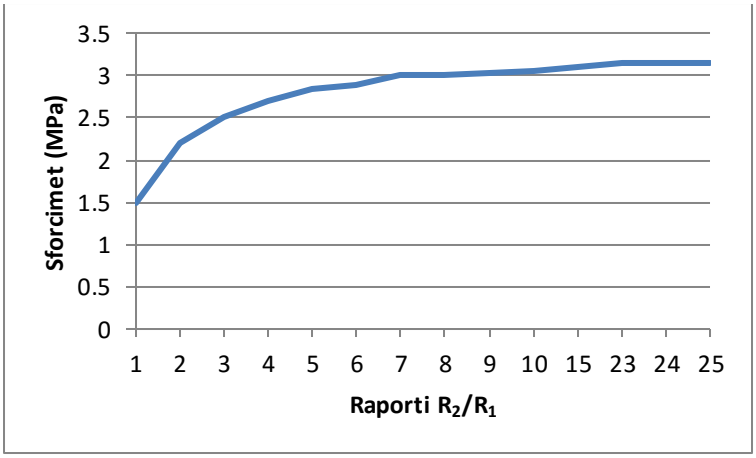


Fig. 6. The relation between stresses and R1/R2 ratio, where R1 is the femoral radius of curvature and R2 is the tibias radius of curvature

References

1. ABAQUS (2009). Documentation manual. ABAQUS Simulia
2. Bankoff, A.D.P. (2011). Biomechanical Characteristics of the Bone. Human Musculoskeletal Biomechanics. ISBN 978-953-307-638-6.
3. Bergmann, G., Bender, A., Graichen, F., Dymke, J., Rohlmann. A., Trepczynski, A., Heller, M.O., Kutzner, I. (2014), Standardized Loads Acting in Knee. Implants. www.plosone.org.
4. Borelli, G.A., Bernoulli, J., Elinger N., & Joannes a Jesu, C. (1743). De Motum Animalium. Aput Petrum Gosse.
5. Butz, K. D., Chan, D. D., Nauman, E. A., Neu,C. P. (2011). Stress distributions and material properties determined in articular cartilage from MRI-based finite strains. Journal of Biomechanics 44 2667–2672.
6. Carey, R.E., Zheng, L., Aiyangar, A.K., Harner, C.D, & Zhang, X. (2013). Subject-Specific Finite Element Modeling of the Tibiofemoral Joint Based on CT, Magnetic Resonance Imaging and Dynamic Stereo-Radiography Data in Vivo. *J Biomech Eng* 136(4), 041004.
7. Cerny, K. (1984). Pathomechanics of stance, clinical concepts for analysis. Phys.ther. 64:1851-1859.
8. Harris, J., & Flanigan, D.(2011) Management of knee articular cartilage injures. Modern arthroscopy. ISBN 978-953-307-771-0.
9. Heydon, R. (2011). Finite Element Analysis of Knee Articular Cartilage. Ryerson University. Toronto, Ontario, Canada,
10. Kauster, M., Wood, G., Stachwiak, G., & Gächter, A. (1997). Joint load considerations in total knee replecement. J Bone Joint Surg [Br]; 79-B:109-13.
11. Kaëamura, S., Lotito, K., & Rodeo, S.A. (2003). Biomechanics and healing response of meniscus. Operative Techniques in Sports Medicine, Vol 11, No 2: pp 68-76.
12. Luis Gracia et al. (2012). Simulation by Finite Elements of Bone Remodelling After Implantation of Femoral Stems. Finite Element Analysis - From Biomedical Applications to Industrial Developments. ISBN 978-953-51-0474-2.
13. McGinty, G., Irrgang, J.J. & Pezzullo, D. (2000). Biomechanical considerations for rehabilitation of the knee. Clinical Biomechanics 15: 160±166.

14. Nagura, T., Dyrby,C.O., Alexander, E.J., & Andriacchi, T.P. (2002). Mechanical loads at the knee joint during deep flexion. Journal of Orthopedic Research 20 881–886.
15. Nikodem, A. & Ścigała, K. (2012). Biomechanics of Physiological and Pathological Bone Structures. ISBN 978-953-51-0063-8.
16. Open Knee Project, www.simtk.org.
17. Roberto, P., Ventura, R., Andrea, Isis., Poiate, E.J. & Bastos de Vasconcellos, A. (2012). Evaluation of Stress Distribution in Implant-Supported Restoration Under Different Simulated Loads. DOI: 10.5772/38971.
18. Wang, H., Zheng, Y., & Rong, Y. (2012). Contact Stiffness Study: Modelling and Identification. Finite Element Analysis - From Biomedical Applications to Industrial Developments. ISBN 978-953-51-0474-2.
19. Wangerin, S. (2013). Development and validation of a human knee joint finite element model for tissue stress and strain predictions during exercise. Faculty of California Polytechnic State University, San Luis Obispo.
20. Xu, J., Huang, V., & Xu, Q. (2012). The Kinematic and Static Analysis of the Tibio-femoral Joint Based on a Novel Spatial Mechanism. International Journal of Advanced Robotic Systems. DOI: 10.5772/52943.
21. Yamaguchi, G.T., & Zajac, F. (1989). A planar model of the knee joint. Characterize the knee extensor mechanism. J. Biomechanics Vol. 22. No. I, pp. l. Britani e Madhe.
22. Bathe, K. J. (1996). Finite Element Procedures. Prentice Hall: Neë Jersey.
23. Becker, A. A. (1992). The boundary element method in engineering- a complete course. Mcgraw-Hill.
24. Przemieniecki, J.S., (1985). Theory of Matrix Structural Analysis. Dover publivation, inc. New York.
25. Reddy, J.N., - An Introduction to Nonlinear Finite Element Analysis. Oxfford University Press.
26. Stavileci, M., Pojani, N., (2006). Metoda e elementeve te fundem ne mekaniken e strukturave. Prishtine.
27. Zienkiewicz, O.C., & Taylor, R.L., (2000). Finite element method - the basis (Vol.1, 5th edition), ButterWorth Heinemann.

Application of EC regulations on assessment of the effect of fire on buildings

Xhemshir Mulliqi[1]

University of Zagreb, Faculty of Civil Engineering
xhemshir_mulliqi@yahoo.com

Abstract: The last decade has been characterized by construction of multi-storey buildings in almost all cities of Kosovo, with the storey-height ranging from B+G+4 to B+G+11 and even B+G+15, which means that they need to be subjected to the revision of the main project,including things be verified for the effect of fire.

This paper aims to illustrate the use of EC regulations for the verification of *reinforced concrete structures* under effect of fire, respectively:

EN 1991-2-2 Basis of design and actions on structures. Part-2.2: Actions on structures exposed to fire and EN 1992-1-2:2004 Design of concrete structures- part -1-2: Structural fire design.

In this regard, we will review the residential and business object B+G+11, respectively the complex called "KULLAT" in Mitrovica, the safety assessment of reinforced concrete structures in case of fire The analysis of certain parts of the structures - beams and columns by applying the tabular method and analysis of beams with the application of simplified calculation method will be shown.

Keywords: Fire calculation, Tabular calculation, simplified calculation method, Cross-section resistance

1. Introduction

The comprehensive analysis of reinforced concrete structures under the specified fire scenario includes thermal analysis (determination of temperature distribution within each point of structural elements) and mechanical analysis (evaluation of structural response to determined temperature fields). In order to carry out these analyses, it is necessary to possess detailed information as to numerous material properties (physical, thermal, mechanical –both for structural concrete and for reinforcing steel) which are the functions of temperature [1]

In this regard, we will review the safety assessment of reinforced concrete structures in case of fire for the residential and business object B+G+11, respectively the complex called "KULLAT" whitch c ontains a basement 2.6 m high, the ground floor 3.9 m high and 11 floors 2.9 m high. In case of an eventual risk of fire, the building height for evacuation is: 3.9 + 11x2.9 = 35.8m. The surface of facade openings: windows and balcony doors per one storey is :48,405 m^2 . The analysis of certain parts of the structures - beams and columns by applying the tabular method and analysis of beams with the application of simplified calculation method will be shown. Than only the object in a surface of storey 491.84 m2 will be reviewed.

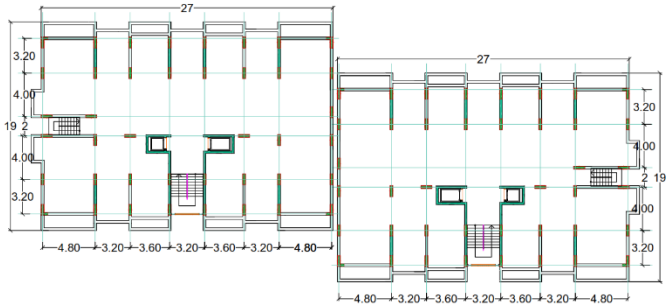


Fig1. The base of the characteristic storey of the object B+G+11

2. Values – limit state and load combination

2.1 Equation of the value – limit state

The equation of the limit state is expressed by:

$$R_{fi,d,t} \geq E_{fi,d,t} \quad (1)$$

Where:

$R_{fi,d,t}$ design resistance in the fire situation, at time t.

$E_{fi,d,t}$ design effect of actions in the fire situation, at time t. [2]

2.2 Permanent situation for normal temperature design

Taking into account only permanent and temporal loads, the following shall apply for the calculation permanent situation:

$$\sum_{j\geq 1} \gamma_{G,j} \cdot G_{kj}) + \gamma_{Q,1} \cdot Q_{k1}; \quad = 1.35 \cdot g_k + 1.5 \cdot q_k \quad (2)$$

G_{kj}, Q_{k1} characteristic values of permanent and imposed loads

$\gamma_{G,j}$, γ_Q partial factor for permanent actions and for imposed loads

Analysis of permanent loads:

- Reinforced concrete slabs 0.2x25=5.0Kn/m2x(4.8/2+3.2/2) =20.0 Kn/m'
- Beams 0.35x0.25x25= 2.188 Kn/m'
- Floor 1.5 Kn/m2 x(4.8/2+3.2/2) = 6.0 Kn/m'
- Walls 4x2.7= 10,8 Kn/m'

gk=38,99 Kn/m'

Live load:qk1=5.0x((4.8/2+3.2/2)=20 Kn/m', qk2=2.0x((4.8/2+3.2/2)=8 Kn/m'

The dimension of internal beams is 25/35 cm, while the dimension of perimetric beams is 25/50 cm. The beams are reinforced as shown in the fig 2. in the bottom area with 3 bars Rϕ14 mm and stirrups Rϕ8 mm /20/10 cm.

The minimum cover is 2 cm so that the distance from the bottom of the beam to the axis of the bars is:20+8+0,5 · 14=35 mm.

The dimensions of columns are 25/100 cm, which are reinforced as shown in the fig. 2. with 10R□20 mm +4 R□16 mm+2 R□12 mm in section "3-3" and with 14 R□16 mm+2 R□12mm in section "4-4".

The minimum cover is 2 cm, so the distance from the bottom of the column to the axis of the bars in fig.2 section "3-3"will be: 20+8+0,5 · 20=38 mm

While for the column in the section "4-4"will be: 20+8+0,5 · 16=36 mm

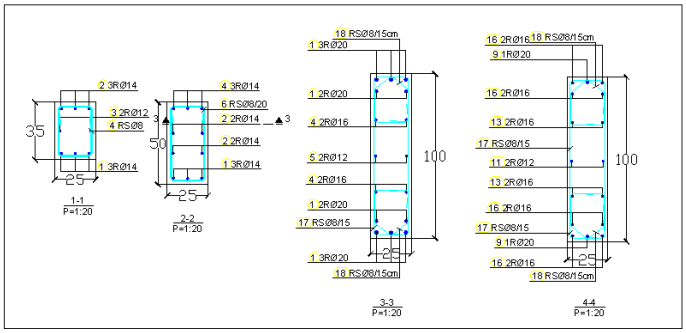


Fig.2. Cross-sections of the beams and columns

2.3 Accidental situation in fire situation

Having into consideration only one temporal load, respectively the exploitative one, the combination for the accidental calculation situation is expressed by:

$$\Sigma(G_{kj})+(\psi_{11}\text{ or }\psi_{2,1})\cdot Q_{k,1}+A_d \quad (3)$$

$j\geq 1$

G_{kj}, Q_{k1} characteristic values for the permanent and temporal loads

γ, γ_Q partial safety factors for permanent actions in the accidental situation

$\psi_{11}, \psi_{2,1}$ combination factors for buildings

A_d design value of the accidental action (in this case actions caused by fire)

Expressed wth:

$$\xi=Q_{k,1}/G_k \quad (4)$$

and calculate the reduction factor η_{fi} which represents the connection between the calculation value of the effect of fire and calculation value of the effects during normal temperatures.

$$\eta_{fi}=\frac{G_k+\psi_{11}\cdot Q_{k,1}}{\gamma_G G_k+\gamma_{Q1}\cdot Q_{k,1}}=\frac{(\gamma_{GA}+\psi_{11}\cdot\xi_1)}{(\gamma_G+\gamma_Q\cdot\xi_1)}=0{,}59 \quad (5)$$

For $\psi_{1,1=0,5}$, $\xi_2=0.2$ we have: $\eta_{fi}=0.666$ (6)

For $\psi_{2,1=0,3}$, $\xi_{1=0.51}$ we have: $\eta_{fi}=0{,}54$, $\xi_2=0.2$ $\eta_{fi}=0.64$ (7)

3. Fire calculation

3.1 Equivalent time of fire exposure –(III class of fire load)

The equivalent time of fire exposure is the neccesary time for the fire that follows the temperature-time curve to produce the same temperature in the element just like a real fire.The equivalent time of exposure to fire is determined according to:

$$t_{e,d}=q_{f,d}\cdot k_b\cdot w_f \quad [\text{min}] \quad (8)$$

which is:

$q_{f,d}$ is the design fire load density A_f according to annex E

k_b conversion factor dependent on the thermal characteristics of the circuit

w_f ventilation factor

where $q_{f,d}=\gamma_q\cdot\gamma_n\cdot q_{f,k}$ (9)

where is:

γ_q safety factor that depends on the consequences of the destruction of the structure and impact of the fire taken $\gamma_{q=1.5}$ from the table E.1 in the annex E of EN 1991-1-2

γ_n factor that takes into account the active protective measures against fire, verified firefighting equipments is expressed by $\gamma_{n=0.6}$
$q_{f,k}$ the value of the characteristic density of the fire load in the compartment unit on the assumption that it is III class fire load may be taken 1000 MJ/m^2

namely $q_{f,d} = 1.5 \cdot 0.6 \cdot 1000 = 900$ MJ/m^2 (**10**)

If the thermal characteristics of the environment/circuit were not implemented in details, we take $k_b=0.07$

$$w_f=(6.0/H)^{0.3}\,[0.62+90(0.4-\alpha_v]^4/(1+bv\cdot\alpha_h)]>0.5 \quad (\mathbf{11})$$

where :

$$\alpha_{v=}A_v/A_f \quad (\mathbf{12})$$

with limits: $0.020<\alpha_v<0.20$; $\alpha_v=48{,}405/491.84=0{,}098$
$\alpha_{h=}A_h/A_f$ ratio of surfaces of horizontal openings A_h in roof and surfaces of floor A_f

$$bv=12.5(1+10\alpha_v-\alpha_v^2)=12.5(1+10\cdot 0{,}098-0{,}098^2)=24{,}63>10{,}0 \quad (\mathbf{13})$$

H the height of the fireplace H=2.7m,so, the value is:

$$w_f=(6.0/H)^{0.3}[0.62+90(0.4-0{,}098\alpha_v]^4/(1+24{,}63\cdot 0)]=1.739 \quad (\mathbf{14})$$

and finally, equivalent time of exposure to fire:

$$t_{e,d}=900\cdot 0{,}07\cdot 1{,}739=109{,}56\ \text{min} \quad (\mathbf{15})$$

3.2 Comparison of the rated and parametric temperature-time curve

As regards to fire parametres used in the Item 3.1, we compare the rated temperature-time curve:

$$\Theta g = 20+345\ \log_{10}(8t+1) \quad (\mathbf{16})$$

The parametric temperature-time curve in the phase of heat is expressed by:

$$\Theta g = 1325(1-0.324e^{-0{,}2t^*}-0{,}204\,e^{-1{,}7t^*}-0.472\,e^{-0{,}19t^*}) \quad (\mathbf{17})$$

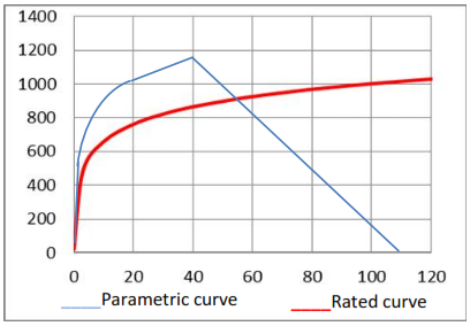


Fig.3. Rated and Parametric temperature time curves

4. Calculation of fire resistance

4.1 Tabulated data design

The simplest way to verify the fire resistance is the Tabulated data approach.. This method of verification of the fire resistance provides adequate security and does not require taking into account indirect loads or other similar effects.
This access enables to set the minimum dimensions of the cross section and minimum distance of the axis of the rebars to the border of the section , regards to the standard fire curve i.e. 30, 60, 90, 120, 180 or 240 minutes.

4.1.1 Beams

Based on the equivalent time of exposure to fire of 109.56 min, we apply the rated fire resistance R90 as shown in Table 5.6[3] based on which the minimum axial distance for the minimum width of beam of 250mm should be a = 25 mm, which in our case is fulfilled : beam 250 mm/ the axial distance 35 mm.
The axial distance a_{sd} in cases with one one layer reinforcement should be increased to 10mm, in our case the a_{sd} = 35mm. This condition is also fulfilled a_{sd} = 35mm,
Consequently, it is not necessary to change the maximum axial distance of beam in order to calculate fire resistance for R90

4.1.2 Columns

As regards to rated fire resistance R90, according to the table 3 for the columns exposed to fire in more than one side bmin=240mm, the minimum axial distance should be a=35 mm, which in our case is fulfilled Table 5.2a [3]-width of the beam 250 mm/ axial distance 36 mm.
As a result: it is not necessary to change the maximum axial distance in order to calculate fire resistance for R90

4.1.3 Temperature analysis

In annex A ,temperature profiles ,of (EN 1992-1-2) the isotherms are given for different cross-section and different specified times under standard heating conditions.In the annex B of the (EN 1992-1-2), we will use the profile with cross-sections 300x600 mm for the fire resistance R90 and R120 .

4.1.3.1 Cross-section resistance

Positive bending moment resistance of the beams may approximately obtained according to Annex E of EN 1992-1-2 by the expression:

$$M_{rd(\Theta)=}\Sigma k_{si}(\Theta)\cdot (f_{ski}\cdot A_{si}\cdot d_i) \quad (\mathbf{18})$$

where :
$M_{rd(\Theta)}$ is the design resistance to positive bending of the element in the fire situation
$k_{si}(\Theta)$is the reduction factor of the characteristic yield strength of steel rebar i for the given temperature Θ

f_{ski} is the characteristic yield strength of the rebar i at normal temperature $f_{yk}(20^{O})C$
A_{si} is the nominal section of the rebar i
d_i is the effective static depth of rebar i

In the diagram from Figure 5.1 of [3], the reduction factor $k_{si}(\Theta)$ can be read, for the given temperature Θ for R90 and R120,than results $M_{rd(\Theta)}$. Compare: $M_{rd,(90min)=}$ 43,20 Knm with $M_{rd,0}$=62,27 Knm, results that $M_{rd,(90min)=}$69,4% of $M_{rd,0}$ (the cover for R90 was increased from 35 mm to 40 mm since for the case 35 mm for $M_{rd,(90min)}$=59% of R90 $M_{rd,0,}$ in an analogue manner $M_{rd,(120min)=}$78% of $M_{rd,0.}$

$$E_{fi,d,t} = E_{fi,d=}\ \eta_{fi} \quad (\mathbf{19})$$

Calculation value of the effects of fire taking into account η_{fi} = 0,666 (or 0,64) is 66,6% of $M_{Ed,0}$ or (64% of $M_{Ed,0)}$ as a result the beams and reinforced bars meet the fire resistance.[4]

Conclusions

Upon verification of the resistance of the object B+G+11, in order to calculate fire resistance for R120 it is necessary to change the maximum axial distance of beam and columns. This is achieved by increasing the concrete cover to 40 mm from the axial distance of the reinforced steel bar to the end of the beam, which is:40+8+0.5x14=55 mm and by increasing the concrete cover for columns to 25 mm, the axis of the rebar Rϕ20mm to the border of the section should be: 25+8+0.5x20=43mm.
In general cases, the application of reinforced steel bars in more than a sequence allows for the possibility that the axial distances are not increased to 10 mm (although this reduces the cover and extends the necessary surface of the reinforced steel)
The bearing capacity of the building should be preserved in case of fire for a specific time.It could be of interest to get results established by more refined methods .

References

1. Fire Design of Concrete Structures – materials, structures and modelling. fib bulletin38, Lausanne, Switzerland, April 2007.
2. EN 1991-1-2 Actions on structures-Part1-2:Genaral actions-Actions on structures exposed to fire,European Committee for Standardization, Brussels, November 2002
3. EN 1992-1-2:2004 Design of concrete structures –Part 1- General rules-Structural fire design
4. JURE RADIC Betonske Konstrukcije ,Zagreb,2006

Application of EN 1991-1-2 Annex E, using's software package

Xhemshir Mulliqi

University of Zagreb, Faculty of Civil Engineering
xhemshir_mulliqi@yahoo.com

Abstract. The fire may occur anywhere and in any phase in the lifetime of a building .Fire resistance requirements should be based on the parameters influencing fire growth and development. For calculating the characteristic fire load, the characteristic fire load has to be determined using the table of EN 1991-1-2 Annex E.The aim of this paper is to present the methodology used in this tool and to show an example of application. The fire resistance of a steel beam submitted to compartment fires which supports a non-collaborating concrete slab in a compartment is estimated in case of an unprotected and a protected steel section. It will be possible, having this gas temperature, to calculate the temperature of a steel profile .Different results can be extracted from the software. The software package that will be used to perform this calculation is Ozone V2. Ozone V2 has been developed as a practical design tool to realize a performance based analysis of the behavior of simple steel elements in a compartment fire situation.
The figures provided for the input data by the graphic interface are indicative values. They can be modified by the user who has full responsibility for the choice of these input data. A combination of a two and a one zone model is included. The criteria of transition offers to the user an automatic decision procedure to know whether a two or a one zone model is appropriated to the fire stage which is model.

Keywords: Compartment fire, Zone model, Fire resistance of a steel, Software package

1. Introduction

Annex E presents a method for calculating design fire load densities based on characteristic values from survey data for different occupancies.The characteristic values are modified according to the risk of fire initiation the consequence of failure related to occupancy and compartment floor area.Active fire safety measures are taken into account through a reduction in the design fire density. In order to use EN 1991-1-2 Annex E it is necessary to have different information about the building: Size of the compartment, boundary properties, ceiling height, opening area, fire surface.
When simulating numerically the fire development, different simplifications of the fire dynamics can be made. The fire resistance of a steel beam submitted to compartment fires which supports a non collaborating concrete slab in a compartment is estimated in case of an unprotected and a protected steel section. The software package that will be used to perform this calculation is Ozone V2 .

2. Zone models

Zone models are numerical tools commonly used for the evaluation of the temperature development of the gases within a compartment during the course of a fire. Based on a limited number of hypotheses, they are easy to use and provide a good evaluation of the situation provided they are used within their real field of application. Zone method ,developed in Danmark,and included in ENV 1992-1-2. Since the first numerical one zone models have been made by Petersson, major developments of the numerical fire modelling have been done. Among other things, multi- zones, multi-compartment and computational field dynamics models have been developed. Although zone models are the less

sophisticated numerical fire model, they have their own field of application and thus are essential tool in fire safety engineering applications.
In the scope of the ECSC projects NFSC 1 & 2 [2], [3] the two-zone model OZone, has been developed at University of Liège together with PROFILARBED-Research and has been validated,taking as reference the results of 54 experimental tests.

3. Two-zone models

Zone model is the name given to numerical programs which calculate the development of the temperature of the gases as a function of time, integrating the ordinary differential equations which express the conservation of mass and the conservation of energy for each zone of the compartment. They are based on the fundamental hypothesis that the temperature is uniform in each zone.
The data which have to be provided to a zone model are:

- geometrical data, such as the dimensions of the compartment, the openings and the partitions;
- material properties of the walls;
- fire data, as RHR curve, pyrolysis rate, combustion heat of fuel.

3.1 One- zone model

The one-zone model is based on the fundamental hypothesis that, during the fire, the gas temperatureame is uniform in the compartment. One-zone models are valid for post-flashover conditions.
The data have to be supplied with a higher degree of detail than for the parametric curves and are the same, as those required for a two-zone model.
Figure 1. shows how a compartment fire is modelled, with different terms of the energy and mass balance represented.

4. Criteria of transition from two to one zone model and/or of modification of the input of energy

The criteria of the transition from two to one zone and/or of modification of the fire source model.
• Criterion 1 (C1) : $T_U > T_{FL}$
High temperature of the upper layer gases, composed of combustion products and entrained air, leads to a flashover. All the fuel in the compartment is ignited by

radiative flux from the upper layer. The flashover temperature (T_{FL}) is set to 500°C.
• Criterion 2 (C2) : Zs < Zq and $T_Z > Tignition$
If the gases in contact with the fuel have a higher temperature than the ignition temperature of fuel (Tignition), the propagation of fire to all the combustible of the compartment will occur by convective ignition. The gases in contact (at temperature T_Z) can either belong to the lower layer of a two zone, the upper layer (if the decrease of the interface height (Zs) leads to put combustible in the smoke layer - Z_q is the maximum height of the combustible material) or the unique zone of one zone models. *Tignition* is assumed to be 300°C.

• Criterion 3 (C3) : $Z_s < 0.2\ H$
The interface height goes down and leads to a very small lower layer thickness, which is not representative of two zone phenomenon.

• Criterion 4 (C4) : $A_{fi} > 0.25\ A_f$
The fire area is too high compared to the floor surface of the compartment to consider a localised fire.
Criteria 1 or 2 lead necessarily to a modification of the rate of heat release. If the fire load is localised the simulation will continue using a 2ZM and if the fire load is uniformly distributed, a 1ZM will be considered. If one of the criteria C3 or C4 is fulfilled, the code will switch to a one zone model but the RHR will not be modified, except if criterion C1 or C2 happens simultaneously.

5. Worked example

The fire resistance of a steel beam witch support a concrete slab (without composite action) in compartment is estimate in case of an unprotected and a protected steel section (fig.1)

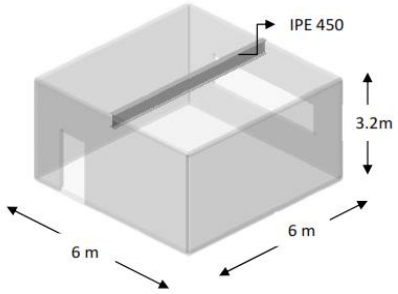


Fig.1. Schematic view of the compartment.

The data are:
- The compartment is used as a library;
- The square floor is 6 m on 6 m wide. The height is 3.2 m (inner dimension);
- All partitions are made of normal weight concrete (unit mass: 2300 kg/m3; Conductivity: 2W/mK; specific heat: 1000J/kgK) and are 15 cm thick;

There are two openings, one door (width: 1 m; height: 2 m) in first wall and one window (sill at 1m; soffit at 2m; width: 4 m) in the third wall. Both openings are supposed to be opened from the beginning of the fire;
- The beam is an IPE450. Steel S355;
- The beam is simply supported from the middle of wall one to the middle of wall three and the load isuniformly distributed;
- The design bending moment at mid span in the fire situation is 120 kNm;
- The protection material is sprayed vermiculite (unit mass: 350 kg/m^3 ; conductivity: 0.12W/mK; specific heat:1200J/kgK).

Step 1: *Define the compartment:* The compartment is defined: internal dimensions, openings positions and sizes and partitions characteristics.

Step 2: Define the design fire: The suggested value of the NFSC method [4,5] for a library are:
- Fire load uniformly distributed with a characteristic value $q_{f,k}$= 1824 MJ/m^2;
- *H*=17.5MJ/kg;m = 0.8;
- The fire growth rate is fast (1 MW is released by the fire after 150 s);
- The maximum rate of heat release density is 500 kW/ m^2 ;
- The partial safety factor which consider the benefits of the automatic fire detection by heat is γ = 0.87;
- The partial safety factor which consider the benefits of off site fire brigade is γ=0.78;
- The fire risk area is equal to 36 m^2 thus γ = 1.12;
- The danger of fire activation is medium thus $\gamma_{q,1}$ = 1 ;
- The design fire load density is then: $q_{q,2}$.=1069.1MJ/m^2.

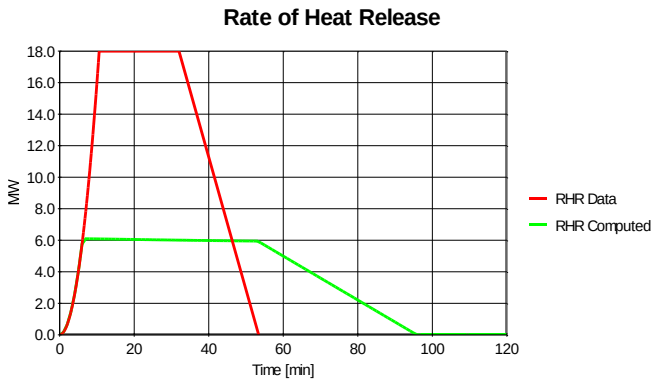


Fig.2. Input and calculated rate of heat release.

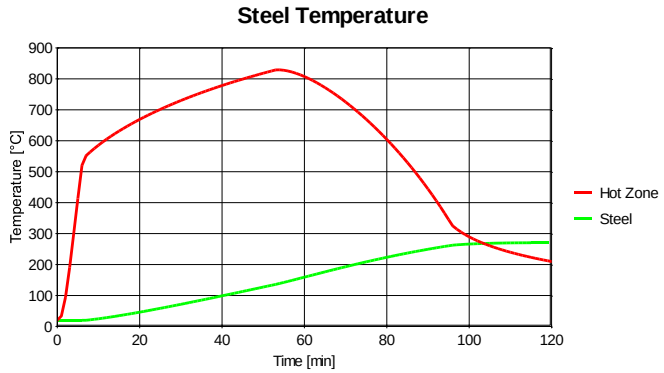


Fig.3. Calculated compartment temperatures

Step 3: *Run the compartment fire model:* The main output are the rate of heat release curve calculated (Fig. 3),the hot zone temperature and the cold zone temperature (Fig.4).
Step 4: *Calculate the steel temperature:* The steel temperature is evaluated for the unprotected and protected section (Fig. 5).

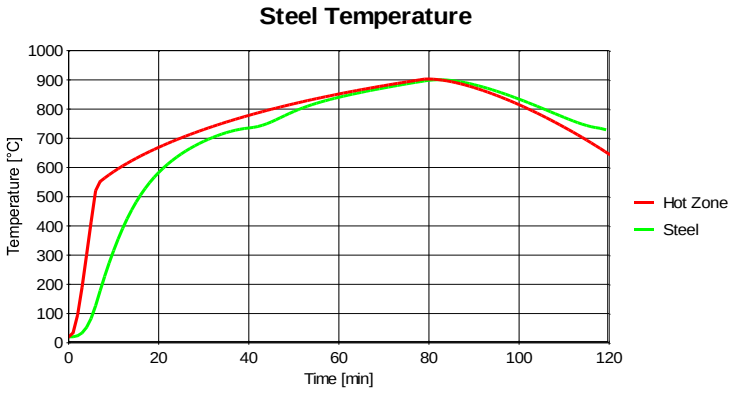


Fig.4. Calculated compartment temperatures

Step 5: *Calculate the member resistance:* Thanks to EN 1993-1-2, it will be possible, having the gas temperature, to calculate the temperature of an unprotected steel profile. The fire resistance of the unprotected steel section IPE450 is 36.63min. while for protected steel section IPE450 is 120 min.[6]

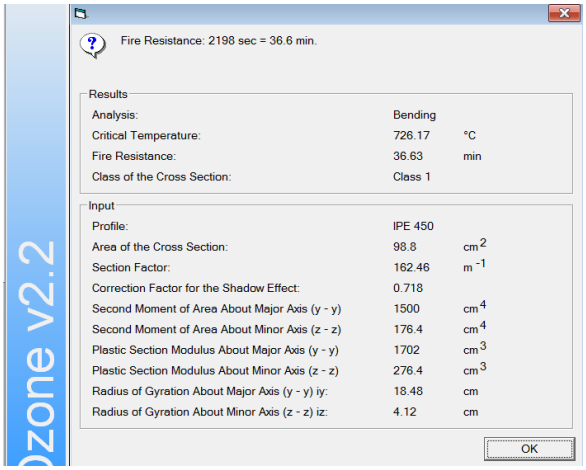


Fig.5. Calculate the fire resistance of the unprotected steel section IPE450

Conclusions

The figures provided for the input data by the graphic interface are indicative values. They can be modified by the user who has full responsibility for the choice of these input data. A combination of a two and a one zone model is included. The criteria of transition offers to the user an automatic decision procedure to know whether a two or a one zone model is appropriated to the fire stage which is model.

In order to introduce glazing surface into the OZone software, openings must be added to the façade and a "stepwise" variation must be chosen. With this "stepwise" variation, it is possible to define a scenario of opening depending on the temperature.

The heating up of a structural element depends on the type of element (e.g. pure steel or compositesteel/concrete)and of the nature and amount of fire protection.

References

1. EN 1991-1-2 Actions on structures-Part1-2:Genaral actions-Actions on structures exposed to fire, European Committee for Standardization, Brussels, November 2002
2. Schleich J-B., Cajot L-G., et al.: "Competitive steel buildings through natural fire safety concept." ECSC Research 7210-SA/125,126,213,214,323,423,522,623,839,937, 1994-98; Final Report 2002 – EUR 20360 EN.
3. Schleich J-B., Cajot L-G., et al.: "Natural fire safety concept –Full scale tests, implementation in the Eurocodes and development of a user-friendly design tool." ECSC Research 7210-060,1997-2000;, Final Report 2003 - EUR 20580 EN..
4. Cadorin J-F, Franssen J-M. A tool to design steel elements submitted to compartment fires-Ozone V2-Part1: pre and post flashovercompartment fire model Fire Safety J 2003;38:395-427.
5. Schleich JB, Cajot L-G. Natural Fire Safety for Buildings. INTERFLAM 2001 ConferenceProceedings, London: Interscience Communications Ltd., 2001. p. 359-68.
6. EN 1993-1-2 Actions on structures-Part1-2:Genaral rules-Structural fire design

Reducing the Porosity and Sealing Cracks by Using Crystalline Admixture in Conventional Concrete

Visar Krelani[1], Liberato Ferrara[2]

[1] UBT – Higher Education Institution, Kalabria, 10000, Kosova
[2] Politecnico di Milano, P.za L. Da Vinci, 20133, Milan, Italy
visar.krelani@ubt-uni.net[1], liberato.ferrara@polimi.it[2]

Abstract. There is a continuous increase of quality on civil engineering materials in developed countries and parallel increase of need for new constructions in developing countries. Professional community should propose solutions for the durability that can resist in different severe environments. The most important factor that can affect concrete durability is represented by the pore distribution. Transport properties can take place through the porous network inside the cementitious composites and the aggregates interface, permitting the ingress of aggressive agents damaging concrete function intrinsically as a material and the well-functioning of the entire structure. The use of a crystalline admixture during the mixing procedure can fill the pores and capillarity of the cement composites, while in case of the appearance of the cracks, can perform as sealing agent, representing a secondary innovative benefit. Concrete structure, in this case will be more durable and there will be no need for un-planned intervention.

Keywords: durability, self-sealing, concrete, crystalline additive

1. Introduction

Concrete as known; represent intrinsically porous material, which are represented from the pores at nano, micro and millimetric-scale. Porosity depends from the project of mix design that can be modified while mixing procedure or even by the wrong casting and low attention during curing. This is due to water presence based on mix design or due to entrained air and capillarity of the material itself, where water than could penetrate into concrete structure and consequently create physical and chemical processes that can seriously damage concrete durability.
A better control of porosity is possible by using "supplementary cementitious materials" (fly ash, silica fume, slag etc.) that are characterized with a finer distribution on the granulometric curve, when compared with cement, which will densify the matrix and reduce the general porosity or reduce the pore diameter. This effect then generates the reduction of general permeability and the ingress of potentially aggressive ions giving to the matrix the possibility to control the water and humidity movements, giving even some positive effect on concrete durability.Last decades, beside "supplementary cementitious materials" mentioned before, in the civil engineering market, other effective contributors at the density of the matrix as densifiers or refiner of the pores, are shown such as specific admixtures known as "admixtures for the reduction of the permeability". These admixtures can be hydrophobic or crystalline admixtures.
The constitution of the first is represented from chemical compounds, similar constituents as soap or based fatty acids in petrol, which doesn't react into the porosity of the matrix itself but they contribute to create a hydro-repellent layer up to the pores. Crystalline admixtures, in the other side are powder that are added usually to the dry components of the concrete and mixed together and represent something as one percent of the cement mass. Based to its constituents these admixtures represent a strongly hydrophilic nature, which reacting with humidity of the atmosphere, creates a crystalline structure, densifying the matrix while during the calcium hydro silicate (CSH) phase reducing the porosity, consequently the permeability opposing the ingress of the water and aggressive agents. For a better understanding of this admixture, different exposure conditioning has been performed such as normal or increased water pressure and there was shown an important

effectiveness as a porosity reducer. Otherwise, the same admixtures showed good results ion reducing the hydraulic shrinkage which can be seen better when concrete is limited by different constrains, which delayed the appearance of the cracks and reducing their width. When the last happen, another advantage is shown by improving the freeze-thaw cycles. An important testing of this admixture has been done into the structures of Shanghai Airport, Terminal 3, which is totally constructed into the seawater; structures that are exposed into sever conditioning. Concrete samples have been extracted for further chemical studies and results have shown that; crystalline products are formed, such as calcium, oxygen and silica with scent of zolfo and aluminum (ettringite), plus calcium carbonate CaCO3. Increasing the number of crystals some of the studied cracks have shown reduction of their width, result that pushed us for a deeper study on literature about the self-healing capacity of cementitious composites. One of the first reports about self-healing capacity was found by the French Academy of Science, dates back to 1836: it was reported that the conversion of the calcium hydroxide leaching from the hydrated cement into calcium carbonate closes the cracks on atmospheric exposure. Abrams, in 1913, was among the first researchers who explained the autogenic self- healing in concrete. He suggested that that the healed strength of concrete is caused by the retarded or the interrupted hydraulicity of the cement. Gilkey in 1930 studying a concrete about six months old, found that the recovered strength is inversely proportional to the age of concrete. In the same report Bogue concluded that the healing action is represented by the continued hydration, supplemented by physical stresses, helping the formation of the precipitated bonds between severed grains. Another idea was reported by Loving 1936, who found that cracks in the concrete tubes were filled by the calcium carbonate. Whitehurst (1951), in a soniscope testing of cracked concrete structures subjected to wet spring, following a freezing and thawing season reported an increasing of the dynamic modulus in the healed concrete. An important study on the strength recovery and on the explanation of the possible healing mechanisms of the healed cracks surfaces was performed by Lauer and Slate.

They showed that the strength gain from autogenous healing in the water is not linear with time but follows of a parabolic trend with time whereas in a 95% relative humidity environment this healing activity is more nearly linear, though the recovery is slower but in a greater length in time. Dhir et al. [5] performed an extended experimental campaign investigating the autogenous healing potential of nine different mortars, varying the aggregate/cement ratio and comparing virgin with fractured specimens.

Investigation showed that all types of tested mortars had the ability to self-heal. This ability is highlighted in percentage of recovery due to higher content of cement in front of other mortars with the higher water/cement ratio that showed a higher initial tendency of healing but lowers in time. Several studies performed by Van Tittelbom et al., Li et al. and Edvardsen et al. [8] showed a reduction in water permeability of concretes between the un-cracked and cracked state, lead to the conclusions that this reduction was performed by the self- healing of the cracks.

The potential of this kind of admixture on reducing the porosity [9] and the advantages as permeability reducers doesn't represent last advantage and the last but not the last, the possibility to reduce or potentially heal the cracks pushed us to perform and extend experimental campaign and a detailed study in the self-healing capacity of cementitious composites with and without crystalline admixture.

2. Experimental Activities

The mix composition, detailed in Table 1, has been designed for a target cube compressive strength at 28 days equal to 30 MPa. Because of the interest to evaluate the effects of crystalline additives on the permeability and at the self-healing capacity of concrete, a companion mix has been also produced with a 1% additive addition, by weight of cement.

Constituent (kg/m3)	Without Additive	with Additive
Cement type II-42.5 R	300	300
Water	190	190
Superplasticizier (lt/m3)	3	3
Fine Aggregate 0-4mm	1078	180
Coarse Aggregate 4-16mm	880	880
Crystalline Additive	-	3

Table 1. Mix-design of the investigated mortar

The additive was dry mixed with the raw aggregates at the very beginning of the mixing sequence, which was then followed by the addition of cement and, upon further mixing, by the incorporation of water and superplasticizer.

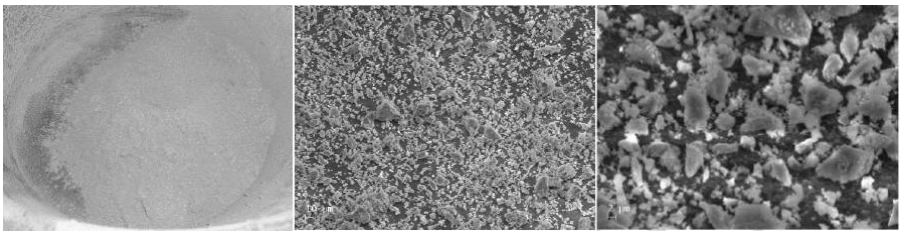


Figure 1. Observations on the crystalline additive; Visual observation on different scale of additive particles of in a scanning; (left) original visualization of the additive; (middle, right) scanning electron microscope in different magnifications

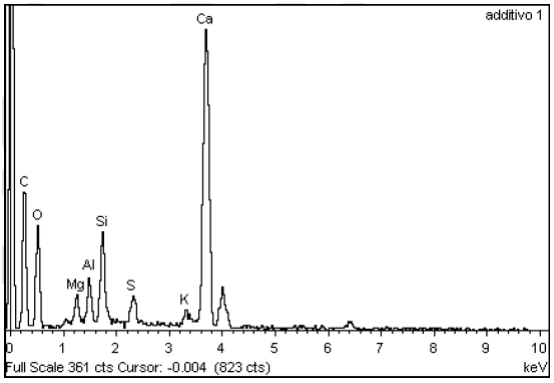


Figure 2. Chemical characterization of the crystalline additive showed in (Figure1) by the Energy dispersive spectroscopy (EDS) test.

In Figure 1 it is possible to observe the particles of the crystalline admixture. They have irregular shape and size in the range of about 1-20 μm (Figure 1, middle-right); their morphology is similar to that of cement grains; as a matter of fact, also according to the manufacturer, cement is present in the admixture and this is confirmed by the presence of calcium, oxygen, silica, magnesium, aluminum and potassium in the EDS microanalysis shown in Figure 2. This spectrum is comparable with that of an Ordinary Portland Cement (OPC), except for the peak of Sulphur which is slightly higher.

Figure 3. Manufacturing of the specimens; (left) casted slab; (middle) reference cube specimens; (right) slabs under wet towels.

Slabs 1m long x 0.5 m wide and 50 mm thick were casted (Figure 3, left) with both mixes; after three days curing in laboratory environment under wet towels. (Figure3,right). Slabs were cut into prismatic "beam-like" specimens, each 500 mm long and about 100 mm wide (Figure 4) and cured in a moist room. Comparison cube specimens (Figure 4, middle) were also cast for compressive strength measurements.

Figure 4. (left) Slabs stored on a chamber room; (middle) cutting machine; (right) specimens like "beam" after cutting

At the end of the curing period detailed above, the beam specimens were pre-cracked up to different levels of crack opening, equal to 150 and 300 □m. Un-notched specimens were pre-cracked employing the three - point bending (3pb) test set-up shown in Figure 5, where the clip-gauge measuring the Crack Opening Displacement (COD) at mid-span (used as test control variable) is also shown. Some specimens were kept un-cracked for reference as well.

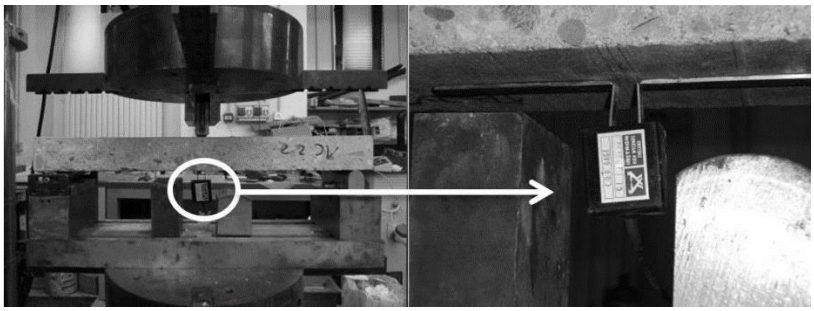


Figure 5. (left) Three point bending test set-up for pre-cracking procedure; (right) clip gauge used for measuring the crack opening mouth displacement

Besides these "natural" exposure conditioning, accelerated conditioning in a climate chamber, also to assess the reliability of accelerated haling procedures, were performed (Table 2) [10]. The performed cycles, each lasting 6 hours and meant as representative of exposure to either a winter or summer Northern Italy climate, are shown in (Figure 7, left). Exposure up to 1, 2 and 4 weeks in climate chamber for both types of accelerated cycles was performed (Figure 7, right).

At the end of the scheduled exposure times, the specimens were first of all analyzed with an optical microscope to visually check the presence of the healing products in the cracks.

Type of the Conditioning	Duration of the Conditioning
H – Water Immersion	1, 2, 3, 6, 12 months
D – (Dry) Natural air exposure	1, 2, 3, 6, 12 months
HD – Wet/Dry	1,3 months
C – Climatic Chamber	1,2,4 weeks

Table 2. Exposure conditioning and the duration for each of them

Figure 6 (left) Climatic chamber; (middle) Water immersion; (right) air exposure

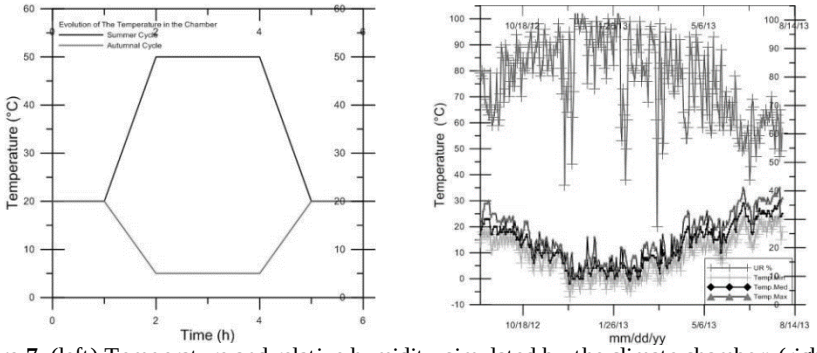


Figure 7. (left) Temperature and relative humidity simulated by the climate chamber; (right) T and RH recorded along the specimen exposure period.

	Exposure condition and duration															
	Water immersion					Open air exposure					Climate chamber					
											winter			summer		
	1m	2m	3m	6m	12m	1m	2m	3m	6m	12m	1w	2w	4w	1w	2w	4w
w/out additive																
Un-cracked	1	2	2	2	2	1	2	2	2	2	2	2	2	3	3	3
Pre-cracked 100 μm											2	2	3	3	3	3
Pre-cracked 200 μm	1	2	2	2	2	1	2	2	2	2	3	3	3	3	3	3
with additive																
Un-cracked	1	2	2	2	2	1	2	2	2	2	2	2	2	6	6	6
Pre-cracked 100 μm											2	2	3	6	6	6
Pre-cracked 200 μm	1	2	2	2	2	1	2	2	2	2	3	3	3	6	6	6

m = months
w = weeks

Table 3. Synopsis of experimental programme (n° of specimens per each test condition)

Then the specimens were tested up to failure according to the same set - up employed for the pre-cracking. A typical response, in terms load vs COD in the case of healing, is shown in the Figure 9 that corresponds with the response exhibited by the same specimen in the pre-cracking stage.

3. Discussions of Experimental Results

The two investigated concretes, with and without the crystalline admixture, were first of all characterized by meaning the development of their compressive strength all along the 28 days curing period before the pre-cracking.

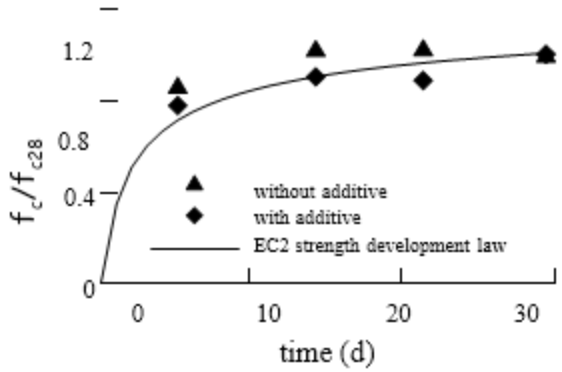


Figure 8. Strength development of concrete with and without crystalline additives vs. EC2 previsions

Based on the EC2, cubic specimens were tested by comparison between the concrete with and without admixture, to evaluate the effect of admixture in the strength development of concrete. Then, EC2 predictive law [11], has been plotted on the same graph and compared with the strength development of both concretes.

By observing the graph in the Figure 8 it can be stated that: the crystalline admixture alone, in a sound concrete specimen, does not affect the strength of the material nor its development within time.

Based in the porosimetry test named as mercury porosimetry test, the obtained results shown differences between two types of concrete where the total pore area equal to 6.461 m²/g of the concrete without admixture is higher compared to the same concrete with the mentioned admixture where same parameter shows a total pore area equal to 5.083 m²/. This result has been obtained after first month of water exposure.

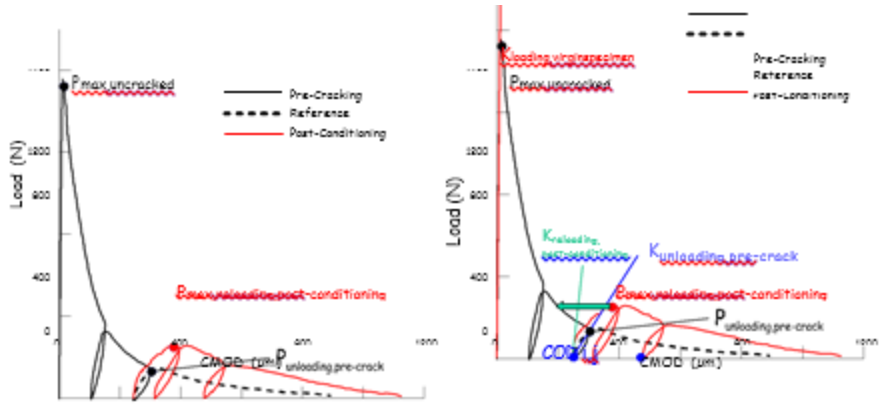


Figure 9. Example of load vs. COD curves for specimens submitted to pre-cracking and post-conditioning 3pb tests; definition of quantities for calculation of self- healing indices.

$$ILR = \frac{\sigma_{N,\max\ reloading,\ post\text{-}conditioning} - \sigma_{unloading,pre-crack}}{f_{ctf} - \sigma_{unloading,pre-crack}} \qquad \text{Equation 1}$$

$$ICH_{\ stress\text{-}\ crack\ opening} = \frac{COD_{pre-cracking} - COD_{post-conditioning}}{COD_{pre-cracking}} \qquad \text{Equation 2}$$

In Figure 9 the results of a typical test, in terms of load vs. COD curves, are shown: it is worth remarking that the graphs are built up in a way that the curves pertaining respectively to the pre-cracking test and to the post-conditioning up-to-failure test for the same specimens are compared.

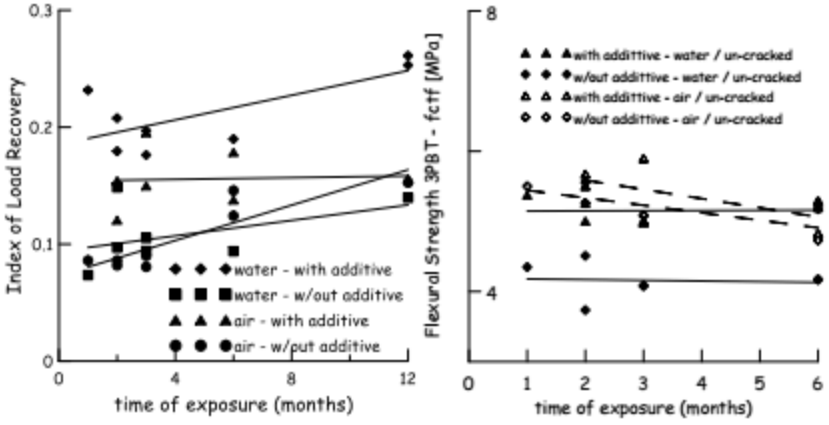


Figure 10. (a) Index of Load Recovery (as evaluated from 3pb test results) vs. exposure time for water immersion/air exposure (b) and flexural response un-cracked specimens.

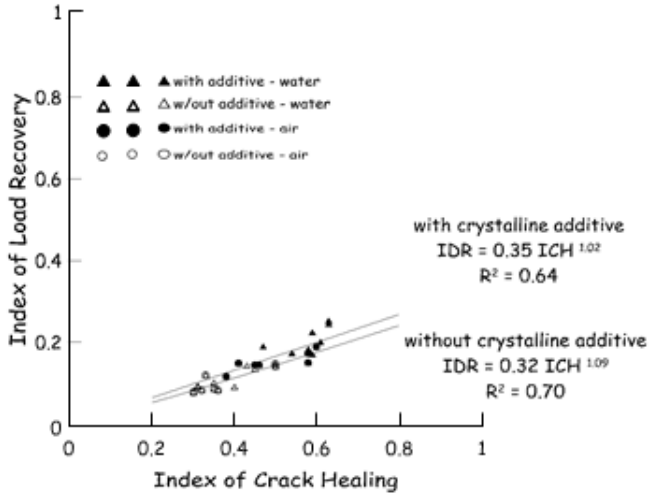


Figure 11. Index of Damage Recovery as evaluated from 3pb (left) vs. Index of Crack Healing as estimated from fitted damage evolution laws and (right) Index of Load Recovery vs. Index of Crack Healing as evaluated from stress vs. COD curves obtained from 3pb tests.

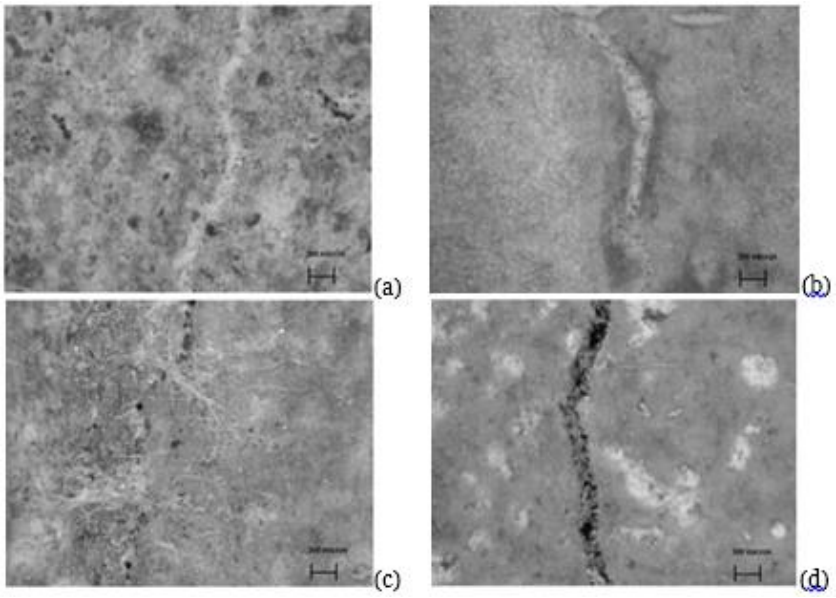


Figure 12. Healed cracks for specimens with (a) and without (b) crystalline additive after six months of immersion in water; specimens with (c) and without (d) crystalline additive after six months of exposure to open air.

Based in the equation 1 has been possible to be calculated the load recovery and the results has been plotted in the Figure 10. From the observed results (Figure 10, a), recovery of load bearing capacity, with respect to the loss of load bearing capacity (softening) experienced upon cracking, as also affected by presence/absence of crystalline additive and different exposure conditions, is absolutely coherent with observed trends of recovery of other mechanical properties. Whereas, most important recovery of bearing capacity, could be observed in the most favorable examined cases, specimens with the additive immersed in water. While, un-cracked specimens showed a stabled strength in time of exposure measured and identified from stress- crack opening flexural response (Figure 10, b). These results confirm the idea that hydration products have been produced in higher level when cracks are formed, where the same were not produced in un-cracked specimens. Load recovery versus estimated crack healing (Figure 11) shows that some load bearing capacity appears to be recovered since for very low values of estimated crack healing while for higher recovery of bearing capacity higher closure of the crack is needed. Pictures obtained by stereo-microscope in Figure 12 confirm the aforementioned statements, where immersion in water triggers the self-healing also for specimens without any additive, but at a much slower pace: only after 2 to 3 months effects start being visible and after 6 months a performance comparable to specimens with the additive was achieved; specimens without any additive exposed to air hardly shows recovery and only after prolonged (6 months) exposure period the crack closure can be appeared.

Conclusions

In this papers just a part of the results has been shown, there is still undergoing the experimental campaign, which can complete the here showed experimental campaign. Whatever, it has been showed that concrete owes intrinsically the capacity to heal the cracks, even this can be scant, which directly depends in the exposure conditions. When crystalline admixture is added into the mix design, the capacity to heal the cracks increases, and there is shown more systematic and reliable performance, obtaining recovery of the load capacity up to 80%, thanks to the contribution of the admixture into the porosity and not just the reducing of the total volume of pores was obtained but consequently the healing of the crack and the continuation of the hydration process, which is another process that was promoted by the admixture. The methodology showed here has been

confirmed and validated due to the different exposure conditioning, duration or the presence of the crystalline admixture comparing with the same mix design without the mentioned admixture. The formed products contribute directly to one of the most fundamental phenomena of the design of reinforced concrete, such as presence of the cracks. So, by reducing the porosity and engineering the healing capacity, it is possible to introduce a new valuable sustainable concept to the concrete structures. In this sense the effect of the admixture shows the possibility to create more durable concretes and increase the lifecycle of the whole structure due to the steel defense in front of the aggressive agent, reducing or stopping the corrosion into concrete reinforced structures.

References

1. Abrams A. Autogenous Healing of Concrete [J]. Concrete, 1925: 10-50.
2. Gilkey H. J.–"Annual Survey of the American Chemistry", Volume V, p.453,
3. 1930
4. Whitehurs E. A. "Soniscope Tests Concrete Structures", ACI Journal, February
5. 191, 1951, Proc. V., pp. 433-444
6. Lauer, K.R. and Slate, F.O.: "Autogeneous healing of cement paste". ACI
7. Journal, 1956. Vol.52, No. 6, pp. 1083-1097.
8. Dhir, R. K., Sangha C. M. and Munday J. G. – "Strength and Deformation
9. Properties of Autogenously Healed Mortars", ACI J. (1973); 70; 231-236.
10. Van Tittelboom K., Snoeck D., Wang J., and De Belie, N.: "Most recent advances in the field of self-healing cementitious materials", Proceedings of Self- Healing Int.Conf. pp.406-4013, 2013
11. Lepech M.D, Li V.C.: "Water Permeability of Engineered Cementitious
12. Composites. Cement &Concrete Journal Composites", 31, 2009, pp.744-753
13. Edvardsen, C. "Water permeability and autogenous healing of cracks in
14. concrete". ACI Mater.J. 1999, 96, 448–454
15. Collepardi M. (2003) - "Il nuovo calcestruzzo", Edizioni Tintoretto.
16. Krelani, V. • Ferrara, L. "Self-healing capacity of concrete with crystalline additives: Natural vs. accelerated exposure conditions"., Proceedings of the 4th International Conference on Self-Healing Materials, Ghent, Belgium, June 16-20,
17. 2013; p. 426 - 430
18. UNI EN 12390-3 - "Hardened Concrete Testing– Part 3: Compression strength of tests specimen".

Assessment of wood processing engineers by requirements of leading manufacturing entities in Albania

Ramadan Topuzi[1], Arben Bejtja[2]

[1,2]Agricultural University of Tirana, Department of Wood Industry, Tirana-Albania
dan_topuzi@live.it[1], arbenbejtja@yahoo.fr[2]

Abstract. In Albania a significant number of wood-processing engineers exercise this profession in the field of manufacturing and trading of furniture. In this sector exercise their activity over 800 manufacturing entities distributed across the country with about 9,000 employees. The main purpose of the study is the assessment of wood processing engineers as perceived by the manufacturing entities and their adaptation to the requirements of the labor market.
The data collected through a structured questionnaire for this purpose, are thrown into a database (where they are analyzed to generate the results given in this paper. The selection of the respondents is made by purposeful sampling, as access to a non-probability sample. The surveying method chosen is the "face to face" one. The material prepared refers to 100 surveys carried out throughout Albania. There have been selected the main manufacturing entities that operate in the field of manufacturing and trading of furniture and which are well-known in the market.
The respondents are mainly wood processing engineers, experienced managers of manufacturing entities, economists etc., exercising the above mentioned profession. The study shows that the market needs wood processing engineers who are professionally skilled. The most part of respondents express themselves in favor of engineers who have carried out Master Studies in this profile. They think that scientific and economic training also matter in the formation of engineers. In Master degrees, the courses related to the field of architecture are valued higher than others. Respondents also think that Professional practice of students is paramount in the formation of a fully trained engineer. The most effective way to this goal is that the professional practice should be realized in the manufacturing, and is best if carried out through paid employment. Elements completing the profile of the wood processing engineer are also considered the knowledge of foreign languages and new technologies.

Keywords:, manufacturing entity, practice, market, wood processing.

1. Introduction

In the Faculty of Forestry Sciences, the Wood Industry Department in Albania, over the years there have been graduated a significant number of wood processing engineers. This Department operates on the basis of the curriculum, developed by the Academic Staff of the Department and approved by the Council of Professors and the University Senate.
On the other hand, in our country operate a significant number of wood processing production entities, with a geographical distribution across the territory. These subjects constitute real opportunities for the employment of engineers today and in the future, in other words, they constitute the labor market. The market includes a significant number of wood processing engineers who practice this profession. Engineers result; employed in management positions and a good part of them are entrepreneurs and exercise their activities in the field of manufacturing and trading of furniture.
The main purpose of this study is the evaluation of wood processing engineers as perceived by manufacturing entities, considering their opinion and adaptation of the curriculum to the requirements of the labor market. This will be achieved through assessment provided by the respondents to the curriculum of the Wood Industry Department, presented to them by means of questionnaires. Data collection was conducted through structured questionnaires for this purpose, where respondents express their opinion regarding the curriculum and expectations they have towards the Wood Processing Engineers.

2. Methodology

The methodology followed for the implementation of this study is:

- Identification of entities operating in the wood processing industry in Albania.
- Development of questionnaires needed for this purpose, through which, all manufacturing entities express their opinion for the wood processing engineers regarding the curriculum.
- Direct site contact with the manufacturing entities and completion of questionnaires, through **face to face** surveys.
- Data analysis, their comparison and finding of adaptation ways

3. Data Collection

After site verification and the data collected it results that: In Albania over 800 entities with approx. 9,000 employees, exercise their activity in the field of manufacturing and trading of furniture, scattered across the country. There are about 70 Wood Processing engineers exercising this activity throughout Albania.

This study is based on surveys carried out in the country with leading manufacturing entities operating in the field of manufacturing and trading of furniture, and which are prominent in the market. The material prepared refers to 100 surveys conducted throughout Albania, in the most prominent manufacturing entities. To conduct surveys were selected main business in major cities in proportion to the number of these businesses nationwide. Most of them are located in Tirana, Fushe Kruja, Durres, Shkodra, Lezha, Elbasan, Fier, Vlora, Korca etc. Table 1 provides summary data of subjects identified and of those where surveys were conducted for each city.

Table 1. Number of respondents for each city

No	City	The number of surveys conducted	No	City	The number of surveys conducted
1	Bajram Curri	1	15	Lushnjë	2
2	Pukë	1	16	Elbasan	5
3	Kukës	3	17	Berat	3
4	Shkodër	4	18	Fier	6
5	Lezhë	3	19	Vlorë	5
6	Rrëshen	1	20	Gramsh	1
7	Peshkopi	1	21	Librazhd	1
8	Burrel	2	22	Çorovodë	1
9	Fushë Krujë	14	23	Pogradec	2
10	Krujë	3	24	Korçë	3
11	Tiranë	21	25	Ersekë	1
12	Kamëz	2	26	Përmet	1
13	Durrës	6	27	Gjirokastër	2
14	Kavajë	3	28	Sarandë	2
				TOTAL	100

Data were collected through a structured questionnaire for this purpose wherein are included open and filtering questions. The questionnaire is intended to approach a common/usable format to enable the creation of a profile of the engineer closer to the labor market needs. The data collected through these questionnaires are thrown into a database to be further analyzed and to fulfill the study objectives.

4. Data Analysis And Results

Surveys were conducted mainly with entrepreneurs/managers of manufacturing entities, but also with employed engineers and economists. To create a clearer picture also the engineers who run the activity themselves are considered employed. Table 2 provides data on subjects where surveys were conducted, the number of engineers employed and the market needs.

Code of the respondents	Total employed	Workers Specialists	Employed Engineers	Needs for Engineers	Code of the respondents	Total employed	Workers Specialists	Employed Engineers	Needs for Engineers
A10	6	6	0	1	A106	15	14	1	0
A12	50	48	2	0	A108	14	14	0	1
A13	18	17	1	0	A110	6	5	1	0
A15	8	7	1	1	A114	4	3	1	0
A18	7	7	0	1	A121	8	7	1	0
A21	23	23	0	1	A130	18	18	0	0
A23	60	58	2	0	A131	170	170	0	0
A24	13	13	0	1	A132	30	29	1	0
A26	12	11	1	1	A138	7	7	0	0
A30	5	5	0	1	A139	6	5	1	0
A31	13	12	1	1	A141	7	6	1	0
A33	12	12	0	0	A145	8	8	0	0
A34	11	10	1	0	A147	5	5	0	0
A36	60	56	4	0	A149	5	5	0	1
A37	30	30	0	1	A151	6	6	0	1
A38	13	11	2	0	A153	6	6	0	1
A39	40	39	1	0	A154	7	7	0	1
A40	20	19	1	1	A158	7	7	0	1
A42	17	17	0	1	A160	5	4	1	0
A43	33	32	1	0	A161	8	8	0	1
A45	40	37	3	0	A164	80	79	1	0
A46	40	39	1	1	A170	25	25	0	1
A47	20	19	1	0	A172	6	6	0	1
A49	40	40	0	1	A173	26	26	0	1
A51	12	11	1	0	A175	7	7	0	1
A52	8	7	1	0	A177	10	10	0	1
A54	14	14	0	0	A178	2	2	0	0
A56	8	8	0	0	A179	20	20	0	1
A57	7	7	0	0	A184	7	7	0	1
A59	15	14	1	0	A188	10	10	0	1
A61	12	12	0	0	A194	4	4	0	0
A62	10	9	1	0	A195	15	15	0	1
A72	5	5	0	0	A198	15	14	1	0
A73	5	5	0	0	A199	10	10	0	1
A74	7	7	0	1	A200	12	12	0	1
A77	11	11	0	0	A205	14	14	0	1
A78	17	16	1	0	A208	35	35	0	1
A81	16	15	1	0	A209	12	12	0	1

A82	7	7	0	0	A210	5	5	0	0
A83	8	8	0	0	A216	5	5	0	1
A84	14	14	0	0	A217	50	49	1	0
A85	15	15	0	1	A221	34	33	1	0
A86	10	9	1	0	A228	17	16	1	0
A89	15	15	0	1	A230	50	50	0	1
A90	10	9	1	0	A232	7	7	0	0
A91	8	7	1	1	A241	30	29	1	0
A92	9	9	0	0	A248	6	6	0	0
A96	30	30	0	0	A249	12	11	1	1
A97	8	8	0	0	A251	22	21	1	0
					TOTAL	**1834**	**1784**	**50**	**41**

Table 2. Summary data on the subjects surveyed

The data show; that only to surveyed entities the needs for Wood Processing engineers are also for 41 versus 50 engineers employed.

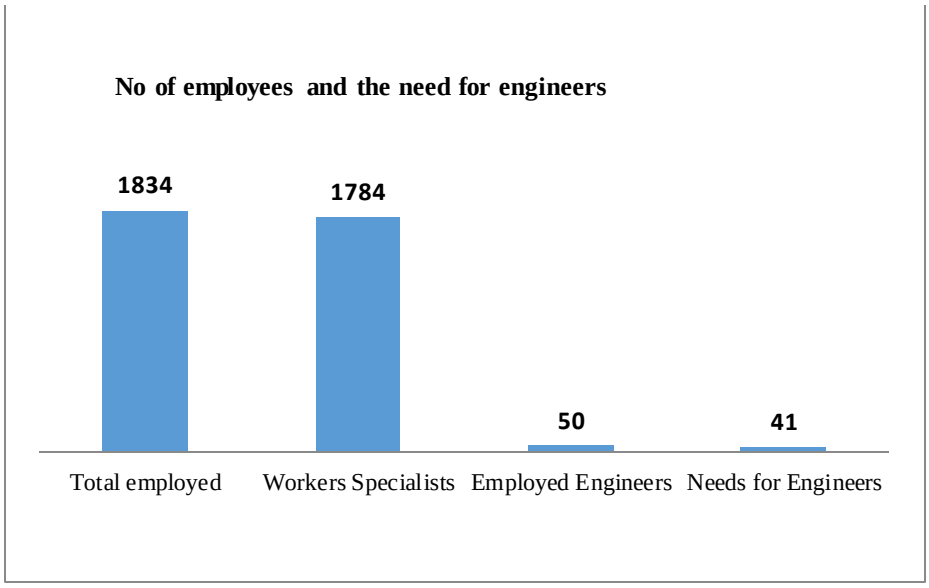


Figure 1. The number of employees and the need for engineers

5. Curriculum Assessment

In the following analysis it is made an assessment in a generalized form of both levels of study for groups of curriculums as follows:
General training subjects, Basic training engineering subjects, Business economy oriented subjects, Vocational training subjects, Other subjects that are practically optional.
Data collected from the survey are thrown into a database and it is conducted their analysis. For each of the groups, it is given the amount of assessment points and an overall average that shows how they are quoted by importance, as perceived by the respondents. For ease of calculation they are marked

with numbers, because the assessment in the questionnaire is received in words; Paramount/**5**, Important/**4** Less Important/**3** and Insignificant/**1**. The results are summarized in the following tables.

Table 3: Assessment by the respondents, for first level Bachelor curriculum **subjects**

Subjects taught in the first level Bachelor Scoring by importance, in increasing order 1, 3, 4, 5					
The grouping of subjects	General training subjects	Basic training engineering subjects	Business economy oriented subjects	Vocational training subjects	Other subjects
No of subjects	7	9	10	16	11
Total of points	2602	3607	3853	6877	3715
Overall average	3.7171	4.0077	3.853	4.2981	3.3772

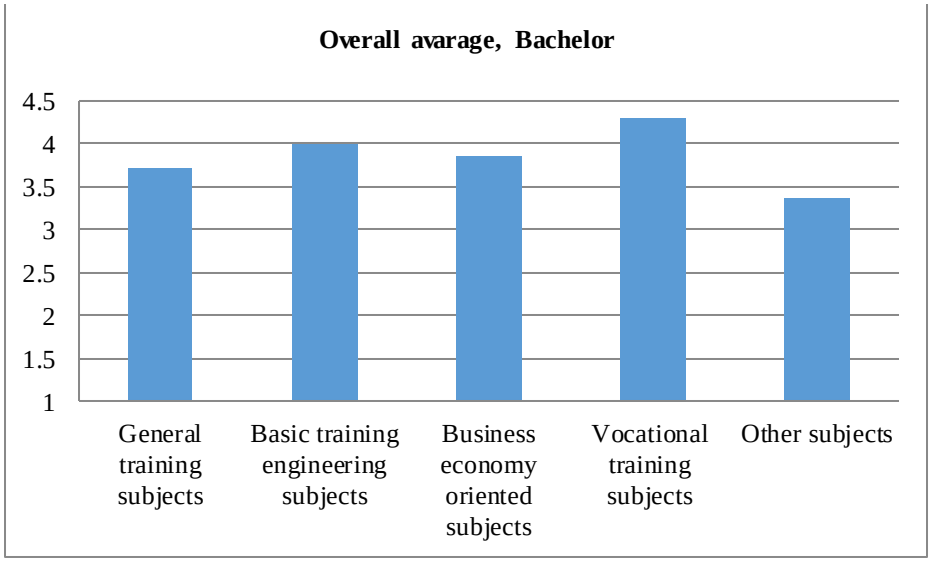


Fig. 2: Average data for the evaluation of the curriculum of the First Level Bachelor (Degree)

The graph shows a higher rating for the vocational training subjects. The respondents list as second in importance the basic engineering subjects which again vary by profession. Later, they list the economy-business oriented subjects.

Tab. 4: Assessment by the respondents of the curriculum subjects in the MSc level

Subjects taught in the Master of Science Scoring by importance, in increasing order 1, 3, 4, 5		
The grouping of subjects	General qualification subjects	Specialty subjects and other subjects
Number of subjects	8	11
Total of points	3148	4450
Overall average	3.935	4.0495

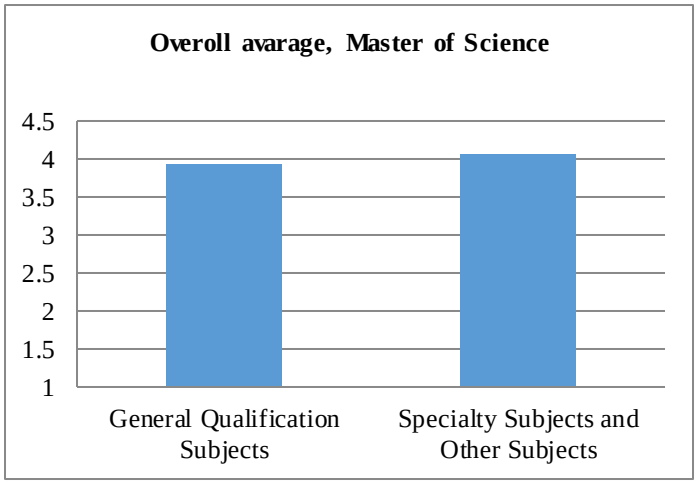


Fig. 3: Assessment by the respondents of the curriculum subjects in the MSc level

As shown by the graph, related to subjects in the MSc, the respondents underestimate the above specialty training subjects as compared with the general knowledge subjects. Thus, in their opinion, the market needs specialized engineers in the field of Wood Industry, professionally capable. The difference is small due to the overlapping of subjects.

Tab. 5: Assessment by the respondents of the curriculum subjects that are thought to be developed in the Master of Professional Studies.

Subjects to be developed in the Master of Professional Studies. Scoring by importance, in increasing order 1, 3, 4, 5		
The grouping of subjects	Engineering and architectural subjects	Engineering and other basic subjects
Number of subjects	6	7
Total of points	2540	2842
Overall average	4.233	4.06

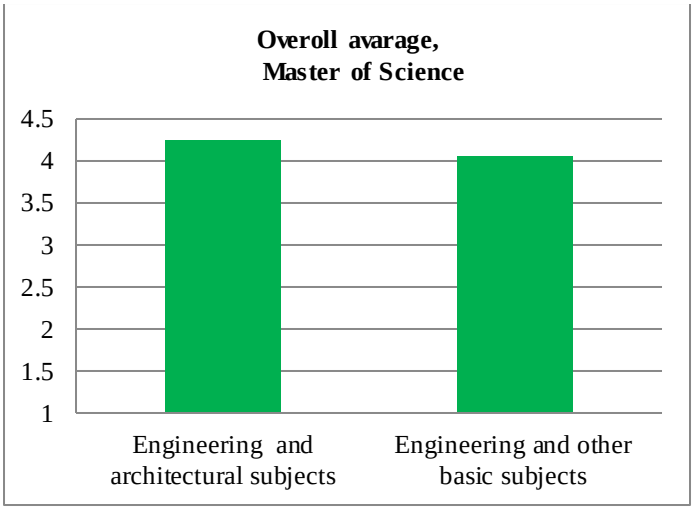


Fig. 4: Assessment by the respondents of the curriculum subjects that are thought to be developed in the Master of Professional Studies.

Studying for Professional Studies Master Degree has aimed to obtain a preliminary assessment of the manufacturing entities as basically, this level of studies has not yet been applied. So far it is drafted the Curriculum for this level of studies which is considered to be soon implemented. As above are estimated the architectural training subjects.

6. Assessment of some elements of university training

The assessment of the respondents on the education level of wood processing engineers.
In the Faculty of Forestry Sciences, Department of Wood Industry in Albania, for years it has been applied the educational system under the Charter of Bologna. In practice there are two levels of study, Bachelor (3 years) and Master of Science (2 years). Professional Master (1.5 years) has not yet been applied. So far it has only been designed the Curriculum which is thought to be implemented soon.
Through the question; *How would you rate the engineer in terms of education*? Respondents have received as follows:

Table 6. Number of answers by 100 respondents

Education level of engineers	Paramount	Important	Less Important	Insignificant	Total respondents
3 year Bachelor	15	36	**37**	12	100
4.5 year Professional Master	43	**51**	6	0	100
5 year Scientific Master	**72**	20	7	1	100

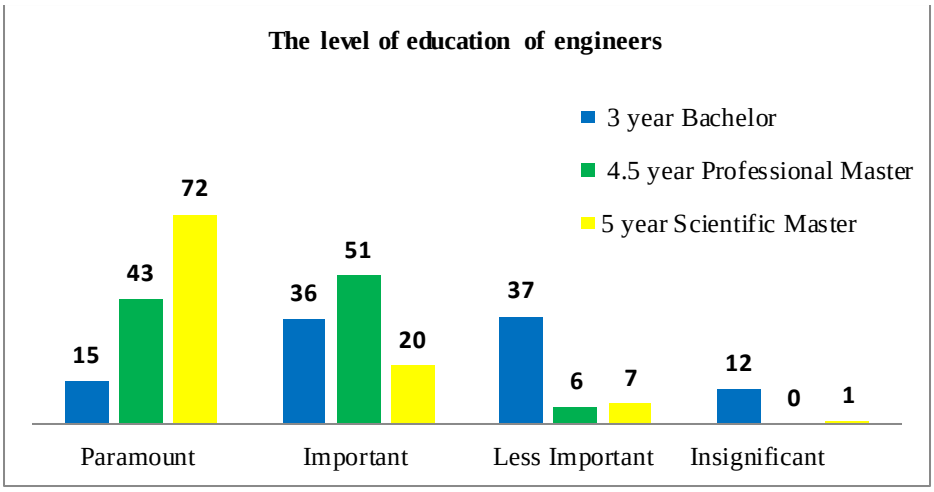


Fig. 5: The reating for the level ol education of engineers

By analyzing the responses received from respondents it turns out that:
Regarding the Bachelor level 37% of the respondents think that this level is less important to their business. While 36% of them say it is important and only 15% of them think that this level is paramount. This means that the engineers who have completed this level of study are viewed with reservations from the labor market. The market is not fully ready to accept "3 year term engineers".
For the Professional Master level which is expected to be applied soon, respondents have other expectations assessing higher its curriculum. Specifically there are 51% who say that it is important and 43% who think that it is paramount. The assessment in this case goes not only for the duration of studies, but mainly for the professional training courses and especially for architectural training courses.
In the MSc level the paramount assessment goes to 72%. In this case the duration of the studies is maximally assessed because this difference is not so evident in the curriculum. It should be considered that a good portion of the respondents are familiar with the earlier idea of the study tradition on a 4-year timeline.

Conclusions and Recommendations

- Respondents express themselves with reservations about the engineers who perform first level 3-year Bachelor studies. The majority of respondents are in favor of engineers who have completed Master studies in this profile. In Master levels it is also assessed the extension in time of studies ie. 4.5 up to 5 years in total.
- Vocational training courses "vocational courses" are considered as paramount by the majority of respondents. They also think that the scientific and economic training are important in the formation of engineers. In Master levels, courses related to the field of architecture are valued higher than others. As an elements completing the profile of wood processing engineers is also considered the knowledge of foreign languages and new technologies.
- The current labor market in the field of manufacturing and trading of furniture needs professionally skilled engineers.
- We should aim to improve the curriculum to increase the practicality of implementing the knowledge gained by being closer to the profession of the wood processing engineer.
- The Faculty should focus its attention on the progress of engineers after graduation, by intensifying the cooperation with them and simultaneously with the requirements and labor market trends.

Literature

1. National consultation with international participation. Academic restructuring and institutional assessment of the Agricultural University of Tirana. Tirana (2003)
2. The strategic plan of the Agricultural University of Tirana. Tirana (2005)
3. The need for Wood Processing engineers in the manufacturing entities of Tirana. Topuzi R Bejtja A.(2015)
4. Elements of engineering training and their assessment by the labor market. Topuzi R Bejtja A Peri L.(2015)

Structural analysis of a typical highway bridge comparison between KTP, EN and AASHTO load models

Endrit Berisha

Epoka University, Tirana, Albania
endritberisha1990@gmail.com

Abstract. This study consists on a structural analysis comparison of a typical highway bridge between KTP, EN and AASHTO based on load capacity. The Eurocodes are currently in the process of national implementation towards becoming the Europe wide means for structural design of civil engineering works. A team from Mott Macdonald inspected 562 bridges and the main causes of the defects are figured out in the study as traffic load, nature force, and aging, lack of maintenance and design deficiencies. As design codes are advancing with time, the need of Albania to upgrade its code has become a must. This paper presents the deficiencies of KTP when compared to the other design codes in order to help identify the areas which KTP is prone to problems and defects. A typical highway bridge with three spans (60, 80 and 60m) was selected to be compared. CSi Bridge was used as the tool to do a structural analysis of this bridge. The bridge was designed three times according to each code. Maximum moment is compared for the maximum load combinations of each code, on the columns and beams supporting the highway. Due to the design of the bridge the only members giving a cross-section of the load effect from the main deck are the one chosen. KTP is 40%-90% lower than EN and 20%-80% lower than AASHTO when compared for maximum moment at mid span of the beam and column. These refer to the biggest areas of deficiency KTP faces when compared with EN and AASHTO.

Keywords: KTP, EN, AASHTO, Road Bridge, CSi Bridge.

1. Introductıon

In 1989 CEN/TC 250 was formed in charge of the development of the Eurocodes program which led to the first generation of Eurocodes in 1980s. The first EN Eurocode was published in 2002 and by 2007 all 58 parts were published. From March 2010 a wide implementation of the Eurocodes has started. Due to its high success and quality they have spread throughout the world and countries like Algeria, Lebanon, Libya from Africa and countries like Indonesia, Philippines, Malaysia, Vietnam, Laos, Singapore, Thailand, Myanmar, Brunei, Cambodia from Asia use them as their design codes to align with EN. The Eurocodes have entered its critical phase of implementation in the Balkans. Albania, Moldova and Turkey have not created National action plans, whilst fYRoM, Montenegro and Serbia have had a NAP for years. The translation has finished in fYRoM and Moldova; it is almost finished in Croatia (except EN1993 and EN1999), Serbia (except EN1992, EN1997 and EN1998). Albania has finished EN1990, EN1991, EN1992, EN1993 and 1998. Regarding the definition of NDPs (National Defined Parameters) the only country that has finished this process is Croatia. In Albania it has started for EN1998. In their first study cycle only Croatia and BiH use EN, whilst for the second cycle studies BiH, Croatia, fYRoM and Moldova use EN.
Study demonstrates that moving from country to country, condition change. For example comparing the flow of traffic of the Netherlands with Slovenia, it can be seen that the traffic volume and frequency is bigger in first. Even types of vehicles change, as bigger, heavier trucks are travelling more in the roads of the Netherlands than in Slovenia. Comparing EN with the RSA (Portuguese Code), SNiP (Russian Code), IAP (Spanish Code) proves that EN is the most conservative. Even when comparing EN with AASHTO (USA) and CSA (Canada) provides the same result as before.
Building bridges in Albania dates back to antiquity. The period from early twentieth century until World War II is recognized as new era in the construction of bridges. For the first time began the use of pre-stressed bridges. One of the greatest achievements of this period was the construction of Zogu's

Bridge (1938), one of the first in Europe with pre-stressed elements. During the 90s the country opened to the economy market and the road transportation system is characterized by a great development process. The overpass in Sukth, St. Vlash, Shkozet were built with pre-stress beams, the bridge in Mat was built with metal beams and concrete deck. The bridge at the entrance of Lezha is built with metal beams and monolithic deck.
At the moment design requirements are based on current regulations and national standards. It should be noted that most of them are actually quite old, a product of the latest revision of the code end 80s. The period before the 90s was characterized by the type of low masonry buildings, reinforced concrete columns. The rapid urbanization and the explosion of manufacture buildings characterized the period after the 90s. An improved design control and construction of structural works, and a better communication between EU members would be the result of the adaptation. From the institutional point of view, the management of the adoption of the Eurocodes will be supervised by the Technical Committee that was established in Tirana.

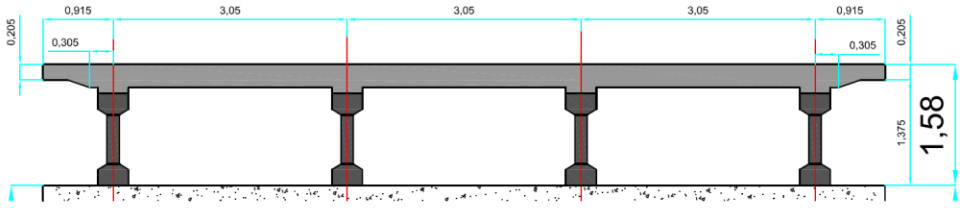


Figure 2 Cross-Section of the Bridge

2. Methodology

A general model of a bridge is chosen based on average length given by recent studies. A typical bridge was chosen because choosing an existing bridge would need further details about the aging of components, further testing and will not provide a fair comparison of the codes. The bridge has three spans: 60, 80 and 60m. It is designed by CSi Bridge comparing the design loads of KTP, EN and AASHTO. As the loads are applied and after the bridge is subjected to different combinations and comparison of moment and shear is done. The comparison is done for the middle section of the left span, middle section of the middle span, middle section of the right span and for the middle section of the columns. These points are chosen as being the most critical points of the bridge.
The width of the bridge is 11m; 5.5m is divided into 3.5 m for the lane, 1m for the sidewalk and 1m for the parapet. The bridge is 10m high. It contains continuous beams, 25cm thick slab, abutments and piers. The deck is designed to have two internal girders.
The minimum temperature considered for shadow areas is -20ºC. The return period of this is 100 years (meteorological institute of Tirana). The maximum temperature in the shadow area is considered to be 40ºC. The difference between the concrete slab temperature and steel part was taken to be not more than 10ºC. The ambient relative humidity is assumed to be taken as 80%. These statistics explain why no temperature change effect has been taken into account in the design. At the bridge spans over a field and underneath lays a highway, there are few obstacles, like some houses or trees. No settlement is taken in account to happen.

Results

After the analysis has finished, the bridge loads have been compared. The differences between KTP, AASHTO and EN have been described in the tables below. The analysis is conducted separately for each design code, taking into account the design loads, and load combination of each one. The comparison is done for element frames. For the element frames, two columns and the beam over them, which comprise the bridge bent, are taken. Maximum shear and moment are compared. Below figure 2 illustrates the location of this point and elements. The comparison is done for shear, moment on the column, and beam. Figures 3 and 4 are for the column, while figures 5 and 6 are for the beam.

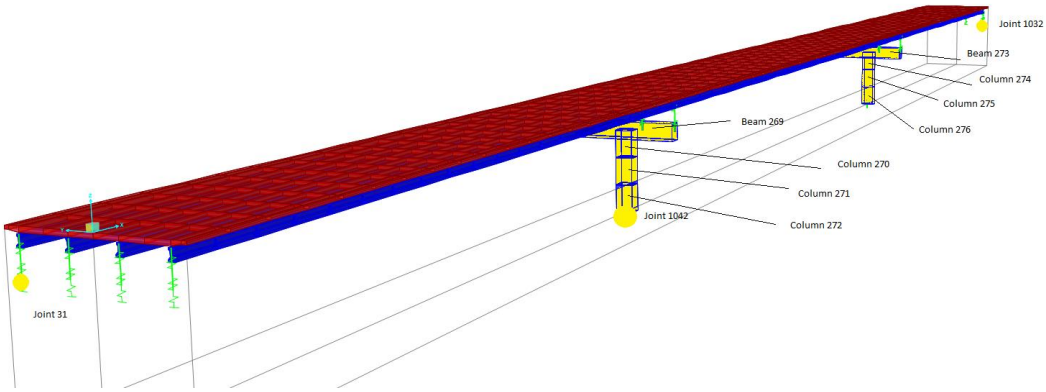


Figure 2 Location of Joints and members taken into account

Column

Figures 3 and 4 are for the column. Graph 3 it can be seen that in the case of KTP shear is much lower than in the cases of other codes. Shear force for the Eurocode is greater than AASHTO; this comes mostly because of the load models used. Eurocode takes into account bigger loads and therefore the shear is bigger. The model of KTP is design for 200kN shear force, AASHTO is designed for approximately 400kN, and Eurocode is designed for approximately 580kN.

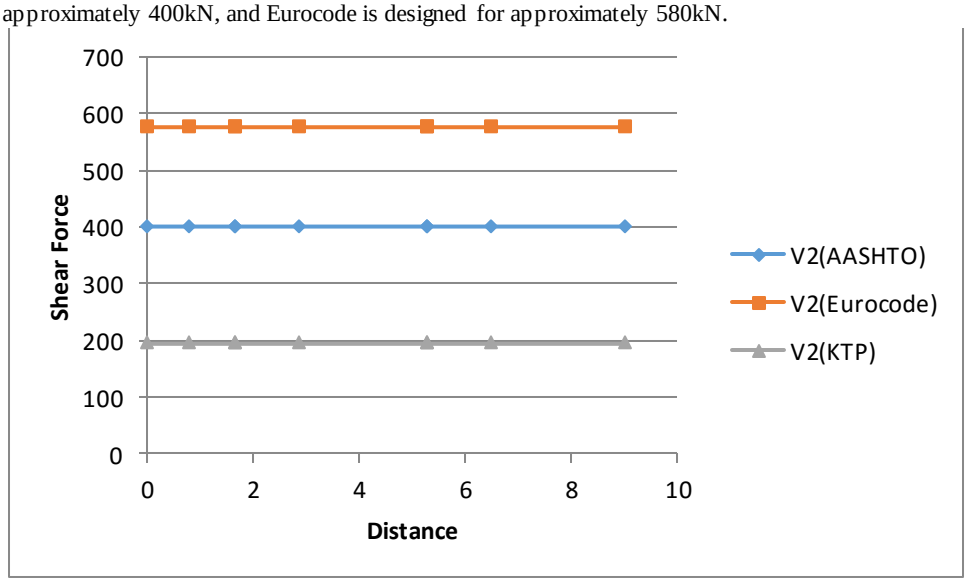


Figure 3 Graph of the variation maximum of shear for the column

At the graph it can be seen that in the case of KTP shear is much lower than in the cases of other codes. Shear force for the Eurocode is greater than AASHTO this comes mostly because of the load models used. Eurocode takes into account bigger loads and therefore the shear is bigger. The model of KTP is design for 200kN shear force, AASHTO is designed for approximately 400kN, and Eurocode is designed for approximately 580kN.

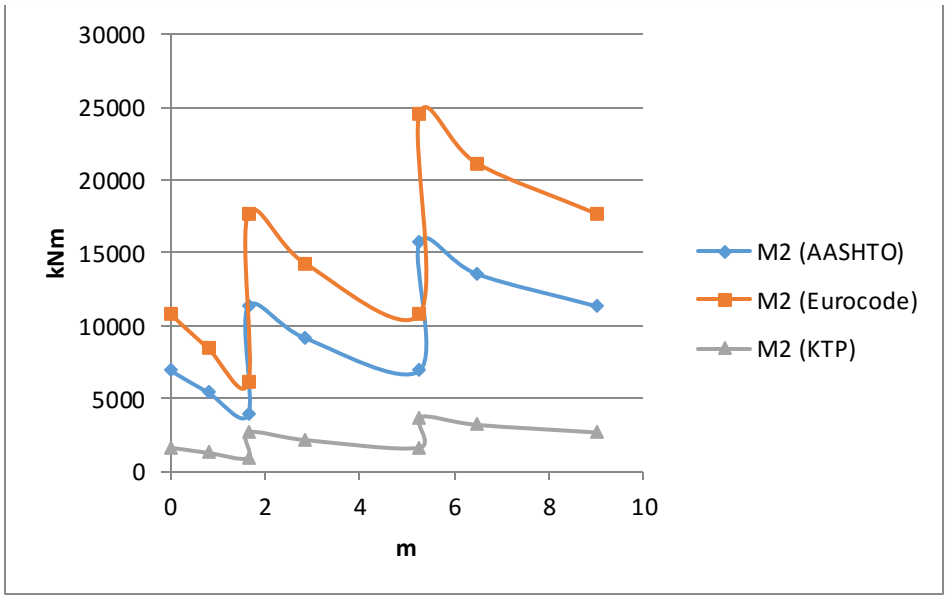


Figure 4 Graph of variation of maximum moment for the column

When comparing maximum moment, the results give the same conclusion as the ones before. Eurocode due to its model load inflicts a bigger moment on the structure. Maximum moment for EN is 23594.14kN/m, 15762.45kN/m for AASHTO and 3721.72kN/m for KTP. All these results are due to the lack of input needed to design according to KTP, As AASHTO and Eurocode design taking into account earthquake forces and wind, which are not inputted on the KTP.

Beam

The graphs below express relation between the codes for the beam.

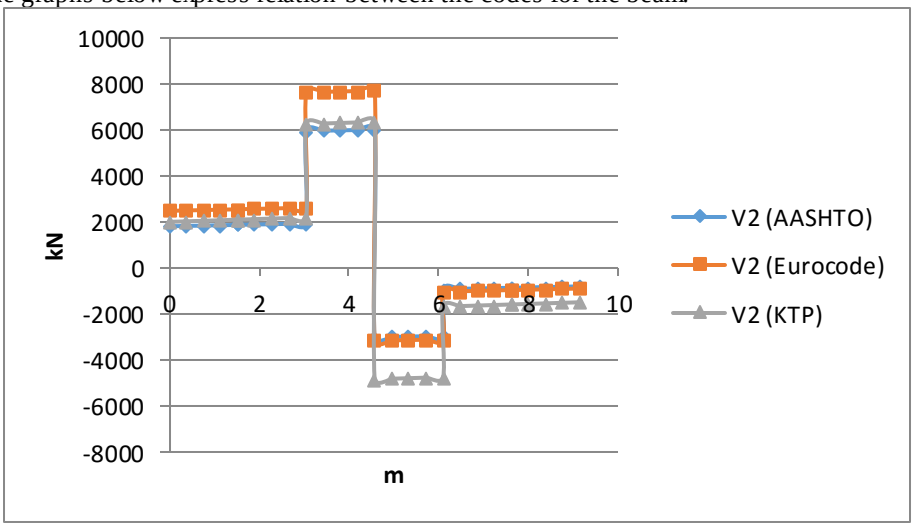


Figure 5 Graph for the variation of maximum shear for the beam

Figure 5 gives the relation of shear for the three codes. Eurocode has bigger shear acting on the beam, with AASHTO and KTP giving similar results. AASHTO gives a shear of 5986kN; Eurocode has a maximum shear of 7679kN, and KTP 6325kN. Figure 6 provides the moment acting on the beam. As

it can be easily understood the biggest moment acts in the mid span. The biggest moment is subjected by the Eurocode with a value of 5958kNm, with AASHTO having a moment of 4096kNm, and KTP 3273kNm.

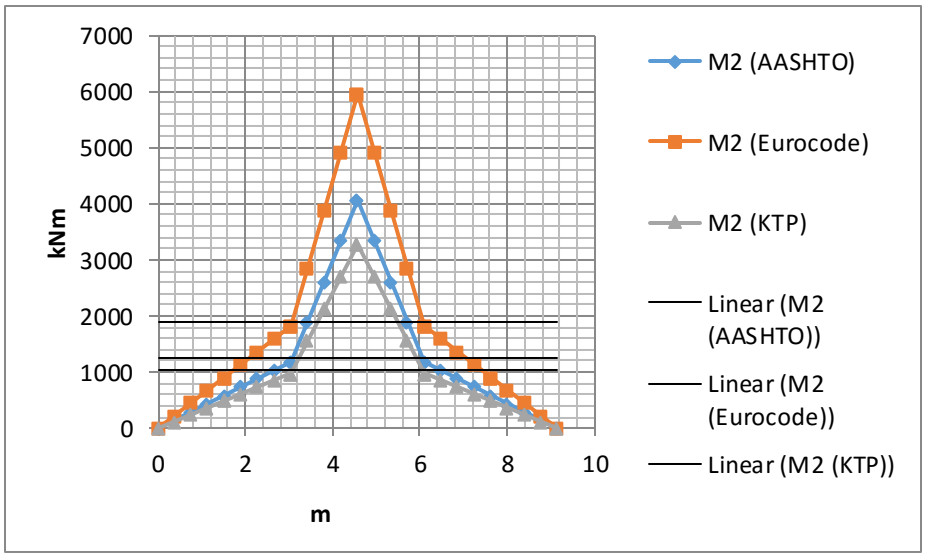


Figure 6 Graph for the variation of maximum moment for the beam

Conclusion

Design codes have improved from the time of construction of most of the bridges in Albania. Requirements for safety, calculation and construction techniques have advanced. All the experience from failures around the world have been collected and summarized in literatures and strict design codes. The advancement of design codes has been symmetrical with the population growth. This explains why the capacity of bridge before 50 years is much lower than the ones constructed today. From previous researches and comparisons done, the Portuguese Code, The Russian Code and Spanish Code all are designed with lower requirements than the Eurocode. Even in the case of KTP the results show the same conclusion. From the information provided by KTP, when calculating load capacity the effect of wind and earthquake loads are not taken into account. This limits the ability of the superstructure to withstand lateral loads and be prone to deficiency in bending moment and shear. Further detailed testing needs to be done in order to understand the life of each structure, as none has been constructed the same way. This thesis provides a structural analysis of a bridge comparing KTP, EN and AASHTO based on load capacity. Other problems can be found when comparing the methods of construction, the materials used and calculations done. Both cases for beams and columns shown in the result give that:

For beams:

KTP is 17.6% lower than EN and 5.66%bigger than AASHTO when compared for shear capacity.
KTP is 45% lower than EN and 20% lower than AASHTO when compared for maximum moment.

For columns:

KTP is 65% lower than EN and 50% lower than AASHTO when compared for shear capacity.
KTP is 84.25% lower than EN and 76.4% lower than AASHTO when compared for maximum moment.

The results found provide the areas where the bridges in Albania suffer the most, providing also the areas where the strengthening needs to be performed in order to meet requirements imposed by EN. As Albania is a candidate for the European Union it needs to follow the standards it imposes. This thesis provides the background where the first steps need to be taken for the upgrade to happen.

Reference

1. Bridge Loads, Colin O'Connor, (2000).
2. En 1991 En 1991-2 Traffic Loads Traffic Loads On Bridges On Bridges
3. Ktp (Pg 23 – 78), (1978).
4. Aashto Lrfd Bridge Design Specifications, 4th Edition, (2007).
5. Adoption Of The Eurocodes Outside The E.U. (Malcolm Greenley, Program Manager, Bsi – Department - Construction And The Built Environment)
6. Adoption Of The Eurocodes In The Balkan Region, Jrc Enlargement And Integration Action, Roberta Apostolska, Fabio Taucer, Silvia Dimova And Artur Pinto, (2014).
7. Bridge Assessment Loading: A Comparison Of West And Central/East Europe by Eugene J. Obrien, Professor Of Civil Engineering, University College Dublin, Earlsfort Terrace, Dublin 2, Ireland; Colin C. Caprani, Phd Researcher, Dept. Of Civil Engineering, University College Dublin, Earlsfort Terrace, Dublin 2, Ireland; Gavin J. O'connell, Mengsc Student, Dept. Of Civil Engineering, University College Dublin, Earlsfort Terrace, Dublin 2, Ireland, (03.2006)
8. Reliability Analysis Of Pre-Stressed Concrete Bridge Girders: Comparison Of Eurocode, Spanish Norma Iap And Aashto Lrfd, By Andrzej S. Nowak, Chan-Hee Park And Juan R. Casas (2002)
9. Service Life Assessment Of Existing Highway Bridges With No Planned Regular Inspections By Alp Carter, P.E., Asce, A. Melih Yanmaz, Etc…(2008)
10. Comparison of Russian Norms (Snips) And European Norms (Eurocodes) For Road And Railway Bridge, Anastasia Lukianenko, 2012.
11. Structural Analysis of Concrete Bridge Decks: Comparison between the Portuguese Code (Rsa) And The Eurocode Road Load Models, João Nuno Taborda Brás Robalo, (2013).
12. Bridge Design To Eurocodes Worked Examples, Y. Bouassida, E. Bouchon, P. Crespo, P. Croce, L. Davaine, S. Denton, M. Feldmann, R.Frank, G.Hanswille, W. Hensen, B. Kolias, N. Malakatas, G. Mancini, M. Ortega, J. Raoul, G. Sedlacek, G. Tsionis, (4- 6 October 2010).
13. Bridge Assessment in Albania by Mott MacDonald, (2011)
14. Instituti Meteoroligjik Shqiptar. Retrieved from: http://www.akti.gov.al/kerkimishkencor/institucione_ash/ihm.html
15. Introduction To Csi Bridge, (2011). Retrieved From: Https://Wiki.Csiamerica.Com/Display/Csibridge/Home

Imperfection impact on behavior of the secondary nonstructural elements and vertical non precise erection of members

Armend Mujaj[1], Florim Grajçevci[2], Driton R. Kryeziu[3], Zijadin Guri[4], Fisnik Kadiu[5]

1 Politechnical University Faculty of Civil Engineering in Tirana,
2 Univeristy of Prishtina, "Faculty of Civil Engineering and Architecture",
3Politechnical University" Faculty of Civil Engineering in Tirana,
4 University, Faculty of Civil Engineering in Skopje,
5 Politechnical University of Tirana, Faculty of CE
armend20mujaj@gmail.com1, florim.grajcevci@uni-pr.edu2
driton_kryeziu@yahoo.com3, guri.zijadin@gmail.com4, kadiufisnik@gmail.com5

Abstract. In this paper of works will be try to present the fundamental computation referring to the imperfection impacts phenomena of non-precise erection effects of the structural members as are vertical columns. Depends from the structural type, the structure should have a vertical structural members with the enough vertical and shear capacity provoked from horizontal action of earthquake, wind, dead and imposed vertical loads. The structural designers, during the structural computation are improve the several approximations creating the dynamic modeling, having into the consideration of structural elements classification in the prior and secondary structural elements. It is very none that the structural vertical elements have a designed capacity from the horizontal actions, the nonstructural elements has the indirect impact on the structural behavior at all. Also the non-precise erection phenomena or imperfection of the vertical structural members is very important in the structural behavior.

Key Words: Structure, nonstructural elements, non-precise erection - imperfection.

1. Introduction

Upon dealing with the designing of structural elements, based on best designing practices, without having into consideration the type of the material, its destination and stories (floors), it has do go through some phases which are in a way connected to each other. As the first phase has to do with the structural concept, the second phase deals with the static-dynamic analysis of the structure, the third phase deals with the dimensioning of comprised elements, usually the fourth one shows the details of elements and its verification. During the first phase, the designers mostly do the preliminary calculation by adopting dynamic calculation models, in a way that to do the dimensioning of structure elements. Within these calculation models are mainly taken into account the supporting elements, and not those that are treated as secondary elements – constructive. In this paper mainly is going to be treated the secondary elements (constructive) on the behavior and reaction of structures in general. Upon dealing with structures, especially with vertical load of high intensity, the issue of imperfection should be taken seriously into consideration as for dealing with single isolated elements, such as columns, and to those that are combined with each other, portal frames.
According to EN 1992-1-1 for single isolated column or portal frame under vertical load, imperfection can be expressed by supposing that the structure or its elements gets a deformation by creating an angle θ in respect to vertical axis, as shown below:

$$\theta_i = \theta_o \cdot \alpha_h \cdot \alpha_m = \frac{1}{200} \cdot \frac{2}{\sqrt{H}} \cdot \sqrt{0{,}50\left(1+\frac{1}{n'}\right)} \quad (1)$$

θ_0- represents the base value that is recommended to be 1/200, but it can also be as a part of coefficients determined by National Annexes,
θ_h- represents a reduction factor which is in the function of column height or portal frame and has the values $2/3 \leq \theta_h \leq 1{,}0$,
θ_m- represents a factor of reduction for the number of elements,
H- the height of elements that are taken into consideration (columns or portal frames),
n'- represents the number of vertical elements that do contribute on the effect of imperfection.
In Figure 1 is shown the way of calculation upon the effect of imperfection on the single vertical structural elements, such as columns, respectively the calculation of horizontal component from the action of vertical loads.
The phenomena of imperfection can be calculated even for elements that are parts of the structure whereby in the Figure 2 will be represented three models and the way of its treatment for imperfection. The effect of vertical load upon the structure which shows the bending moment and rotation moment could be substituted with equivalent forces in multiple floor structure where its imperfection could be approximated by adding in every level of floors one horizontal force, as it is shown in the Figure 2, whereby their values can be calculated with the formula as it is shown below:

$$H_i = \frac{V_k \cdot \Delta_i}{H_{story}} = V_k \cdot \theta_i \qquad k=1,2,3 \ldots \qquad (2)$$

where:
V_k - is the total load of one floor in the structure

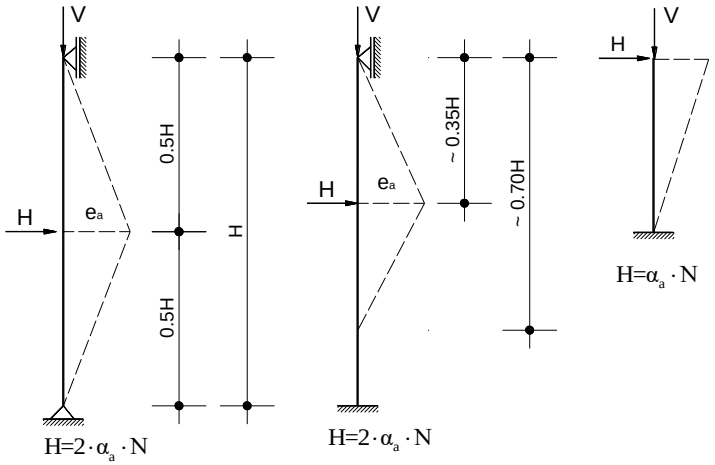


Figure 1. The presentation of horizontal load from the action of vertical loads as a result of imperfection upon the elements of the structure.

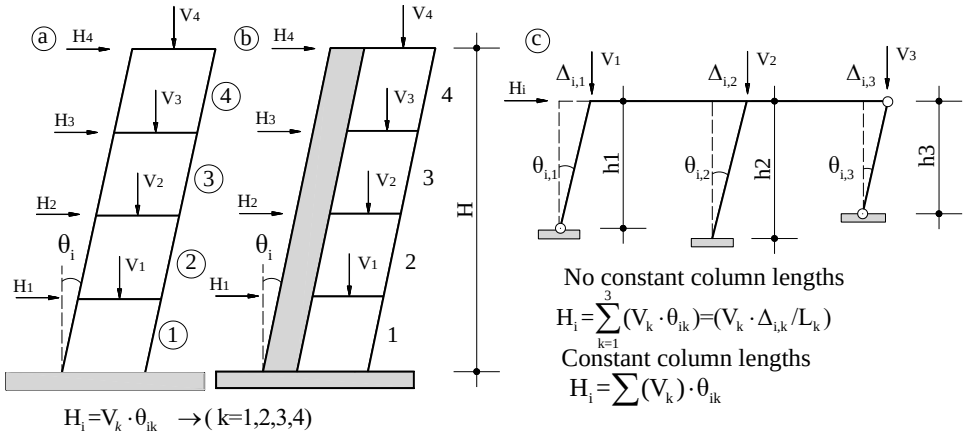


Figure 2. Types of structures with vertical loads and the determination of its imperfection a) the structure type of portal frame, b) combined structure and c) portal frame structure with two spans

Structures without stiffness elements could be treated as non-moveable construction joints if every element (column) holds more than 70% of the central average force $N_{Ed,m}$, which is calculated with the formula as shown below:

$$N_{Edm}=0{,}70\cdot\sum\frac{V_{Ed}}{n} \quad (3)$$

$$\sum V_{Ed}=\sum G_{Ed}+\sum Q_{Ed} \quad (4)$$

n - the number of vertical elements of the structure including columns and walls,
G_{Ed} - the sum of vertical loads calculated as dead load,
Q_{Ed} - the sum of horizontal loads calculated as live load.

Point 4.2.2 (4) of EN-1988-1, suggest that the total contribution of all secondary seismic elements (constructive), on the side rigidity shall not exceed the value 15% of the contribution of all primary seismic elements.

$$\frac{\rho_w}{\rho_{MR}}=\frac{K_{MR}}{K_w}\le 15\% \quad (5)$$

2. Numerical part

To better analyze the phenomena of imperfection in Figure 3 it shown the multistory object P+14, with residential destination. The height of all floors is h=300 cm. The elements that are about to be taken into consideration are the secondary vertical construction elements towards its reaction of imperfection phenomena. During the analysis of the given structure, in order to absorb the horizontal loads from seismic movements, for our analysis are taken into account only the vertical elements, as it is shown in the Figure 3, that are walls W-1, W-2 and W-3, and the effect of imperfection by vertical loads it is not taken into consideration.

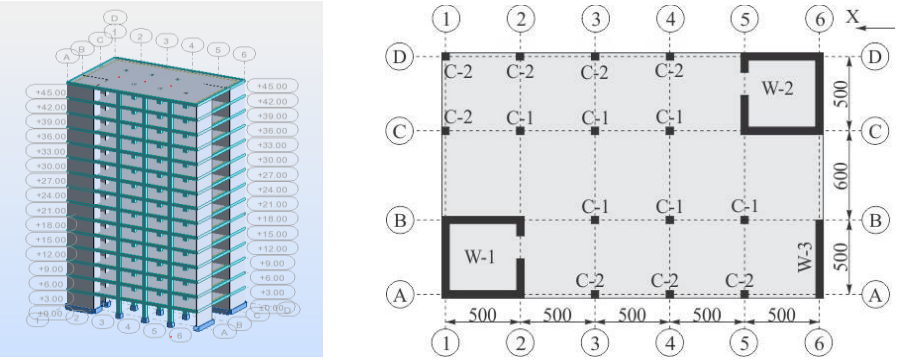


Figure 3. Plan and the view of analyzed structure

Table 1. The material quality use the structure

Analysis	Statics	Seismic
Concrete C 30/37	f_{ck}=30N/mm^2 γc=1,50 $f_{cd}=f_{ck}/\gamma_c$=20.0 N/mm^2 E=32000N/mm^2	f_{ck}=30N/mm^2 γc=(1,30-1,50) $f_{cd}=f_{ck}/\gamma_c$=20.0N/mm^2 E/2=16000N/mm^2
Reinforcement S-500	f_{yk}=500N/mm^2 γs=1,15 $f_{yd}=f_{yk}/\gamma_s$=435N/mm^2 E=200000N/mm^2	f_{yk}=500N/mm^2 γs=(1,0-1,15) $f_{yd}=f_{yk}/\gamma_s$=435N/mm^2 E=200000N/mm^2

Table 2. Seismic forces and following parameters

Directions	unit	X-X	Y-Y
weight	[kN]	70737	70737
center of stiffness	[m]	11,843	7,90
center of masses	[m]	12,50	8,00
static eccentricity	[m]	0,657	0,10
accidental eccentricity	[m]	1,250	0,80
dynamic eccentricity	[m]	0,873	0,10
maximum eccentricity	[m]	2,780	1,00
minimum eccentricity	[m]	-0,9215	-0,75
bending	[λ]	1,56	1,56
torsional radius r_i	[m]	11,30	12,38
Ls	[m]	8,568	8,568
$0{,}30e_{oi}$	[m]	3,39	3,72
e_{oi}	[m]	0,657	0,10
base acceleration a_g	[m/s^2]	0,25g	0,25g
fundamental period T_c	[s]	1,7096	1,695
behavior factor	no	3,00	3,00
spectral type	no	B	B
spectral ordinate	no	0,07312	0,07375
coefficient λ	no	0,85	0,85
factor importance γ_I	no	1,00	1,00
base seismic forces	[kN]	4396,50	4434,33

Shear control stability and torsion using European code, for designing, are given with the expression shown below:

$$\alpha_{xy} = h_{tot} \cdot \sqrt{\frac{F_v}{E_{cm} \cdot I_c}} \le \begin{cases} 0{,}2 + 0{,}1n & \text{for } n \le 3 \\ 0{,}6 & \text{for } n \ge 4 \end{cases} \quad (6)$$

$$\alpha_T = \varphi \cdot h_{tot} \sqrt{\frac{F_v}{E_{cm} \cdot I_\omega} \cdot \left(\frac{d^2}{12} + c^2 \right)} \le \begin{cases} 0{,}2 + 0{,}1n & \text{for } n \le 3 \\ 0{,}6 & \text{for } n \ge 4 \end{cases} \quad (7)$$

Table3. Control stability in shear and torsion

Loads		**Geometrical data**	**Stability control**		
Permanent	Live	Structure height	Shear -x direction	Shear -y direction	Torsional
kN/m^2	kN/m^2	m	α_x	α_y	α_T
10.65	2.00	45.00	0.352	0.321	0.24

Table 4. Distribution of seismic force on the floors of the structure in the direction x-x

Level	**Zi (m)**	**Wi (kN)**	**WiZi (kNm)**	**Fb (kN)**	**Fi (kN)**
15	45	3860.7	173731.5	4396.5	455.07
14	42	4776.88	200628.96	4396.5	525.52
13	39	4776.88	186298.32	4396.5	487.99
12	36	4776.88	171967.68	4396.5	450.45
11	33	4776.88	157637.04	4396.5	412.91
10	30	4776.88	143306.4	4396.5	375.37
9	27	4776.88	128975.76	4396.5	337.84
8	24	4776.88	114645.12	4396.5	300.30
7	21	4776.88	100314.48	4396.5	262.76
6	18	4776.88	85983.84	4396.5	225.22
5	15	4776.88	71653.2	4396.5	187.69
4	12	4776.88	57322.56	4396.5	150.15
3	9	4776.88	42991.92	4396.5	112.61
2	6	4776.88	28661.28	4396.5	75.07
1	3	4776.88	14330.64	4396.5	37.54
Shuma:		70737.02	1678448.7		4396.50

Table 5. Distribution of seismic force on the floors of the structure in the direction y-y

Level	**Zi (m)**	**Wi (kN)**	**WiZi (kNm)**	**Fb (kN)**	**Fi (kN)**
15	45	3860.7	173731.5	4434.33	458.99
14	42	4776.88	200628.96	4434.33	530.05
13	39	4776.88	186298.32	4434.33	492.19
12	36	4776.88	171967.68	4434.33	454.33
11	33	4776.88	157637.04	4434.33	416.46
10	30	4776.88	143306.4	4434.33	378.60
9	27	4776.88	128975.76	4434.33	340.74
8	24	4776.88	114645.12	4434.33	302.88
7	21	4776.88	100314.48	4434.33	265.02
6	18	4776.88	85983.84	4434.33	227.16
5	15	4776.88	71653.2	4434.33	189.30
4	12	4776.88	57322.56	4434.33	151.44
3	9	4776.88	42991.92	4434.33	113.58
2	6	4776.88	28661.28	4434.33	75.72
1	3	4776.88	14330.64	4434.33	37.86
Shuma:		70737.02	1678448.7		4434.33

After the axial value is calculated in vertical elements, such as columns and walls, depending its position and location upon the structure, it results that the value of the axial force on axis A-A and D-D have the value N_{Ed}= 126,75 kN respectively N_{Ed}=213,0 kN, which is lower than $N_{Ed,0.70}$, therefore

are not taken into calculation, and the number of elements that have impact in the effects of imperfection is equal to 10.

Table 6. Imperfection phenomena coefficients determination

α_{a1}	$\sum_{VEd}$ (kN)	$N_{Ed,m}$ (kN)	n (members)	$N_{Ed,0.70}$ (kN)	n' (members)	α_n
$5 \cdot 10^{-3}$	7486,80	440,40	17	308,28	10	0.742

Table 7. Presentation of additional impacts from vertical loads upon the structure

Level	Zi (m)	Wi (kN)	θ	Hi (kN)
15	45	3860.7		4.32
14	42	4776.88		5.35
13	39	4776.88		5.35
12	36	4776.88		5.35
11	33	4776.88		5.35
10	30	4776.88		5.35
9	27	4776.88		5.35
8	24	4776.88	0.0011	5.35
7	21	4776.88		5.35
6	18	4776.88		5.35
5	15	4776.88		5.35
4	12	4776.88		5.35
3	9	4776.88		5.35
2	6	4776.88		5.35
1	3	4776.88		5.35
			∑	**79.23**

Conclusions

Based on the results obtained in our study, and not only, but also referring to the contemporary literature, we can emphasize that the structural designers shall be based by the designing codes, in particular EN-1992-1 which it pays more attention to the phenomena of imperfection to the constituent elements of structure. It should be recalled that imperfection takes into account a number of errors which could be done during the time of designing, execution and structure maintenance, especially its impact is at the case of flexible structure, so that horizontal shift are evident and have a significant value as it is the case of structural elements type of skeleton, structural elements from steel especially to those of precast type.

References:

1. Eurocode 8*"Design of structures for earthquake resistance-Part 1"*2004
2. Michael N. Fardis Eduardo C. Carvalho Peter Fajfar *"Alain PeckerSeismic Design of Concrete Buildings to Eurocode 8"* 2015 by Taylor & Francis Group, LLC
3. GEORGE G. PENELIS and GREGORY G. PENELIS "*Concrete Buildings in Seismic Region*" 2014
4. MICHAL N. FARDIS *" Seismic Design,Assessment and Rretrofitting of Concrete Buildings-basen on EN-Eurocode 8"*, Patras Greece 2009
5. Y. ELGHAZOULI," Seismic Design of Buildings to Eurocode 8" , London, 2009

6. ERNEST & SOHN"Beispiele zur Bemessung nach DIN 1045-1 Band 2- Ingenieurbau", Berlin 2006
7. Prab Bhatt Thomas J. MacGinley Ban Seng Choo "Reinforced Concrete Design to Eurocodes Design Theory and Examples Fourth E d i t i o n"2014
8. Armend Mujaj, Florim Grajçevci, Driton R.Kryeziu "Seismic Analysis of Structural building with reinforced concrete shear walls according to the European Standards" International Annual Conference Architecture - Spatial Planning and CivilEngineering IC ASPCE 2014, November 7-8, 2014, Durrës, Albania
9. Florim Grajçevci,Armend Mujaj, Zijadin Guri, Driton R.Kryeziu "General criteria of structural control in shear and torsion effects based on required European standards" International Conference on Earthquake Engiand Seismology ISSIZ- Shkup 2015
10. ARMEND MUJAJ "Behavior of Reinforced Concrete Wall System Under the Seismic Action" Master Thesis Prishtina 2012
11. A.GAULKE & W.KONN"Konstruktiver Ingenieurbau II Stahlbetonbau", Berlin 2004
12. MUSTAFA HRASNICA" Seizmicka Analiza Zgrada"Sarajevo 2005
13. EMIR HADŹI-MUSIĆ"Aseizmićke Konstrukcije *u Visokogradnji"* Sarajevo 1985
14. ALFONS GORIS, WIRTSCHAFTSING, GERHARD RICHTER und HELMUT KIRCHNER" Stalbeton und Spannbeton Nach EC 2 Teil 1*"* Berlin 2000
15. Eurocode 0*"Basic of structural design",*2002
16. Eurocode 1*"Action on structures"*2002
17. Eurocode 2*"Design of concrete structures"*2004
18. Autodesk Robot Structural Analysis Professional 2015"
19. The design program "AutoCAD 2009"

The impact of Municipal Waste Water in Neredime River, Kosovo

Bekim Selimi

UBT – Higher Education Institution
bekimselimi@gmail.com

Abstract. Today, environmental protection is of great concern in Kosovo. Almost all waste water effluents from the localities are discharging in surface water and groundwater without being significantly treated deterioning water quality in Kosovo's rivers. The aim of this paper is to analyze the level of pollution in the Neredime river created from municipal wastewater as well as to identify pollutants and their impact on the river. An attempt has been made to present the situation of the waters defining physicochemical water qualities of Neredime river from the source to the outskirts of town in the south-west of Ferizaj; this includes 5 (five) stations in different seasons. Determining the level of pollution is made using twelve physicochemical parameters such as: Temperature, Turbidity, pH value, Dissolved Oxygen (DO), Potassium Permanganate Demand, Chlorures, Ammonia, Nitrites, Nitrates, Iron, Manganese and Conductivity. Rating curves were drawn on the basis of results obtained in the laboratory for each parameter. The arguments have been used to classify the water quality in each of the study areas. According to the results of laboratory analysis of the samples taken, it is appearant that the river water shows major water quality changes from the source to the outskirts of town. It was observed that the values of physico-chemical parameters exceeded the tolerable limits at almost every station. This may be due to the high impact of human activities, unprotected areas along the river and direct discharge of municipal effluent which may include other individual pollutants. The river autopurification ability is low, especially during the summer when the pollution level is greater while the amount of river flow is low.

Keywords: Surface Water Pollution, River Autopurification Ability, Municipal Waste Water, Physicochemical parameters.

1. Introduction

Kosovo has limited water resources (surface water as well as groundwater) therefore protection and rational use of them is vital for society and for sustainable economic development of the country. As a result of their geographical position, the Kosovo rivers penetrate very little of its territory and quickly leave the territory. The continuous increase in demand for water, food and energy, and the continuous discharges of waste streams with no sanitary landfills and climate changes, are all indicators which obligates a different access to water as a limited resource. Today the rivers are used as collectors of all urban and industrial discharges. In regions with low density of population, problems of pollution of surface waters are not noticeable because of the river self-cleaning ability; these rivers fail to withstand direct wastewater discharges (untreated) especially in urban areas and for this reason are observing adverse effects on aquatic spaces, risk of infection, etc.

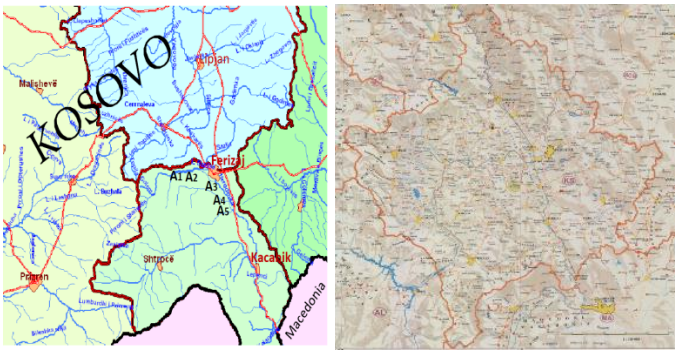
Thorough studies will accurately determine the current state of surface water and to what extent they are able to accept wastewater dischargers without harming the characteristics of clean water. Besides these it is necessary to conduct surveys on the prevention of discharge waste water in hydro resources over the limit values as defined by the permitted norms. [1]

With this research has been specified the level of water pollution in river Neredime, which passes international border through Lepenc river being poured into the Vardar River and then into the Aegean Sea. Therefore, this research aims to raise awareness of the region's population, that effective measures be taken to better management of the waters of the river in order to preserve the flora and fauna of the river Neredime and other rivers in the territory of Kosovo.

2. Materials and methods

In order to research water quality of the river Neredime made physic-chemical analysis of water samples at five sample-locations that flow along the river. Sampling is done after preliminary study of the river as well as the sample-places. Research periods of physical-chemical parameters have been developed in three seasons: in summer, autumn and winter, when it can be seen that there are different data depending on the season when the research is done. Sampling places are chosen so that it can be transmitted to water quality change with very little influence of anthropogenic factors (A1) as well as sample-places where we have big sources of pollutants, especially from municipal sewer. Is hold serious account for distance between sample-places with aim to enabled getting out of conclusions for compare their reciprocal. Sampling places are marked with A1, A2, A3, A4 and A5.
A1 - Place of the two junctions of river, in the village of Neredime; A2 - Before entering the town of Ferizaj; A3 – Place after leaving the town of Ferizaj; A4 - Place near municipal wastewater discharge, the second discharge of sewage city collector on the outskirts of the village Varosh; A5 – Near the village Gurëz respectively 600m from place of discharging the second wastewater city collector.
For the determination of physico-chemical parameters of contaminated water samples were used standard methods of chemical analysis such as: classical methods (Titrimetria) and spectrophotochemical methods (UV-VIS spectrophotometer). During the experimental work there are used chemicals and solvents purity from different manufacturers such as "Merck" "Alkaloid", etc. Initially there are prepared base solutions and diluting their concentrations are prepared with the necessary solutions. Conductivity is measured with Conductometer "Conduktivity / TDS, Meter, HACH"; The turbidity with Turbidimeter "2100 P"; pH value with pH meter "Metrohm 632". Spectrophotometric determinations are made with photometer "Palintest 5000" and spectrophotometer "HACH 2010".

Fig. 1. Map showing location of sampling area in Neredime River at Ferizaj region, Kosovo



3. Sample Analyses

In the European Union Countries, the assessment of the results for quality of the surface water are reported based on the qualifying system, in which the quality of the water is considered to be satisfactory in the first category until the third. The water of the fourth category are considered as polluted water, whereas of the fifth category is considered extremely polluted water. Table 1 shows the qualification set by Economic Commission of the United Nations for Europe, UNECE. [2]
During the research we have followed the change of water quality of the river water Neredime in various site-sampling through these parameters; temperature, pH value, conductivity, turbidity, dissolved oxygen, chemical oxygen consumption, chloride, nitrite, nitrate, ammonia, manganese and iron. Analyses were conducted at the Institute of Public Health-Regional Institute in Ferizaj. Because of lack of the laboratory conditions, determination of heavy metals concentration was impossible.
Water samples were taken and preserved according to water sampling regulations (Dalmacija, 2000). [3]
Table 1. Classification of the river water according to UNECE (content mg/l)

Category	P_{total}	NO_3^-	DissolvedO_2	BOD_5	COD	NH_4^+
Quality I	<10	<5	>7	<3	<3	<0.1
Quality II	10-25	5-25	7-6	3-5	3-10	0.1-0.5
Quality III	25-50	25-50	6-4	5-9	10-20	0.5-2
Quality IV	50-125	50-80	4-3	9-15	20-30	2-8
Quality V	>125	>80	<3	>15	>30	>8

Table 1. Samples results in five (5) locations in summer season

	RESULTS			Summer Season		
	Type of Analysis	**A1**	**A2**	**A3**	**A4**	**A5**
1	Water Temperature, °C	15	16	16	18	18
2	Air Temperature, °C	26	26	26	26	26
3	Turbidity NTU/FTU	7.06	5.79	5.13	12	11.31
4	PH Value	8.52	6.82	8	8.1	7.25
5	Dissolved Oxygen, mg/l	7	6.5	4	1.5	2.5
6	Potassium Permanganate Demand,mg/l	4.74	8.22	12.64	30.12	30.97
7	Chlorures, mgCl/l	11.36	14.2	15.97	53.96	50.41
8	Ammonia, mgN/l	0.09	0.2	0.93	>1.5	>1.5
9	Nitrites, mgN/l	0.009	0.046	0.171	0.05	0.042
10	Nitrates, mgN/l	0.1	0.45	0.67	0.44	0.14
11	Iron, mgFe/l	0.02	0.14	0.34	0.49	0.51
12	Manganese, mgMn/l	0.06	0.1	0.2	0.5	0.45
13	Conductivity, µs	270	342	395	620	597

Table 2. Samples results in five (5) locations in autumn season

	RESULTS			Autumn Season		
	Type of Analysis	**A1**	**A2**	**A3**	**A4**	**A5**
1	Water Temperature, °C	5	8	8	10	9
2	Air Temperature, °C	8	8	8	8	8
3	Turbidity NTU/FTU	24.16	3.89	6.44	23.35	16.12
4	PH Value	7.75	7.73	7.7	7.67	7.1
5	Dissolved Oxygen, mg/l	7.5	6	5.5	2	2.5
6	Potassium Permanganate Demand,mg/l	5.37	8.85	11.06	24.65	25.91
7	Chlorures, mgCl/l	7.455	9.94	18.46	36.21	43.31
8	Ammonia, mgN/l	0.1	0.25	0.9	>1.5	>1.5
9	Nitrites, mgN/l	0.005	0.033	0.095	0.057	0.048
10	Nitrates, mgN/l	2.1	2.84	5.2	10.2	12.2
11	Iron, mgFe/l	0.03	0.1	0.3	0.55	0.5

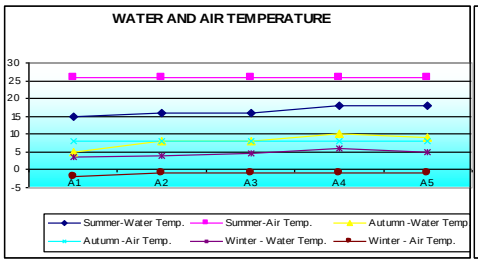
12	Manganese, mgMn/l	0.055	0.09	0.19	0.513	0.46
13	Conductivity, µs	240	356	387	506	508

Table 3. Samples results in five (5) locations in winter season

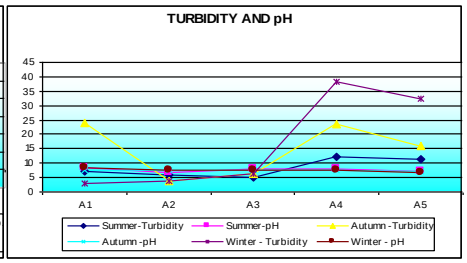
	RESULTS	Winter Season				
	Type of Analysis	**A1**	**A2**	**A3**	**A4**	**A5**
1	Water Temperature, °C	3.5	4	4.5	6	5
2	Air Temperature, °C	-2	-1	-1	-1	-1
3	Turbidity NTU/FTU	2.86	3.77	6.26	38.23	32.56
4	PH Value	8.31	7.69	7.75	7.66	6.67
5	Dissolved Oxygen, mg/l	8	6.5	5.5	2	2.5
6	Potassium Permanganate Demand,mg/l	3.16	6.32	12.64	26.54	27.81
7	Chlorures, mgCl/l	7.1	12.42	14.55	29.56	33.72
8	Ammonia, mgN/l	0.02	0.68	1.72	>1.5	>1.5
9	Nitrites, mgN/l	0.003	0.048	0.058	0.079	0.069
10	Nitrates, mgN/l	0.77	1.57	0.68	0.52	0.1
11	Iron, mgFe/l	0.02	0.22	0.4	0.34	0.36
12	Manganese, mgMn/l	0.031	0.181	0.272	0.571	0.537
13	Conductivity, µs	237	429	451	522	563

Results and Discussions

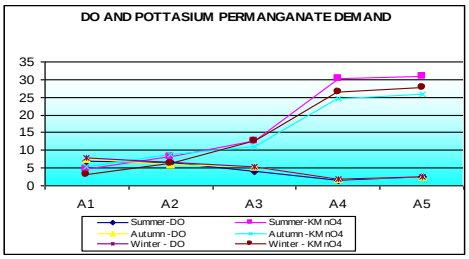
From the results experimentally obtained seen that by a clean river where water can be used for recreation, fishing, irrigation and even drinking water, due to the impact of pollutants in the exit from the city of Ferizaj, water of Neredime river suffers significant shift in quality.



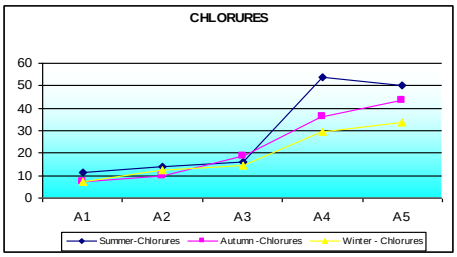
Graph. 1.



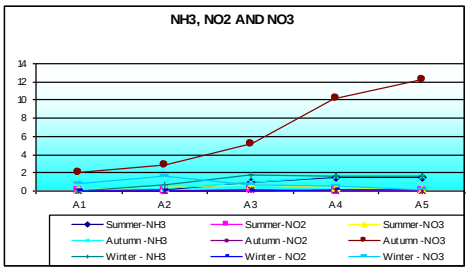
Graph. 2.



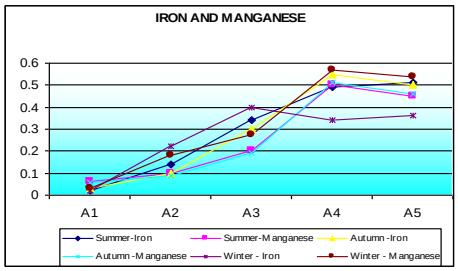
Graph. 3.



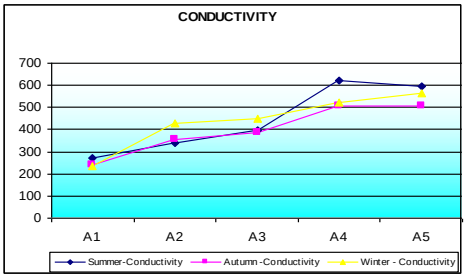
Graph. 4



Graph. 5.



Graph. 6.



Graph. 7.

By comparing the average results of tests taken during the monitoring features of the classification of the quality of rivers by UNECE, the monitored water quality can be classified in the category of water quality II (A1), quality III (A2), quality IV (A3) and the quality V (A4 and A5). In these waters (A3, A4 and A5), there are no conditions for life to aerobic organisms, and at the same time can also be a potential source of various infectious diseases.

Conclusıon

After testing of the physico-chemical water parameters of river Neredime, southwest branch, in certain locations and at different periods of the seasons, we can draw the following conclusions: - Based on the results of laboratory analysis at the Institute of Public Health-Regional Institute of samples taken at the water river Neredime shows that the water of the river undergoes major differences from the source to the outskirt of the town Ferizaj. On the sampling place A1, the water is relatively clean. Characteristic is that in this location found a little bit of turbidity. It is present because the riverbed is stony and sandy as well as the high speed of the water flow. In sampling place A2, after crossing several villages and before entering the city, the parameters indicate that the water here has not essential physico-chemical changes in terms of pollution with organic matter. Comparing with the previous sampling place, in this locality observed low increase of pollution parameters. Higher pollution of the river water observed at the sampling place A3, the river segment at the exit from the city. Lower values of dissolved oxygen, increasing the presence of ammonia and especially

high values of nitrites in this location make this pool of highly contaminated river and unfavorable to the living environment. Especially in this location it was noted a large presence of solid waste such as paper, plastic masses, etc. In sampling place A4, near the discharge of municipal wastewater, there are observed major pollution exceeding every category and pollution in this level makes the river without life. High values of COD, chlorides, ammonia and especially small presence of dissolved oxygen make this segment of highly contaminated river. The values of organic parameters found experimentally in sampling place A5, about 600 m from the city sewage discharge, remain high compared to standard values. Characteristic of this is that the samples taken after the distance of the discharge, still the amount of dissolved oxygen remains low as well as other parameters have not suffered decrease, which shows that the water of the river is dead environment for aerobic organisms. Anaerobic bacteria can not live when dissolved oxygen is present. They use chemically combined oxygen such as nitrates (NO3) or sulphates (SO4). They are active in anaerobic digestion and are associated with treatment processes including: decomposition, odor and septic (infection). [4]
Then, ammonia is the first product of the decomposition of organic materials. His presence over the values set by the EU clearly shows water loaded with organic matter. At high concentrations the ammonium very easily oxidized into nitrates. Ammonium content in drinking water is a sign of their microbial contamination (from sewage). Ammonia is acting as toxic to fishes, especially in the form of neutral molecules.[5] From this we can say that self-cleaning capacity of the river is minimal. This is because the amount of flow of the river is small compared with large discharges and this makes impossible to clean waste water from the river itself. With tendency to Kosovo to move towards European integration it needs to act to fulfill the preconditions for the ratification of the more environmental conventions and protocols. Since the most of the Kosovo rivers flow outside its borders, the Republic of Kosovo must pay attention to maintaining the quality of these waters and particularly the possibility of ratification of the Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes. Pollution knows no national boundaries. Pollutants emitted in a country by air currents, streams of water, food and in other ways, often carried in very large distances, and so often attack the countries that are not sources of pollution. Contamination of the environment by volume, types and consequences has reached such proportions that it has become the concern of all humanity. [6] Kosovo's national policy includes EU integration process. One of the challenges is to meet the EU environmental standards and the harmonization of national legislation with EU legislation. Kosovo is working to harmonize with EU directives through the Water Framework Directive (2006/12 / EC), the Directive on Urban Waste Water (91/271 / EEC), Drinking Water Directive (98 / 83 / EC) and Nitrates Directive (91/676 / EEC). [7]

References

1. Katundi, K., (2000), Furnizimi me ujë dhe kanalizimi, Pjesa II, shblu, Tiranë.
2. European Commission Environment, (http://ec.europa.eu/environment/water/water-drink/index_en.html)
3. Dalmacija, B., (2000), Water quality Control in Towards of Quality Management. Novi Sad.
4. Texas Engineering Extension Service, Water and Wastewater Training Program, Unit I & II .
5. Çullaj, A., (2005), Kimia e Mjedisit, Tiranë.
6. Rozhaja, D. & Jablanoviq, M., (1983), Ndotja dhe mbrojtja e ambientit jetësor, ETMM, Prishtinë.
7. USAID-Kosova, (2009), Environmental Threats and Opportunities Assessment (ETOA).

Design of bearing capacity of the driven piles of a highway bridge foundation according to 3 different methods

Papa Dhimitri[1], Dervishi Idlir[2]

[1,2]Faculty of Civil Engineering, Polytechnic University of Tirana, Albania
dhimitri.papa@gmail.com[1], idlirdervishi@hotmail.com[2]

Abstract. Contemporary design methods of bearing capacity of deep foundation (pile foundation) change according to different design codes. The main requisition of the designing process of the deep foundation is related with the axial bearing capacity, which should be sufficient to withstand the applied loads. Many authors has developed and published detailed methods to analyze the behavior of a single reinforced concrete pile or a group of piles, based on vertical bearing capacity due to lateral friction or residence at the pile point. The goal of this paper is to illustrate the calculation methods according to 3 analytical methods of vertical bearing capacity of bored single pile and group of piles of a bridge foundation. Only the vertical loads are considered during the design process. Shear loads and bending moment act as horizontal loads on the group of piles. A comparison between three different methods is shown to determine the bearing capacity and the stress limit allowed. The bridge is located in the 26 kilometer of Elbasan-Tiranë highway.

Keywords: Bearing capacity, reinforce concrete pile, lateral friction, bored piles.

1. Introduction

The bridge is located in the 26 kilometer of Elbasan-Tiranë highway. In this paper a comparison between three different methods is shown to determine the bearing capacity and the stress limit allowed. Determination of the bearing capacity of a bored pile is studied in details by many different researchers. Given that in the deep foundations reinforced concrete piles are usually placed in a group, it is very important to determine the bearing capacity of the group of piles. Bringing the group of piles is more complex, but less studied as a whole. In this paper, the deep foundation is represented by a group of 15 piles of reinforced concrete cast in place. The piles have lengths of 12.0 m (D) and are placed in two different geological layers (Figure 1), referred to the report of the Geological Survey. It is calculated the allowed bearing capacity during the fixing process of a bored pile by three different analytical methods:

According to the methodology of CODUTO [1] [2]:

$$P_a = \frac{q'_t A_t + \sum f_s A_s}{F} \quad (1)$$

According to Albania Design Practice [3]:

$$P_d = mk_{dw} \times \left(m_\sigma q'_t A_t + m_f \Sigma f_s A_s\right) \quad (2)$$

According to Japanese Design Practice [3]:

$$P_a = \frac{1}{3}(q'_t A_t + P_s) = \frac{1}{3}\left(q'_t A_t + (\frac{10}{3}\overline{N_s} L_s + \frac{1}{2}\overline{q_u} L_c)\varphi\right) \quad (3)$$

After establishing the allowed bearing capacity and the boundary for a bored pile for each of the above methodologies, it is also determined the effect of the group of piles based on the method of CODUTO through the effectiveness of the group coefficient η. The results obtained by each method are compared analytically and graphically. A detailed study of geological-engineering [4], performed by the Geotechnical Studio "GEO-Terra" and based on two geological drillings (BH-I and BH-II), amounting to 25.0 m of depth, is performed in advance in order to determine the geotechnical parameters of the layers, where the foundation will be fixed. The geometry of the foundation piles beam is given in (Figure 2). The distance between the piles in the group is taken in order of 2.5-3 from the diameter of the pile. The diameter of the piles is obtained B = 1.20 m = 120 cm and length of D = 12.0 m.

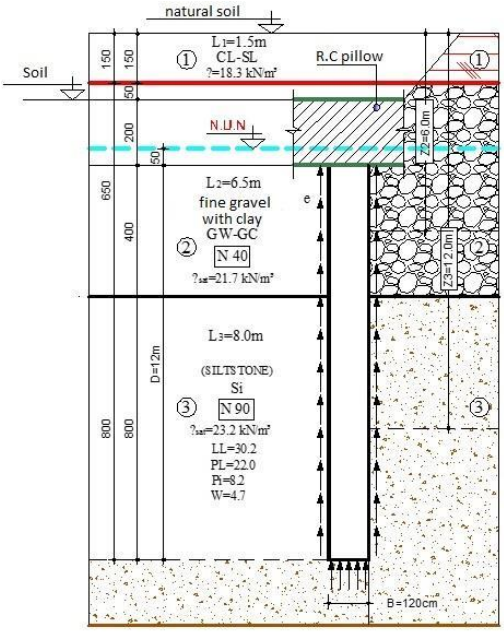


Figure 1: Geological Profile and Setting of the Pile

The piles group is designed with low height pads of H = 2.0 m. By taking in consideration the loads of microstructure, where are included the permanent ones, temporary ones and the weight of soil, there is also defined the foundation design load that operates in the group of piles. Vertical loads, because of the over-structure of the bridge and the weight
of the foundation itself, isPu = 45′640 kN, horizontal loads caused by lateral earth/soil pressure is Vu = 9′975 kN and the maximum/climax moment is Mu = 26′400 kNm.

2. Calculation of axial bearing capacity during pile fixing process

2.1 Calculation of bearing capacity by CODUTO

In terms of the resistance at the pile point and in lateral friction, the allowed bearing capacity during the fixing process of the bored pile is determined by the equation:

$$P_a = \frac{q'_t A_t + \sum f_s A_s}{F}$$

Are determined the coefficients and terms that participate in the above equation:

F=3 Safety factors

Bearing surface of contact at the pile point:

$$A_t = \frac{\pi\, B^2}{4} = \frac{3.1415 \times 1.2^2}{4} = 1.13\ m^2$$

Net bearing resistance at the pile point defined by the formula:

$$q'_t = 57.5 \times N_{60}$$

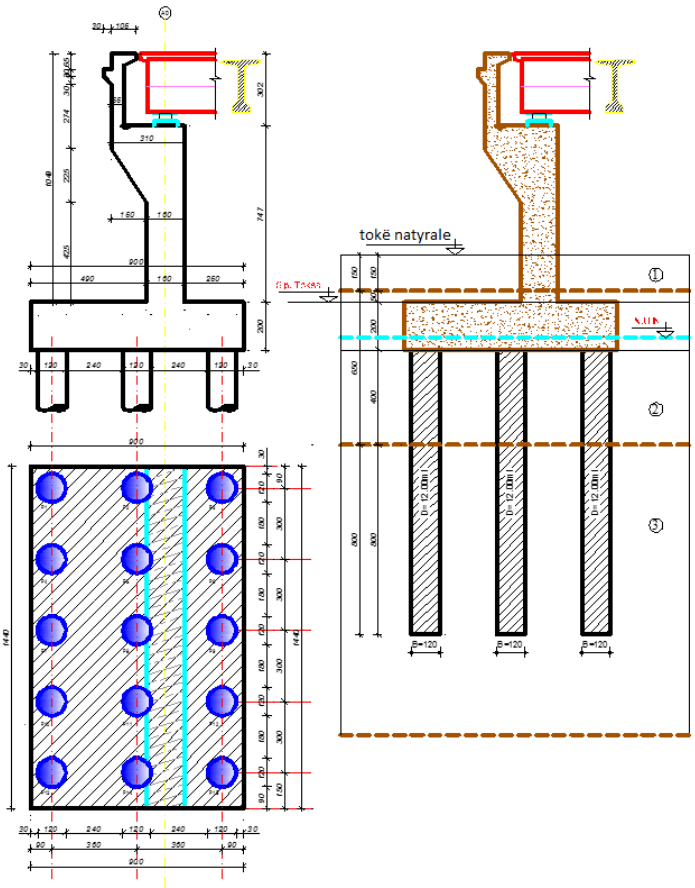


Figure 2: The Group of Foundation Piles of the Bridge in the Highway

$$N_{60} = \frac{E_m \times C_B \times C_S \times C_R \times N}{0.60} \qquad (6)$$

E_m = 0.45 from the table 4.3 pg.119 [1]

$C_B = 1.05$ from the table 4.4 pg.120 [1]

$C_s = 1.00$ from the table 4.4 pg.120 [1]

$C_R = 0.85$ from the table 4.4 pg.120 [1]

$N = 90$ the value is measured by SPT laboratory tests
By replacing the above values in equation (3) is found the value for N_{60}:

$$N_{60} = \frac{0.45 \times 1.05 \times 1 \times 0.85 \times 90}{0.60} = 60.24$$

Also, is defined the effective vertical stress σ'_Z at the pile point as follows:

$$\sigma'_Z = \gamma_1 L_1 + \gamma_2 L_2 + (\gamma_{2,sat} - \gamma_w) L_{2,sat} + (\gamma_{3,sat} - \gamma_w) L_3 = \quad (7)$$

$$= 18.3 \times 1.5 + 19.7 \times 2.0 + (21.7 - 9.81) \times 4.5 + (23.2 - 9.81) \times 8 = 230\ kPa$$

As $\sigma'_Z = 230\ kPa > 100\ kPa$ defines $(N_1)_{60}$, the adjusted value for N_{60} is defined by the following equation:

$$(N_1)_{60} = N_{60} \sqrt{\frac{100\ \text{kPa}}{\sigma'_z}} = 60.24 \times \sqrt{\frac{100}{230}} = 39.75 \quad (8)$$

By replacing we determine the value of q'_t :

$$q'_t = 57.5 \times (N_1)_{60} = 57.5 \times 39.75 = 2285.5\ \text{kPa} \quad (9)$$

It is determined the lateral surface of the contact of the pile with layer 2 and 3:

$$A_{s2} = \pi\, B\, L_2 = 3.14 \times 1.2 \times 4.0 = 15.07\ \text{m}^2$$

$$A_{s3} = \pi\, B\, L_3 = 3.14 \times 1.2 \times 8.0 = 30.14\ \text{m}^2$$

It is calculated the value of unit resistance in lateral friction according to Method β [1] for the second layer:

$$f_{s2} = \beta \times \sigma'_{Z2} = 1.15 \times 96.5 = 112.2\ \text{kPa} \quad (10)$$

Where:

$$\beta = 1.5 - 0.245\sqrt{z} = 1.5 - 0.245\sqrt{2.0} = 1.15 \quad (11)$$

z = 2.00 m it is the depth of the middle of the second geological layer

Value of β is accepted in accordance with the above results, after:

$$(N_1)_{60} = 39.75 > 15$$

σ'_{Z2} Effective vertical stress among the second layer, which is defined as:

$$\sigma'_{Z2} = \gamma_1 L_1 + \gamma_2 L_2 + (\gamma_{2,sat} - \gamma_w)(z_2 - L_1 - L_2) = \quad (12)$$

$$= 18.3 \times 1.5 + 19.7 \times 2.0 + (21.7 - 9.81)(6 - 1.5 - 2) = 96.57\ kPa$$

It is calculated the value of unit resistance in lateral friction according to Method β [1] for the third layer:

$$f_{s3} = \beta \times \sigma'_{Z3} = 0.8 \times 174.2 = 139.2\ \text{kPa} \quad (10)$$

Where:

$$\beta = 1.5 - 0.245\sqrt{z} = 1.5 - 0.245\sqrt{8.0} = 0.80 \quad (11)$$

z = 8.00 m it is the depth of the middle of the third geological layer

Value of β is accepted in accordance with the above results, after

$$(N_1)_{60} = 39.75 > 15$$

σ'_{Z3} effective vertical stress among the second layer, which is defined as:

$$\sigma'_{Z3} = \gamma_1 L_1 + \gamma_2 L_2 + (\gamma_{2,sat} - \gamma_w)L_{2,sat} + (\gamma_{3,sat} - \gamma_w)\frac{L_3}{2} = \quad (12)$$

$$= 18.3 \times 1.5 + 19.7 \times 2.0 + (21.7 - 9.81) \times 4.5 + (23.2 - 9.81)\frac{8}{2} =$$

$$= 174.2\ kPa$$

Allowed bearing capacity during the fixing process of the bored pile, according to the methodology [1] results in:

$$P_a = \frac{q'_t A_t + \sum f_s A_s}{F} = \frac{2285.5 \times 1.13 + (112.2 \times 15.07) + (139.2 \times 30.14)}{3} \quad (1)$$

$$= 2823.1\ \text{kN}$$

Boundary bearing capacity during pile fixing process will be:

$$P_{ult} = P_a F = 2823.1 \times 3 = 8469.3\ kN \quad (13)$$

Allowed bearing capacity during the fixing process of the bored pile, according to the methodology [1] results in:

$$P_{ag} = \eta \times N \times P_a \quad (14)$$

By using the efficiency factor of the group, it results in:

$$\eta = 1 - \theta \frac{(n-1)m + (m-1)n}{90 \times m \times n} \quad (15)$$

Where:

$m = 5$ *number of rows of piles*
$n = 3$ *number of piles in a row*
$\theta = tg^{-1}\left(\frac{B}{S}\right) = tg^{-1}\left(\frac{1.2}{3.6}\right) = 15.48$
$S = 3.6\ m$ *is the axial distance between piles*
$B = 1.2\ m$ *is the diameter of pile*

$$\eta = 1 - 15.48 \frac{(3-1) \times 5 + (5-1) \times 3}{90 \times 5 \times 3} = 1 - 15.48 \times 0.0162 = 0.75$$

is defined the allowed and boundary bearing capacity in the group of piles (N = 15 piles):

$$P_{ag} = 0.75 \times 15 \times 2823 = 31\,760\ kN$$

$$P_{ag,ult} = 0.75 \times 15 \times 8469 = 95\,276\ kN$$

2.2 The calculation of the bearing capacity by Albania Design Practice

Bearing capacity during the fixing process (compression) Pd of the design of a pile, taking into account the resistance in lateral friction at the pile point and the resistance is calculated by the following formula [2]:

$$Pd = mkdw \times (m\sigma qt' At + mf \Sigma fsAs) \quad (16)$$

Where:

$m = 0.65 \rightarrow$ Coefficient of working conditions for piles cast in place
$kdw = 0.7 \rightarrow$ In case of bearing capacity of piles which are working during the fixing process
$m\sigma = 0.9 \rightarrow$ Coefficient of working conditions at the pile point
$mf = 0.6 \rightarrow$ Coefficient of working conditions on the lateral part of the pile

It is determined the contact surface at the pile point At:

$$A_t = \frac{\pi B^2}{4} = \frac{3.1415 \times 1.2^2}{4} = 1.13 \text{ m}^2$$

It is determined the lateral contact surface during rubbing A_s for the geological layers 2 and 3:

$$A_{s2} = \pi B L_2 = 3.14 \times 1.2 \times 4 = 15.07 \text{ m}^2 \quad \text{(layer 2)}$$
$$A_{s3} = \pi B L_2 = 3.14 \times 1.2 \times 8 = 30.14 \text{ m}^2 \quad \text{(layer 3)}$$

It is determined unit resistance in lateral rubbing f_s for the geological layers 2 and 3:

$f_{s2} =$ 53 kPa, (layer 2) for $z_2 = 4\ m$ and $I = 0.3$

$f_{s3} =$ 65 kPa, (layer 3) for $z = 10\ m$ and $I = 0.2$

It is determined the net resistance at the pile point q_t':

$$q_t' = 10860\ kPa$$

By replacing values, we would have the value of axial bearing capacity:

$$P_d = mk_{dw} \times \left(m_\sigma q_t' A_t + m_f \Sigma f_s A_s\right) = \quad (16)$$

$$= 0.65 \times 0.7 \times [0.9 \times 10860 \times 1.13 + 0.6 \times (53 \times 15.07 + 65 \times 30.14)] =$$
$$= 5778.0 \text{ kN}$$

Considering that the Albanian Design Practice recommends a safety factor equal to 1.68, boundary bearing capacity during the fixing process of the pile will be:

$$P_{ult} = P_d \times F = 5778 \times 1.68 = 9707 \text{ kN} \quad (13)$$

2.3 Calculation of bearing capacity by Japanese Design Practice

According to Japanese Standards for buildings, allowed bearing capacity in the fixing process P_a of the pile foundation is determined by the following formula, based on the dates of SPT test:

$$Pa = \frac{1}{3}(q'_t\, At + Ps)$$

Where:

$$q_t' = 150\,\overline{N} = 150 \times 60 = 9000 \text{ kPa for piles of concrete cast in place}$$

Bearing surface of contact at the pile point A_t :

$$A_t = \frac{\pi B^2}{4} = \frac{3.1415 \times 1.2^2}{4} = 1.13 \text{ m}^2$$

Resistance during lateral rubbing is determined by the following formula:

$$P_s = \left(\frac{10}{3}\,\overline{N_s}\; L_s + \frac{1}{2}\overline{q_u}\; L_c\right)\varphi \qquad (16)$$

Where:

$\varphi = 2\,\pi\,r = 3.768$ m

$\overline{N_s} = 30$

$L_s = 12.00$ ml

$\overline{q_u} = 0$ kPa Average compressive resistance to axial clay soil

$L_c = 0$ m Total length of pile in contact with clay soils

$$P_s = \left(\frac{10}{3} \times 30 \times 12\right) 3.768 = 4521.6 \text{ kN}$$

By making the replacements in the equation 4, we will obtain the value of axial bearing capacity:

$$P_a = \frac{1}{3} \times (9000 \times 1.13 + 4521.6) = 4897.2 \text{ kN} \qquad (3)$$

Japan's Building Standard recommends a safety factor equal to 3, so that boundary bearing capacity will be:

$$P_{ult} = P_a \times F = 4897.2 \text{ kN} \times 3 = 14691.6 \text{ kN} \qquad (13)$$

Conclusions

1. The group of the foundation piles of the bridge in the highway is represented by 15 piles with diameter of 1.20m and length of 12.00 ml.
2. The method of calculation according to CODUTO foresees the calculation of bearing capacity of the group of piles in vertical load, based on the bearing capacity of the bored pile, coefficient of efficiency of the group and the number of piles. In Albanian and Japanese practices design, this calculation is not provided.
3. The allowed values of the bearing capacity of the bored pile with vertical load calculated according to the methods mentioned above have resulted in:

According to Coduto: $P_a = 2823.1$ kN
According to Albanian Practice: $P_d = 5778.0$ kN
According to Japonese Practice: $P_a = 4897.2$ kN

Graphically, the values stated above are presented in the chart below (Figure 3):

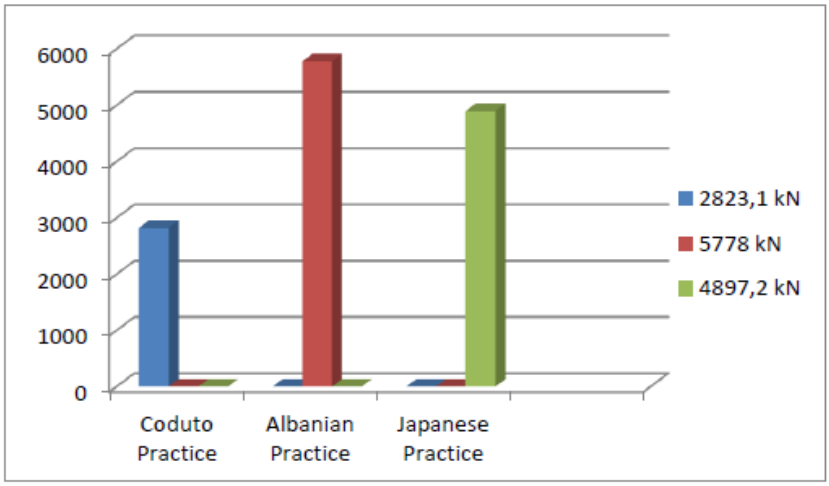


Figure 3. Comparison of Allowed Bearing Capacity [kN]

4. The values of bearing capacity of bored border pile on vertical lord calculated according to the methods mentioned above have resulted in:

According to Coduto: P_{ult}=8469.3 kN
According to Albanian Practice: P_{ult}=9707.0 kN
According to Japanese Practice: P_{ult}=14691.6 kN

Graphically, the values stated above are presented in the chart below (Fig.4):

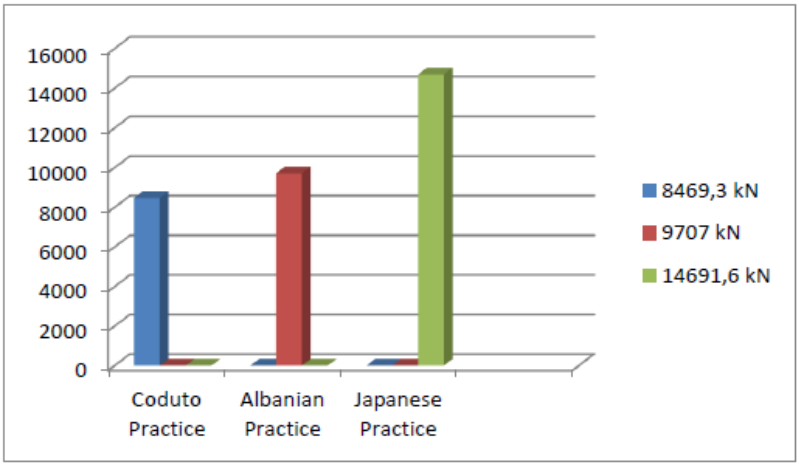


Figure 4. Comparison of the Boarder Bearing Capacity *[kN]*

5. Allowed bearing capacity of the bored pile calculated by Albanian practice results in 90% higher than that calculated under Coduto, and 18% higher than that calculated under Japanese practice.
6. Border bearing capacity of bored pile calculated by Albanian practice results in 14.6% higher than that calculated under Coduto, but 50% lower than that calculated by the Japanese Practice.
7. For the group of piles we are studying, the effectiveness factor of the group resulted $\eta = 0.75$. Allowed capacity for the group has resulted Pag= 31 759.8 kN and the border one Pag,ult=95 276 kN. The design load that acts on the foundation is Pu = 45 650 kN.

References

1. FOUNDATION DESIGN, Principles and Practices, DONALD P. CODUTO, Second Edition, Prentice Hall Inc., (2001)
2. THEMELET E THELLA, Ushtrime të Zgjidhura, Dr. Eng. Neritan SHKODRANI, UPT-FIN, Tiranë (2001)
3. DINAMIKA E PILOTAVE, Parimet Bazë dhe Zbatime, NERITAN J. SHKODRANI, UPT-FIN, Tiranë (2001)
4. GEOTECHNICAL EVALUATION & FOUNDATION DESIGN OF BRIDGE, FROM CH 25.+734 to CH. 25.+805, GEO Terra & CO, Athens 2012
5. PRINCIPLES OF FOUNDATION ENGINEERING, Braja M. Das, 4th EDITION

Advanced Construction Materials for Highway Applications

Altin Bidaj[1], Irakli Premti[2], Hektor Cullufi[3]

[1,2,3] Polytechnic University, Faculty of Civil Engineering, Department of Mechanics of Structures, Tirana, Albania
altinbidaj@yahoo.com[1]

Abstract. Nowadays cost of highway materials increase every year. In addition, use of marginal materials results in early development of pavement distress, requiring more frequent repairs also rehabilitation, associated lane closures, traffic congestion in high volume traffic areas which increases the potential for construction zone accidents and increased levels of environmental pollution related to automobile emissions. Therefore, there is a strong desire in our country to optimize the use of materials currently used for highway pavement construction and to seek advanced materials that are cheaper and environmentally friendly. It has now been recognized that the age of limitless construction materials and the use of conventional materials in their present form is fast coming to an end, and new technologies need to be developed to continue to support the rehabilitation and reconstruction of pavements. Today, concerns about limited availability and sustainability are driving the search for new and advanced materials for highway construction. In this paper we describe the potential for considering the use of alternative materials, also encourage the industry to accelerate the development and implementation of products still under development. The materials range from materials under development to recently commercialized materials.

Keywords: construction materials, next generation sustainable cement, ecofriendly cements.

1. Introduction

Increased traffic, generally limited availability of funds for highway improvement, diminishing raw materials and concerns related to the environmental impact of construction, bring the need to evaluate technologies for a better performance of roads by ensuring that pavements are longer lasting, safer and environmentally friendly. This article is about limited availability and sustainability and also for the search of new and advanced materials for highway construction. The next generations of cements are in various stages of development. Alkali activated and geo polymer cements are already being used on a limited basis and will have higher demand in the next years.

1.1 Advanced construction materials

It is important to find advanced construction materials in order to:

- Extended service life.
- Optimized use of locally available materials.
- Achieving environmental benefits as reduced related emissions.
- Reduced work zone, related to traffic delays and safety concerns.
- The use materials that reduce the potential for early failures.
- Reduced costs
- Conservation of resources, support national efforts to create sustainable solutions to minimize impact of construction on the environment.
- Reduced ecological footprint.

1.1.1 The damage phenomena

In engineering materials exposed to complex mechanical and environmental loading (e.g. temperature and humidity variation etc.), constant micro structural (or structural depending on material types) changes occur, causing a drop of strength. In general such effects are complex, but at macroscopic scale can be seen as so called material damage. Depending on material type, the damage phenomena can be understood differently, for concrete material damage begins by de-bonding between aggregates and cement. In damage mechanics there is the possibility to distinguish some characteristic types of damage. The most important types are presented below.

Brittle damage

Brittle damage occurs when a crack is initiated without a large amount of plastic strains.

Ductile damage

Ductile damage happens simultaneously with plastic deformations larger than a certain threshold on the graph of stress as a function of strain. It results from the nucleation of cavities due to de-bonding between inclusions and the matrix which causes local plastic instability.

Creep damage

When materials have viscous properties, damage can occur at a constant stress level. Total strains gradually increase and cause irregular cracks.

Low cycle fatigue damage

When materials are subjected to cyclic loading with large stress or strain amplitude values, damage develops with plastic deformation in three phases: incubation, nucleation and micro crack propagation. In case of low cycle fatigue, the damage can be either inter granular or trans granular.

High cycle fatigue

This case is contrary to low cycle fatigue damage. Here, damage is observed for a higher number of cycles with lower amplitude of stresses or strains. Depending on material type subjected to such cyclic loading, the plastic strain at the meso level remains small and is often negligible. Then damage symptoms can be observed at the micro scale.

1.2 Next generation sustainable cements

As sustainability becomes increasingly important in the construction of transportation infrastructure, approaches are being made to reduce the environmental footprint of concrete, which is the most widely used construction material in the world. The key to reducing the carbon footprint of concrete is therefore to reduce the amount of portland cement used, and one way of accomplishing that is through the use of next generation cement binders that significantly reduce CO_2 emissions. Although portland cement is a relatively minor constituent in concrete, it is responsible for 85 to 93 percent of the CO_2 associated with concrete. Research is going to improve and to develop cements that eliminate CO_2. This new category of next generation sustainable cements is still in development. Alkali activated and cements with several other components, will help to obtain low carbon footprint concrete for use in transportation.

The availability of carbon neutral and carbon sequestering cements influence the application in transportation infrastructure, particularly in urban environments where economic incentives through local legislation exist to reduce the carbon footprint. Eco friendly cements are newly developed cement types that are more ecologically friendly than ordinary portland cement. Primarily, these cements are capable of reducing the amount of greenhouse gas (CO_2) emissions associated with their production, but they are also capable of sequestering and using additional CO_2 as part of the curing/hardening process that concrete mixtures undergo. The primary benefits associated with the use of eco friendly cements are their sustainability features and overall environmental friendliness. They incorporate solid waste and sewage sludge, can be produced at lower kiln temperatures, and also absorb and sequester CO_2, while also possessing rapid hardening abilities. Once fully developed, ecological cements like Novacem and SC^4 will significantly reduce the carbon footprint of the built environment. In addition, other eco cements that incorporate waste materials will help reduce landfill requirements and the energy and CO_2 emissions associated with hauling wastes. Improving the strength, also the permeability properties of $SC^{4\ will}$ influence positively the longevity of concrete structures and pavements, thus increasing the sustainability of infrastructure.

Conclusions

The limited availability is the factor to push for new and advanced materials for highway construction. In this paper we described the potential for considering the use of alternative materials. Next generation sustainable cements will significantly reduce the carbon footprint of the built environment. This could have significant global impact as a way to mitigate the long term effects of global climate change. The adoption of specific elements of cement and performance specified cements, will increase innovation in producing more environmentally benign cements specifically linked to performance.

References

1. Harrington, D., et al. Guide to Concrete Overlays: Sustainable Solutions for Resurfacing and Rehabilitating Existing Pavements. Ames, IA: National Concrete Pavement Technology Center. 2008.
2. ISO. Environmental Management—Life Cycle Assessment—Principles and Framework 2009.
3. ISO 14040:2006. International Standards Organization. 2009.
4. www.iso.org/iso/catalogue_detail?csnumber=37456.
5. Krantz, L. Jobs Rated Almanac.Sixth Edition. Fort Lee, NJ: Barricade Books, Inc. 2002.
6. Marceau, M., M. Nisbet, and M. VanGeem .Life Cycle Inventory of Portland Cement Concrete 2007.
7. PCA R&D Serial No. 3011. Skokie, IL: Portland Cement Association. McDonough, W. and M. Braungart . Cradle to Cradle: Remaking the Way We Make Things. New York, NY: North Point Press. 2002.
8. NRMCA. . Pervious Concrete Pavement: An Overview. National Ready Mix Concrete Association. Accessed June 2009.
9. www.perviouspavement.org

Processing of GIS data and building of 3D dem models with FME transformer tools

Hebib Alili[1], Fadil Shehu[2], Shenur Muslija[3]

UBT – High Education Institution
hebib.alili@ubt-uni.net[1], fadilshehu01@hotmail.com[2], shenur@gmail.com[3]

Abstract. The processes of processing of 2D or 3D geodetic or geo-information data by using the FME software and other software's or tools in combination and then through mathematical logics in FME building of such 3D models from original measured terrain data within transformers given by FME, could be considered as very important attempt of creating of such 3D models, exactly when we have to deal with huge data by the size of its as input data. These kind of doing of processing of data through FME software, can be considered as important issue also for resolving of other today related exercises derived from field of geodesy and geo-information. By the way many organizations and private companies or investors require realistic and accurate 3D models of their projects for decision-making through visualization and simulation. Additionally for creating the most accurate 3D models as the final product, both 2D and 3D, often needs to be shared with decision-makers in a different file format.

Keywords: 3D DEM, GIS, GPS, DEM, SRTM, RASTER, 3Dpdf.

1. Introduction

1.1 General Information about FME (Feature Manipulation Engine)

A short history of Safe FME software: Safe Software was founded in 1993, since there was a need to work with a format known as the Spatial Archive and Interchange Format (SAIF) which was very similar to GML. Since "SAIF" was considered "safe," a decision was made to name the software "Safe Software" as the main reason to work with the SAIF format files. In 1993, when the company was founded, the focus was on the translation technology from/into the SAIF format. As they went forward, they realised that other formats could benefit from this technology. By 1996, they had released the first version of their data translation software: the Feature Manipulation Engine. By 2008, they had shortened it to "FME" and since then FME software advanced for support and works on manipulation for different kinds of file formats. FME today has a huge gallery of different transformation functions, known as tool transformers for translation from/into different file formats. Currently, FME supports data in over 300 formats across spatial and non-spatial data types including GIS, CAD, raster, database, 3D, XML, point cloud, and other.

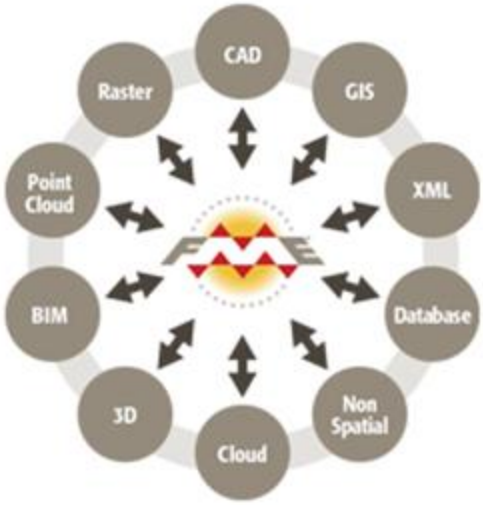


Fig. 1. Safe FME: Exchange formats

The main solutions provided for the transformation of data and formats:

• Applications: CAD products, Bentley products, Erdas Imagine, Intergraph products, ESRI, Google Earth maps, and more.
• Databases: Microsoft SQL Server, Oracle Spatial, PostGIS, Teradata, Google Fusion Tables and Netezza Spatial
• Data types: 3D, CAD and GIS Data Exchange, KML, LiDAR- Point Clouds, Metadata, Non-Spatial, PDF, Raster, Sensor Data, XML etc.

2. Solving the simple exercises by using the FME software.

2.1 Solving a simple case: "Processing of collected data with GPS tracking measurements" using FME software for GIS purposes.

Through these simple exercises we are going to describe the post-processing automatized data processing for our case of data collection with a hand GPS (tracking record method) for GIS implementation projects.

Fig. 2.1. Hand GPS (eTrex)

Fig. 2.2. Waypoint of collected track point with GPS

2.2 Technical approach of the case

The necessary data will be collected in the field (data measurement with a hand GPS using the tracking method) and the recorded tracks or mark point, e.g. measured city roads, places of interest or similar data. These records will be achieved by registering the priority attributes of these data measurements from hand GPS equipment with accuracy 1-10m and by applying the tracking method for measurements. Before the starting of measurements in the field the data will need to be well prepared in advance, knowing the possibilities of GPS installed manufacturer software and its possibilities to make records acceptable for registering such data including these attributes or other relevant information. This preparation form, for recording measurements, will be required for the next processing of these measured data in the office. Secondly, prior to the data post-processing, the data need to be prepared in a such a way, that the input data formats has to be well sorted and formatted in order to be an acceptable data format of its software or tools, which will be used in the next process of data post-processing. These data can be post-processed using primitive incorporating methods and by linking them with the collected GPS track data, point by point, using different software such as AutoCAD, GIS tools or other programmable tools. Processing of these data in this form will be well-prepared, but this will not be as fully automated process. By using the FME software and its possibilities, the user will be able to handle, well manage and very quickly conduct the post-processing of the GPS collected data and also get the required output data format. This output format can then be used as a solution for feature implementation in other projects such GIS implementation or in other types of interpretation for other projects.

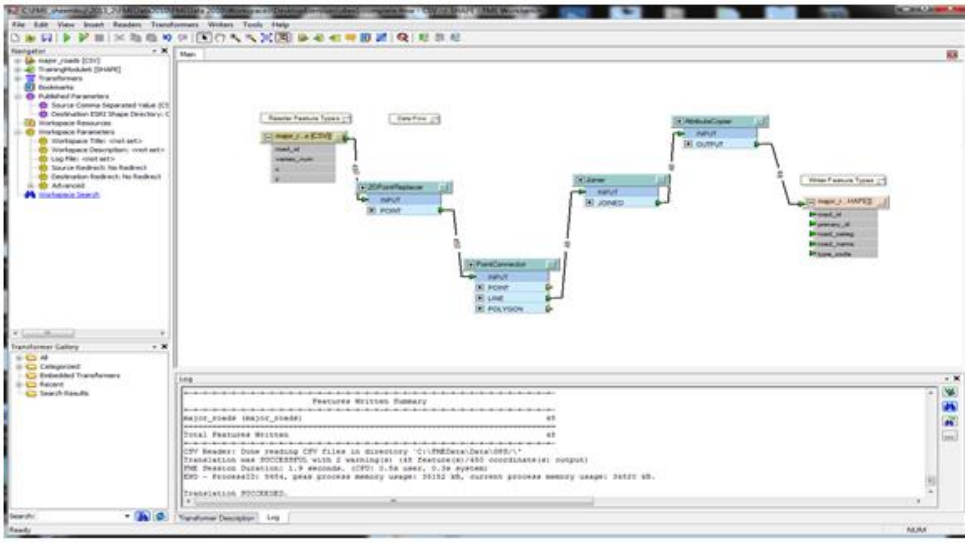


Fig. 3. Workflow: Functional post-processed flows

The FME software is exclusively specialised for reading "Input" of data from different software formats such as GIS, design software, graphical software and other data used nowadays, as well as for writing "Output" for different data file formats. The programming process is related in between input and output in its whole process, where the designer or programmer will make a solution by using of logical operations from the priory predefined FME tools, known as functional transformer tools such as transformers' calculators, raster's, surfaces etc. The project finalisation with a programmable solution using these functional FME predefined transformers tools is known as Functional post-processed flows.

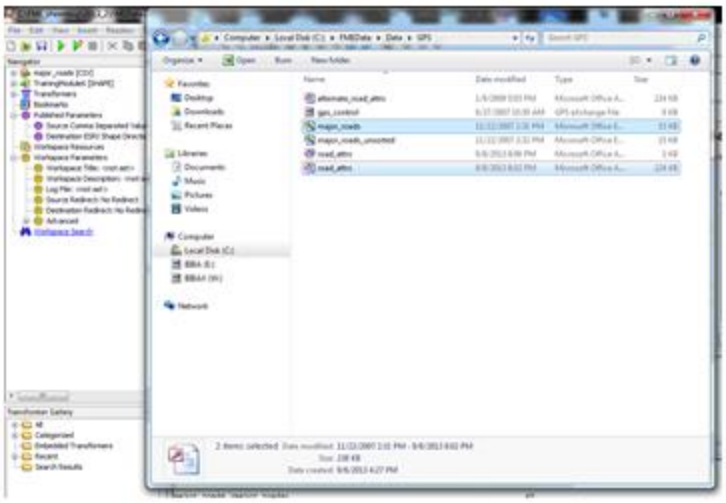
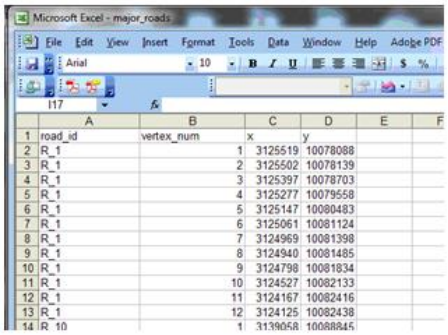


Fig. 3.1. Preparation of data before processing at workflow

Next step, our measured data has to be prepared in advance as a proper file format for the further processing within the FME functional transformers. The whole process of conducting the processing flows will depend on our logical solution, and secondly, should be adoptive with our data to be used in the FME transformers as they by themselves are created. The solution in FME will also depend on the way the workflow process has to be conducted or work without any mistake if we have already performed a good logical solution (through functional FME tools) and this logical solution has to produce our requested preferable output file format. In our case these handled data are prepared in classic software such as text editors or Microsoft products (Excel 2007 or 2010). These GPS data measurements are well sorted and prepared in a form of table and these records by themselves present the information of geodetic coordinates, Id number, attribute of utilities etc. In addition, it will be required that these data are transformed or processed for a prior database file format such as Access table database, known as ".mdb" file format. In this table database, data will be prepared in advance as sorted data information, where then this data will be presented and prepared for feature interpretation as interlink relation due to the work flow process in FME software. Further, the main feature information will present the main information for the type of the road recorded, road ID, road category, attribute of direction, road name etc.



	A	B	C	D	E	F
1	road_id	vertex_num	x	y		
2	R_1	1	3125519	10078088		
3	R_1	2	3125502	10078139		
4	R_1	3	3125397	10078703		
5	R_1	4	3125277	10079558		
6	R_1	5	3125147	10080483		
7	R_1	6	3125061	10081124		
8	R_1	7	3124969	10081398		
9	R_1	8	3124940	10081485		
10	R_1	9	3124798	10081834		
11	R_1	10	3124527	10082133		
12	R_1	11	3124167	10082416		
13	R_1	12	3124125	10082438		
14	R_10	1	3139058	10088845		

Fig. 4.1. Measured data in excel table

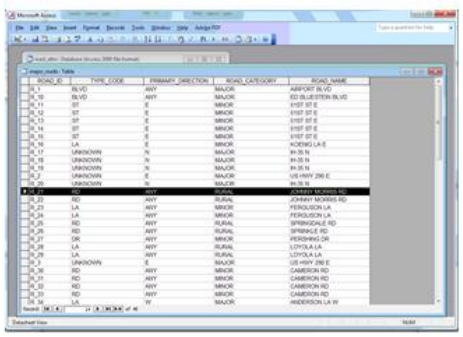


Fig. 4.2. Preparation of data for access table

2.2.1 The workflow process of creating a solution by FME tools for our case.

Firstly, in FME we will read our earlier prepared data in excel format within the FME reading tool for ".csv" file formats. The data of input file formats always have to be accordingly formatted for

FME data flow process and because of this fact, our data from the very beginning of preparation should be prepared for acceptable formats of the calculus in the flows process. For a better explanation, we have to think what data will be used in further calculations, such as numerical data, and what data will be presented as attribute-only, such as non-calculus data as character type of data.

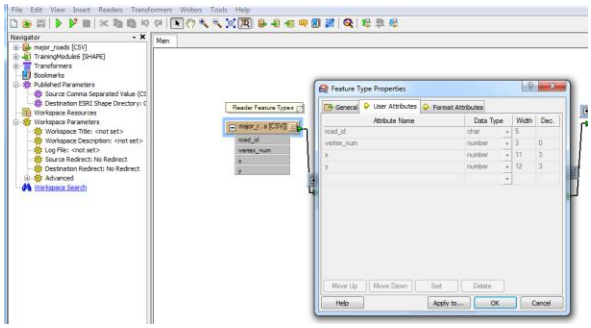


Fig. 5. FME Reader tool for excel data

Having in consideration of these preconditions, for our case as calculus data, will be used 2D coordinates of each GPS measured points represented from origin of ".csv" excel file as coordinates Xi and Yi and for the transformer for these process in the workflow, will be used the "2DPointReplacer" FME transformer tool. These coordinates Xi, Yi at the "2DPointReplacer" as input parameters has to be defined as integer number values.

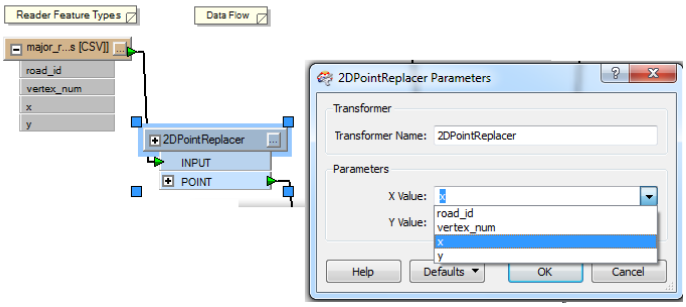


Fig. 6. FME "2DPointReplacer" transformer tool

In the next step forward, for the process of creating of relationship function in between of each priory defined point feature at the origin of ".csv" excel file, will be used the "PointConnector" FME transformer tool. By this, it means that will be created the connections according to the data relation of the measured ID numbers and the relation of its defined attributes, where these attributes are represented as feature at the origin of ".csv" excel file. From these kind, of forming of such relationship, will be possible to be created the new line features (e.g. line measured roads) as output file format. Hence, the input data origin of the "PointConnector", which already comes from the output of "2DPointReplacer", are the 2D coordinates(Xi, Yi) of each tracking GPS points. Based on these, the imaginational GPS measured line collections by its characteristics, will be the feature lines which will derived from the output of the "PointConnector". These feature lines will be related on the information presented for the type of feature data and characteristics information presented for the attribute of feature data.

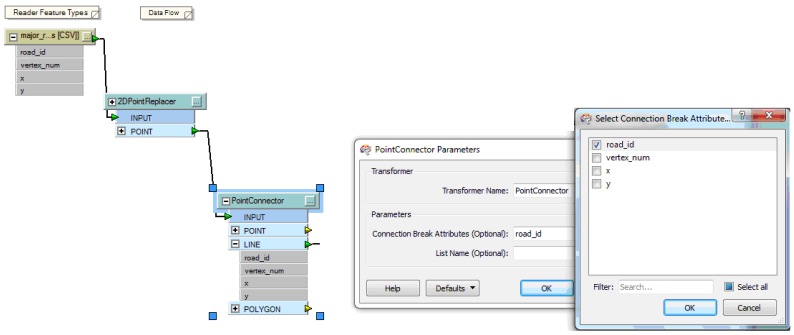


Fig. 7. FME "PointConnector" transformer tool.

After this stage will start the process of joining the attribute definition for each line feature characterised with the data presented in the access database table by using the "Joiner" FME transformer tool.

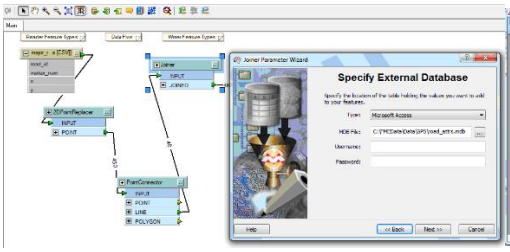


Fig. 8.1. FME "Joiner" transformer tool.

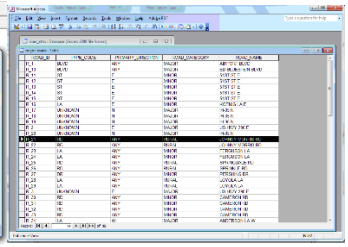


Fig. 8.2. External database(access table).

In this step will be created the connections in between the ".csv" excel table data format and ".mdb" access table data format and also well defined their interrelationship. Firstly, through wizard it is needed to be created a connection with external databases(created database table for our GPS measured data), than the next step, is to be created the data interrelationship in between two different table data formats. By defining the primary keys in both tables, it is easiest of doing the equity or relation in between of these two different tables. These interrelations will be done by defining the matches by equity of key ID numbers in two different data table formats of files.

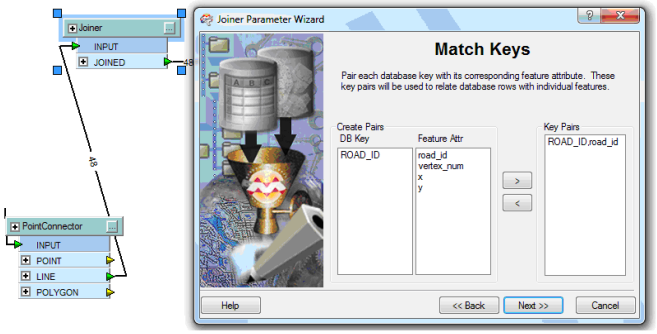


Fig. 9. Matching through equity of keys; FME "Joiner" tool.

Upon completing these matches and the defining process we are ready to copy all data according to the definition on processes of joining the data. These will be done using another transformer tool called "AttributteCopier" which will create new attribute-data from old attribute-data and by copying the rest of these data in order to create the new feature attribute-data.

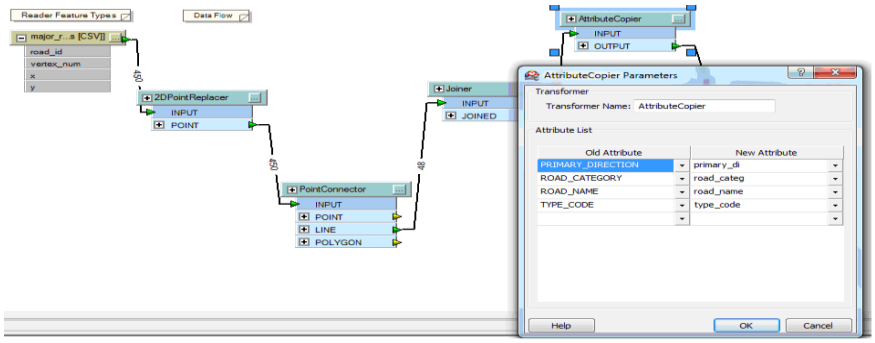


Fig. 10. FME "AttributteCopier" transformer tool.

Before of finalising the solution in workflow, we need to decide, what kind of output source data is needed or requested. Because of this, within the FME, it will be needed to be created the desired or requested output source file and these can be done through the FME "output writers" tools. The desired output data source file, for our case, is preferable the Esri shape file format and the output will be done with the FME "Esri shape writer" tool.

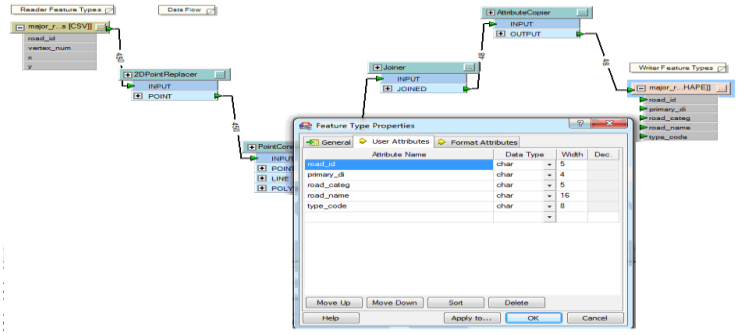


Fig. 10.1. FME "Esri shape writer" tool.

By running of our created solution in the FME and if no error found due to the processing, the data will be created in vector shape file format(known as Esri shape file). These kind of vector file format we can open it from other dedicated software or editor reader for Esri shape files(.shp file).
Here we see, that conducting a logical operation and using already sophisticated tools such FME transformers, we can fully automatize the process and very quickly produce the required data file format. And this produced file will be ready for use in other work or other implementations such as in GIS implementation or other relevant software to be used for other purposes.
Results: vector shape file(.shp file).

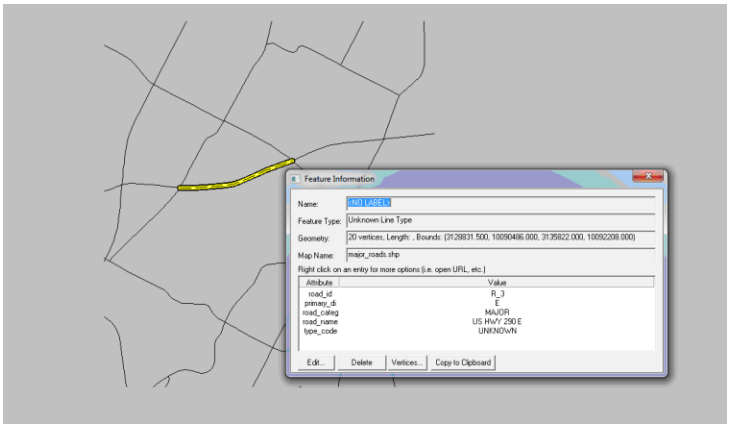


Fig. 11. GM one of software's which can read the shape file formats.

3. Solving the complex cases within the FME solutions

3.1 Creation of DEM(Digital Elevation Model) data surface with overlapping of orthogonal projected Google earth image photo, for a bigger territory by using existing the SRTM(Shuttle Radar Topography Mission) DEM data (3 Arc degrees)

Preparation of existing data sources SRTM data model: The input data are to be used by DEM data sources which we can get from public data source of ORG. For making a DEM file, the SRTM file format data should be read by relevant software designated for processing this kind of format data and then be converted for output as DEM file format. A useful and sophisticated software for the preparation of this kind of data is "Global Mapper" software (GM). The next goal is to exploit these data in process of automatizing through FME functions tools. For testing purposes, to show that data with large size formats can be used for processing and producing a DEM surface file format, we will use SRTM DEM source file for the territory of Kosovo. For creating DEM surfaces from especially large size of format such as SRTM files for today's software in use, it would be impossible to make such processing and create these surfaces with an overlapped photo image. However, for smaller pieces of these kinds of data (SRTM data files), SRTM data with much smaller sizes than our test territory can be processed without any problems with today software designated for creating DEM surfaces with overlapped photo image. In next explanation we want to show that these kinds of data with greater size formats can be processed without any problem, but only by using the solution given from functional FME tools. Firstly, we need to bear in mind that this data entry should be well prepared and processed in a proper way because the goal is to use many other different data format files. Then by merging these data, the final required format can be reached as a photo image 3D DEM surface of larger terrains. Preparation of data sources SRTM DEM and Google Earth print screen photo image as data entry before starting the automatizing processes in FME.

3.1.1 Preparation of DEM file format as USGS (United States Geological Survey) DEM file data from data sources of SRTM DEM file format.

Firstly, we get the source data file format as SRTM file for area of Europe SE (area of (5 Arc degree) x (5 Arc degree)) downloaded from its source origin [3] and then we read this data through GM.

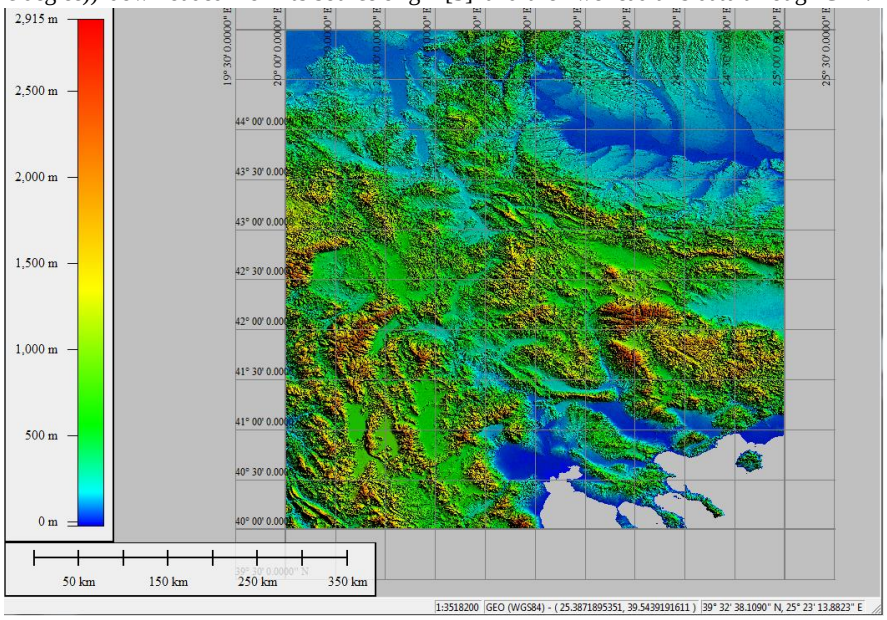


Fig. 12. SRTM (3 arc degree) data for area of Europe (South-East).

From GM we then extract the output format as USGS DEM for the bounding box of the territory of Kosovo. The coordinate system in GM used for this purpose was WGS84.

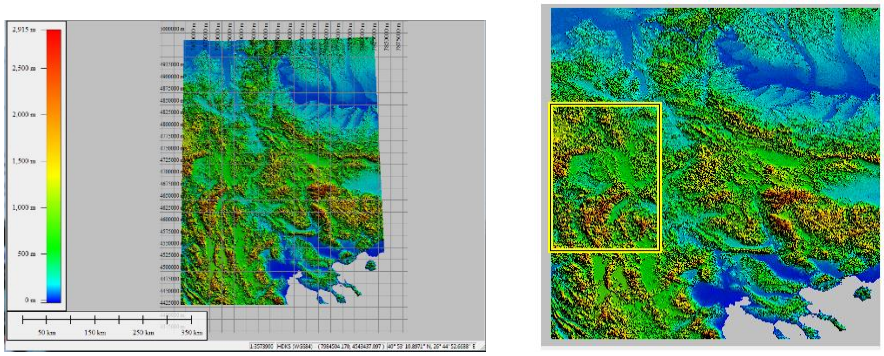
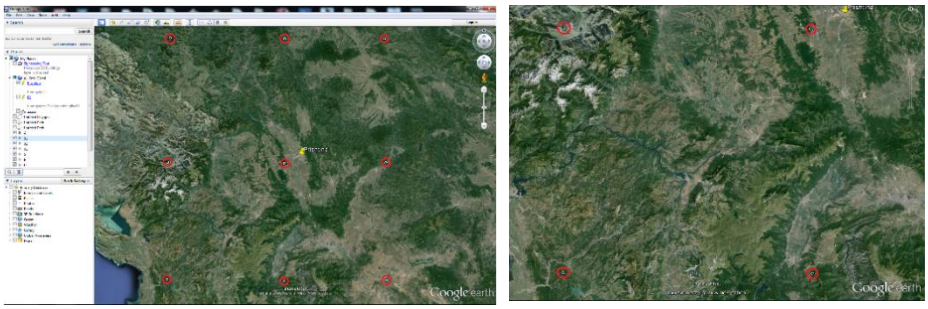


Fig. 13. Extracting by bounding box of desired area(territory of Kosovo)

3.1.1 Preparation of "Print screen Photo images" of Google Earth for overlapping in USGS DEM format file.

Photos of print screen images of part of the territory of Kosovo are taken from the screen shoot on the orthogonal Google Earth screen view. First the Google earth was established in an orthogonal projection exactly in a 2D projection and all back elements of views of Google Earth are cleaned and left to show the only quadratic point market places. These quadratic point market places will represent the base points for geo-referencing photo images and to be formed as one photo image. Merging of the pieces of photos can be done with graphic design software or a solution by any software. In our case geo-referencing of the merged photo will be done by GM and will be projected with our chosen coordinate system of GM.



a) Print screen (Very low resolution) b) Print screen by each quadrants (Much better resolution)
Fig. 14. a) And b) Getting the orthogonal picture print screen of desired area(territory of Kosovo) from Google Earth.

From GM, SRTM file format will be inserted and shape quadratic polygon for correspondent bounding box of pieces of photos aligned to the correspondent coordinate system. Each piece of photos will be inserted due to the process of geo-referencing by correspondent quadratic polygon coordinates of the correspondent photo.

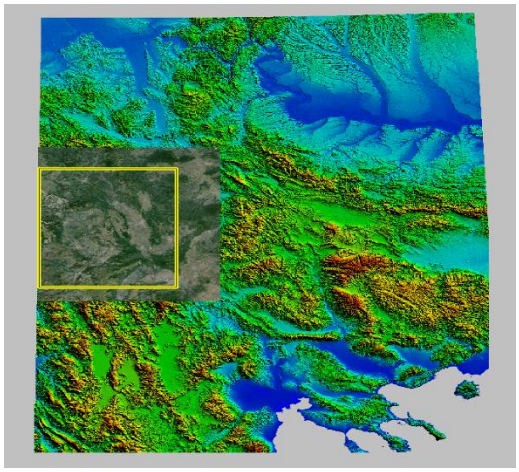


Fig. 15. Overlapping the geo-referenced picture.

The output of export for the elevation data from SRTM data will be done using the USGS DEM format for area (approximately the area of 3 x 3 degree) of the chosen bounding box for the territory of Kosovo, while for the output format for raster for the same bounding box. jpg format will be used. In the FME, the input readers for USGS, jpg and MapInfo format files will be inserted. From USGS data, a logical solution to create the TIN surface from existing functional tools for these purpose, need to be created, and also clippers from clipping of raster image and then be dropped to the created surface from USGS 3D model. The MapInfo vector format will be converted to the process of rasterization and then joined to the new created raster which will be the final raster for dropping to the 3D surface. The output chosen reader can be 3ds, obj or 3Dpdf file format of 3D surface data model.
The input data: Derived USGS DEM elevation; ".jpg" image raster file and MapInfo vector file

a) Derived USGS DEM file b) Image raster file c) MapInfo vector file

Fig. 16. a), b) and c) Input data for workflow in FME

The work flow process:

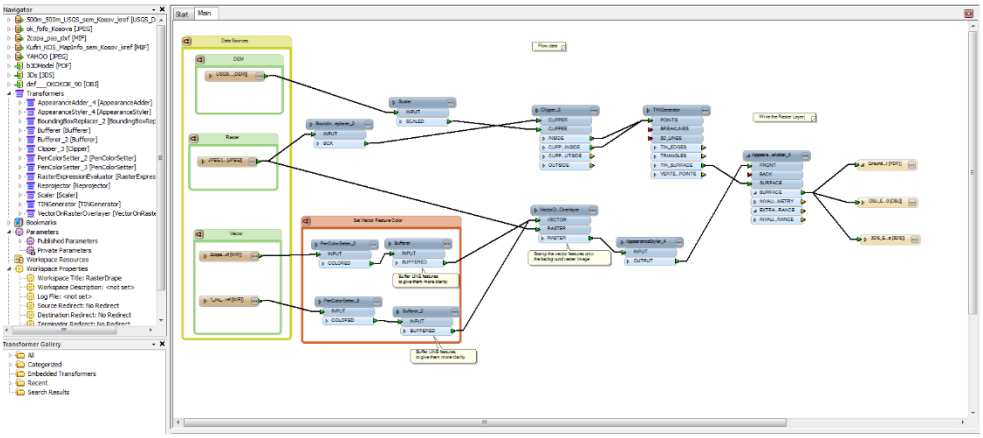


Fig. 17. The workflow: Input data, transformers and output data in FME

The output product: 3D DEM surface of Kosovo.

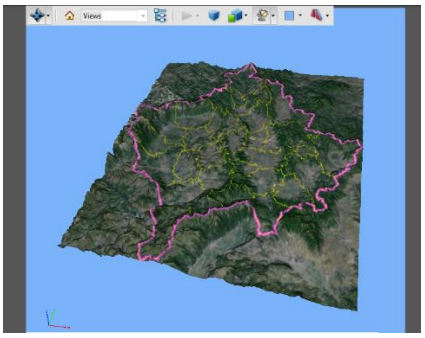


Fig. 18.1. The output as ".3Dpdf" file

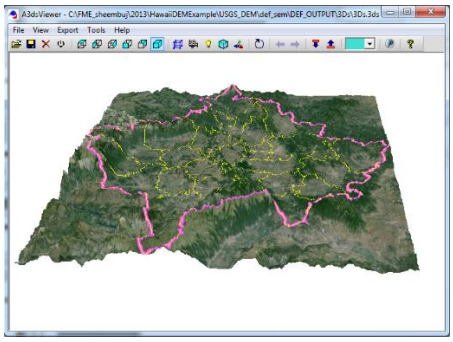


Fig. 18.2. The output as ".3ds" file

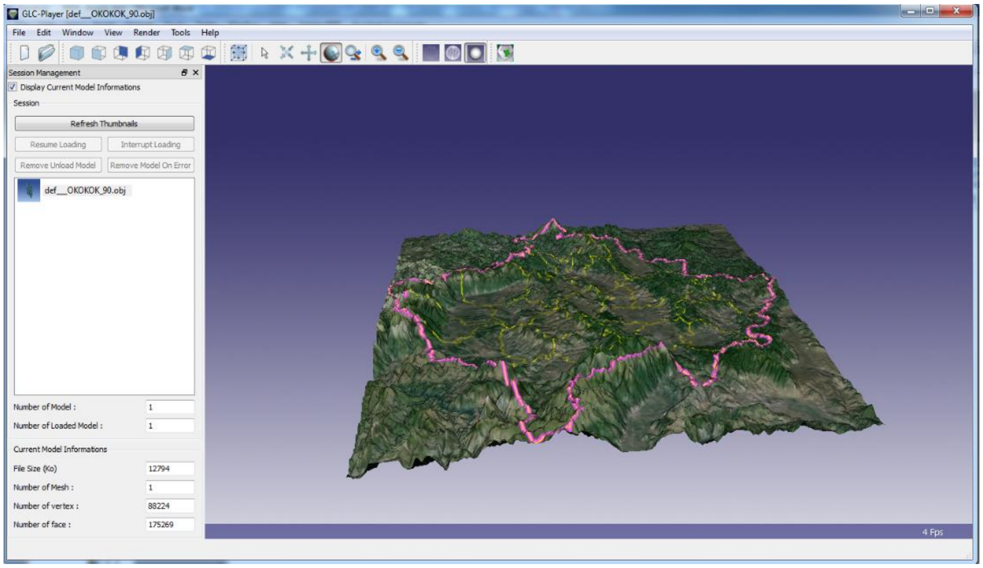


Fig. 18.3. The output as ".obj" file

The result in the editor of FME software:

```
=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-
=-=-=-=-=-=-
Translation was SUCCESSFUL with 0 warning(s) (3
feature(s) output)
FME Session Duration: 2 minutes 13.6 seconds. (CPU:
125.0s user, 4.8s system)
END - ProcessID: 5492, peak process memory usage: 912648
kB, current process memory usage: 683676 kB.
Translation was SUCCESSFUL
=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-
=-=-=-=-=-=-
```

Conclusion

FME provides unlimited flexibility in data model transformation and distribution and also format support for data translation and integration. By using the Safe FME, the FME can converts data between over 300 formats of data such: GIS, CAD (AutoCAD), raster, Point cloud, 3D, BIM, XML, cloud, non-spatial, and database formats and it has over 400 transformers for manipulating data content and structure. Therefore with the transformers integrated within FME we can create 3D models out of 2D data, that will give the most accurate picture of what is happening, then share this informative 3D model with stakeholders in their 3D format of choice such as 3D PDF, 3ds etc.
Hence FME is a complete spatial ETL(Extract, Transform and Load) solution that enables the processing of bigger data known as GIS data and which enables to quickly translate, transform, integrate and distribute spatial data.

References

1. Safe FME: http://www.safe.com/(2013)
2. GPS: http://www.garmin.com/

3. SRTM (Shuttle Radar Topography Mission) 3 arc second DEM:
http://www.viewfinderpanoramas.org/(2013); http://ws.csiss.gmu.edu/DEMExplorer/(2014)
4. Global Mapper: www.globalmapper.com(2012);
http://www.bluemarblegeo.com/ (2014)
5. DEM: http://vterrain.org/Elevation/(2014)
http://en.wikipedia.org/wiki/Digital_elevation_model(2014)
6. Google Earth: https://earth.google.com/(2012)
7. Telia, S.: "Producing Digital Elevation Models Using Global Mapper".
http://pbisotopes.ess.sunysb.edu/ (2014)

The effects of recycling asphalt use in terms of economic growth and environmental improvement in Kosova

Muhamet Ahmeti [1], Binak Beqaj [2]

[1,2] Institution: UBT, Faculty of Architecture and Spatial Planning, Prishtina, Kosovo
{muhamet.ahmeti[1], bbeqaj[2]}@ubt-uni.net

Abstract. Through this paper is analysed the possibility of recycling asphalt and reusing this in receipts of new asphalt to build road infrastructure inside urban areas and inter-urban areas, because analysing the investments that are being realized in the road infrastructure in Kosova last years, and investments that are going on, there are indicators showing economical, environmental and ….benefits of the society.
According to database of the Kosova Ministry of Transport and Telecommunication until the year 2014, the territory of Kosova has 2005.5 km of the road, 4% are highways, magisterial roads 32% and 64% regional roads, most of them should be reconstructed, so, the existing asphalt layers should be removed, and this layer has a thickness of 15 -30 cm, depending on category of road.
Positive expected effects from re-use of recycled asphalt can be treated through cost-benefit analyses, especially through its direct impact on:

- Reducing massive exploration of our natural and other resources for producing asphalt
- Reducing production and use costs of asphalt
- Growing possibility for problem-solving through asphaltation of more roads in urban or periurban areas
- Minimizing of environmental degradation from asphalt waste
- Improving public health

However considering information, that level of asphalt recycling in Kosovo and in the region does not exceed more than 5%, while the construction waste 10%, it is the fact that this process should be treated seriously especially considering the fact that Kosova is a state under development and there is limited capacity for investment in road infrastructure considering mass needs.

Keywords: asphalt, road, infrastructure, investment, benefits.

1. Introduction

Through this paper is analyzed the possibility of recycling asphalt and reusing this in receipts of new asphalt to built road infrastructure inside urban areas and inter-urban areas, analyzing the investments that are being realized in the road infrastructure in Kosova last years, and investments that are going on, there are indicators showing economical, environmental and benefits of the societ. According to database of the Kosova Ministry of Transport and Telecommunication until the year 2014, the territory of Kosova has 2005.5 km of the road, 4% are highways, magistral roads 32% and 64% regional roads.
Most of the roads need to be reconstructed, so, the existing asphalt layers should be removed, and this layer has a thickness of 15-30 cm, depending on category of road and with medium dimension of 7 m. Are of special importance of this work is the setting of the amount of asphalt that can be recycled, information are very important to know how much can be the amounts of recycling asphalt in Kosovo

1.1. State of motor vehicles in Kosovo

In 2014 in Kosovo were registered about 289 .000 motor and non-motor vehicles or 15.6% more than in 2013.
Tabela 1 Registered motor and non-motor vehicles Source of data: Department of Roads to Kosovo

YEARS	2011	2012	2013	2014
Automobiles	170,321	176,398	222,537	236,145
Transport vehicle,3.5 and over 3.5	10,877	11,547	15,352	15,769
Transport vehicle under 3.5t	17,901	18,225	24,659	26,949
Minibus	2,698	2,520	3,225	3,161
Buses	1,117	1,298	1,570	1,697
Motorcycles	546	809	1,488	1,540
Tractors	39	137	776	1,036
Trailer under 3.5t	101	117	217	250
Trailer 3.5 and above 3.5t	1,766	1,800	2,283	2,281
Automobiles	**205,366**	**212,851**	**272,107**	**288,828**

1.2 Roads of Kosovo

Since the end of war and until 2014, capital investments were made in the construction of roads in Kosovo,since investments are ongoing, new classification of roads are not completed.
The respective board of directors makes classification of roads, by construction standards.
KAS (Kosovo Agency of Statistics} by the Department of Roads to Kosovo took only changs in the length of paved and not paved roads for 2009 and 2010, and in 2011 was added motorway length of 38 km. In 2012 were aded 22.4 km, and in 2013 was added 17.6 km route length of the motorway and now 3 motorway road length is 78km.

Table 2 Kosovo's roads by category (Source of data: Department of Roads to Kosovo.)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Paved	1,666.2	1,666.2	1,666.2	1,666.2	1,805.0	1,805.0	1,843.0	1,865.4	1,883.0	1,883.0
Not paved	258.9	258.9	258.9	258.9	120.1	120.1	120.1	120.1	120.1	120.1
Total	**1,925.1**	**1,925.1**	**1,925.1**	**1,925.1**	**1,925.1**	**1,925.1**	**1,963.1**	**1,985.5**	**2,003.1**	**2,003.1**

According to data presented, it shows that in 2013 and 2014 in the territory of Kosovo we have 2003.1 km, the category of roads Motorway 4%, National 31%, while 65% are regional roads.
The table above shows that in the year 2014 a total of 2,003.1 km of roads 1,883.0 km or in percentage 94% are paved (asphalted}, while 120.1 km or 6% of the roads are not paved.

Table 3 Kosovo's roads by category - in kilometers (km) - Source of data: Department of Roads to Kosovo)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Motorway	0	0	0	0	0	0	38	60.4	78	78
National	630.4	630.4	630.4	630.4	630.4	630.4	630.4	630.4	630.4	630.4
Regional	1,294.7	1,294.7	1,294.7	1,294.7	1,294.7	1,294.7	1,294.7	1,294.0	1,294.7	1,294.7
Total	**1,925.1**	**1,925.1**	**1,925.1**	**1,925.1**	**1,925.1**	**1,925.1**	**1,963.1**	**1,985.5**	**2,003.1**	**2,003.1**

Table 4. Percentage of investment in infrastructure from 2005 to 2015

Infrastructure investment in the years since 2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Change in%	0%	0%	0%	8.3%	8.3%	10.7%	12%	13%	13%

As are analyzed the investments in road infrastructure from 2005 to 2014 , the percentage of investments in years comperin with 2005 years , so we have analyzed the percentage increase in the number of vehicles in Kosovo having a focus from 2012 until 2014.

Table 2 Increase the percentage of road construction and the growing number of vehicles since 2011

Increase the percentage of road construction and the growing number of vehicles since 2011	2012	2013	2014
Percentage increase in the number of vehicles	3.6%	32%	41%
The percentage of road construction	1,3%	2,3%	2,3%

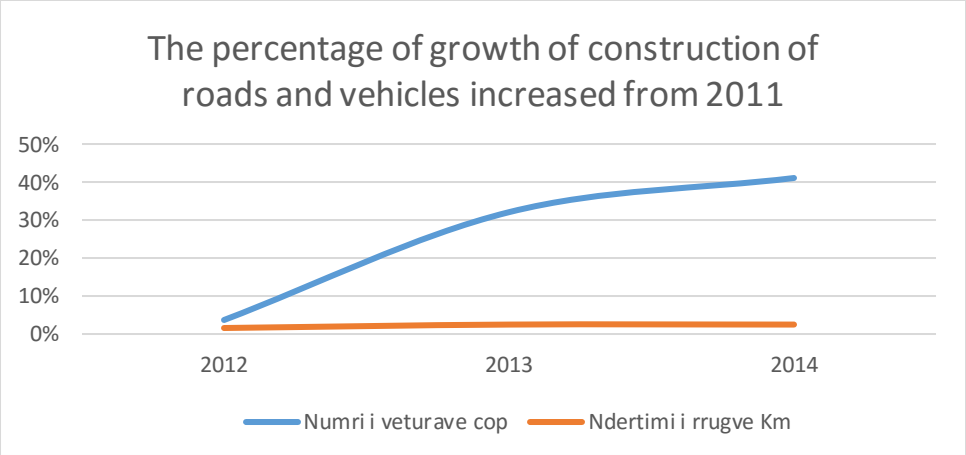


Figure 1 The graphic presentation of the difference between of investment in the roads and growth in the number of vehicles

1.21 Because of this increase, can be concluded:

1. Increase the number of vehicles compared with the increase in road investment is more pronounced
2. Increase very large number of vehicles compared with the increase in road investment, growth necessitates strips of roads
3. Investments slow compared with the increasing number of vehicles leads to blockage of traffic and numerous problems in traffic
4. From these changes is necessary expansion of existing roads as and have started Pristina - Mitrovica, Peja Prishtina, Prishtina - Gjilan are also many other ways to increase vehicle demand and obliges us to expand existing routes.
5. In most cases, extensions are accompanied by a complete new track of the road.

1.22 The situation in areas where road extension done - The need to build new roads and highways each time more and more will be reduced, the more important will be the management, maintenance, and expansion of roads and highways to be builded.

Each time we load the bulk of the increased traffic loads with which to cope roads constructed, these loads lead to damage to the roads and highways in the form of cuts and cracks and other forms of damage.

Fig 1. The condition in road expansion Pristina - Mitrovica

Fig 2. Condition of roads expansion of Skenderaj - Komoran

Until recently with the asphalt road maintenance, is mplied Novel building layers of asphalt material leveler of bitenemizuar and the abrasion layer of asphalt concrete? It is believed that there are limited resources and enough of the material for the construction and maintenance of roads, but costs explant requirements for storage facilities and transport costs of natural stone to plant asphalt has changed the opinion of the former and have begun and proceeded to seek other methods more efficient and lower cost and more effective for replacement of natural materials.One of the methods that were used in the years since the thirties is the method of recycling the materials used in the construction of roads and highways of asphalt and asphalt concrete (PAR - Reclaimed Asphalt Pavement). Accounts in the world for a year produced more than 500 million tons of material.

Table 6 Available reclaimed asphalt (tonnes) ,source european asphalt pavement , www.eapa.org association

Country	Available reclaimed asphalt (tonnes)	% of the new hot and warm mix production that contains reclaimed material
Austria	750.000	
Belgium	1.500.000	51
Czech Republic	1.450.000	10
Denmark	790.000	58
France	6.900.000	>65
Germany	11.500.000	No data
Great Britain	4.000.000-5.000.000	
Hungary	88.000	20
Italy	10.000.000	
Luxembourg	300.000	50
Netherlands	4.500.000	70
Norway	686.268	20
Sweden	900.000	70
Switzerland	1.370.000	27
Japan		76
U.S.A.	69.000.000	

Denmark, Norway, Germany have use of material RAP to produce new layers of asphalt with greater than 50%, the same notes have also in Japan and the UK, while in Kosovo, exploitation and use of the material PAR for production of layers New asphalt has a negligible level.

Recycling of aphalt road that allows us to use material for paper behind them and constructing roads.

Economic conditions, fair legal requirements, and the development of technological equipment for the production of asphalt have conditioned us and enable recycling of asphalt.

Limited quantities of natural aggregates high prices of oil products are the economic conditions that have led to new technologies and new techniques to carry out works in the recycling of materials.

Laws in force and promote recycling and re-use of this material, it reduces the appearance of waste and reduces the emission of CO2 and are prescribed severe penalties for violators of these laws.

According origin-recycled asphalt can be:

- Endogen - which comes from the same street which is recycled or
- EGZOGEN - when father brought from another place in the country of recycling.

Methods of recycling asphalt in road constructions divided into two main categories:

- Method, which uses stationary base driving (in plant)
- Method, which is realized in the country (in place).

In addition, these two methods of recycling may be depending on the temperature of the asphalt work and that makes to separate the two other categories:

- Method of recycling heated
- Cold recycling method

Strengths and weaknesses of the leading recycling categories have been presented to the following:

1. Recycling places.

Advantages:

- High quality of the recycled mix,
- Possibility of controlling the granulometrise,
- Very homogeny measure,
- Sizing opportuto measure and mix,
- Use of recycling bitumen,
- reuse in addition abrasive asphalt,
- A high flexibility of use,

Disadvantages: potential options with high costs

- Very large expenditure of energy
- Greater participation of the material transport
- Storage of recycled material RAP
- Damage to the environment – emitions CO_2

2. Recycling base station for recycling.

Advantages*:* use of full of material RAP

- Introduction in view of fast roads,
- suited for projects large and small,
- Economic influence,
- to reduce transportation costs,
- possibility of committing to recycling only a circular track

Gaps*:* necessary a surface layer

- Homogenization problem presented us new asphalt on the existing
- long recycling are not suitable for the small streets and rural roads
- Simple technology and equipment is only suitable to rural roads and streets with small volume

The laws in Kosovo do not encourage recycling and the use of reuse of this material, which is very different from the regional countries and European countries that by law companies for the production of asphalt promote and stimulate the use of asphalt recycled for reuse ,

Using recycled asphalt in the countries where it is prescribed by law reduces the appearance of waste and reduces CO2 emissions, and are provided for severe penalties for violators of these laws Përdorimi i asfaltit

Fig 3. Collection of waste asphalt removed from track to expand - Polac - Skenderaj

Fig 4. Waste of the removed asphalt layer on the road expanding Skenderaj – Komoran

Fig 5. Waste of the removed asphalt layer on the road expanding Skenderaj – Komoran

Fig 6. Waste of the removed asphalt layer on the road expanding Skenderaj – Komoran

In these works we have used several experiments which are analyzed with recycling asphalt as well as the ducts of the new asphalt, in order to compare curves granulometric and the amount of Bitulitit to asphalt recycling in this case was taken findings in this laboratory, experiments are conducted in the laboratory for building materials of the company ,,Koteks,, city Osijek in Croatia as well ,
The results and recapture of the new asphalt are similar with recapture's for the preparation of the new asphalt in ,,Renelual company ,, city of Prizren, Kosovo. Why have used this laboratory tests with recycled asphalt in company, Koteks, city Osijek in Croatia .
After that existing asphalt is working based on these receptures, therefore the results obtained are simulated with the results to be won in the laboratories of reviewing the materials in Kosovo.
Laboratory in Croatia are performing physical examinations de mechanical samples of asphalt mix asphalt with recycled quantities.In general, we found that the preparation of asphalt receipts are the same as granulometria as well as other components that we need for the preparation of asphalt.

Table 7. Presentation of granulometric curves designed in Croatia and Kosovo.

curve respective	0.09	0.25	0.71	2	4	8	11.2	16	22.4	31.5
Kosove	12	18	27	40	52	68	78	90	100	100
Kroacia	13.3	17.4	27.4	47.2	66.6	89.6	97.2	100	100	100

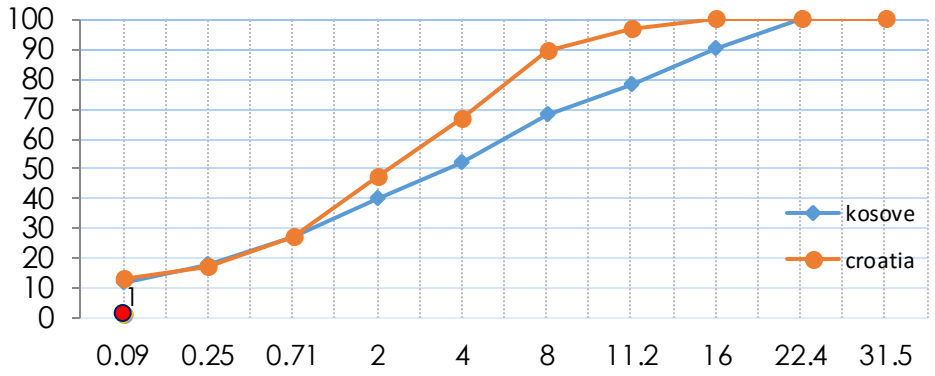


Figure 1. Curve granulomtris

Content of bitumen	2.6	3.0	3.4	3.8	4.2
Measure volume	2372	2394	2412	2442	2435
The emptiness%	9	7.4	5	4.3	1.5
Fill empty	30.2	46.4	56.8	67.3	88.2
Stability KN	8.976	11.957	12.987	12.478	11.215
St-flow wizard	5.11	3.209	2.882	3.236	3.96
St-wizard quotient	1.8	3.7	4.5	3.9	2.8

Table 8. Content of bitumen.

Therefore, these laboratory experiments can be taken as simulated experiments that would be conducted in Kosovo. Recycled asphalt was added to fractions of broken stone, stone Millie and quality bitumen for road 50/70 (according to EN 12591 eur code: 1999).

Table 9 Measure of asphalt with % recycled asphalt mas.

Mixture of asphalt	standard mixture of the asphalt	Mixture with 30% recycled asphalt		Mixture with 25% recycled asphalt		Mixture with 20% recycled asphalt	
Mixing components	participation of the components%	participation of the components%	savings compared to standard mixing%	participation of the components%	savings compared to standard mixing%	participation of the components%	savings compared to standard mixing%
Sheath Stone	6	2	66.67	2.5	58.33	3	50
Bitumen of roads	3.9	2.38	37.5	2.61	31.25	2.85	25
Recycled asphalt		30		25		20	
0/4 mm stone aggregate	25	10	30%	13.5	25%	17	20%
4/8 mm stone aggregate	15	8		9		9	
8/16 mm stone aggregate	20	17		16		17	
Stone aggregate of 16 / 31.5 mm	34	33		34		34	

Fig 7. Waste of the removed asphalt layer on the road expanding Skenderaj – Komoran

Fig 8. Waste of the removed asphalt layer on the road expanding Skenderaj – Komoran

On the basis of data and experiments presented in Kosovo is still construction of roads a priority, but the expansion of roads is being carried out in several directions, the expansion includes the route of the new which means should be overwrite the current structure of the road .
Therefore, there is a need that large amounts of the asphalt to be removed from those areas, should be mentioned some of the ways to be expanding as well as some others that are expected to expand.

Table 10 Measure of asphalt with % recycled asphalt mas.

	Measure of asphalt with 30% recycled asphalt mass	Measure of asphalt with 25% recycled asphalt mass	Measure of asphalt with 20% recycled asphalt mass
Density of the sample asphalt (kg/m3) EN 12697-5	2509	2509	2495
Density of mix asphalt (kg/m3) EN 12697-6	2675	2685	2661
participation of the gaps (%) EN 12697-8	6.19	6.55	6.24
gaps in the aggregate mass (%) EN 12697-8	15.74	15.51	15.85
filling the gaps with bitumen (%) EN 12697-8	60.68	57.73	60.65

Table11. Available recycling asphalt in Kosovo

Nr	Place (from)	Place (to)	Distance in Km
1	Prishtinë	Mitrovicë	36 Km
2	Prishtinë	Pejë	82 Km
3	Prishtinë	Gjilan	46 Km
4	Klina e Epërme-Skenderaj	Komoran - Drenas	30 Km
5	Gjakovë	Prizren	37 Km
		Total :	**231** Km

Fig 9.expansion of the road Prishtina – Mitrovica

Fig 10. expansion of the road Prishtina - Mitrovica

During visite in saite we have noted that the thickness of asphalt, which has removed and can be recycled is 20 cm thickness, as well as the gravel thickness is
average up to 30 cm.
Acirdin those facts can be concluded that if it becomes recycled asphalt removed, will be lot savings first in diferent components of the asphalt .

Fig 11. Thickness of the asphalt in place were its starting to remove in the road expanding Skenderaj – Komoran

Fig 12. Thickness of the asphalt in place were its starting to remove in the road expanding Skenderaj – Komoran

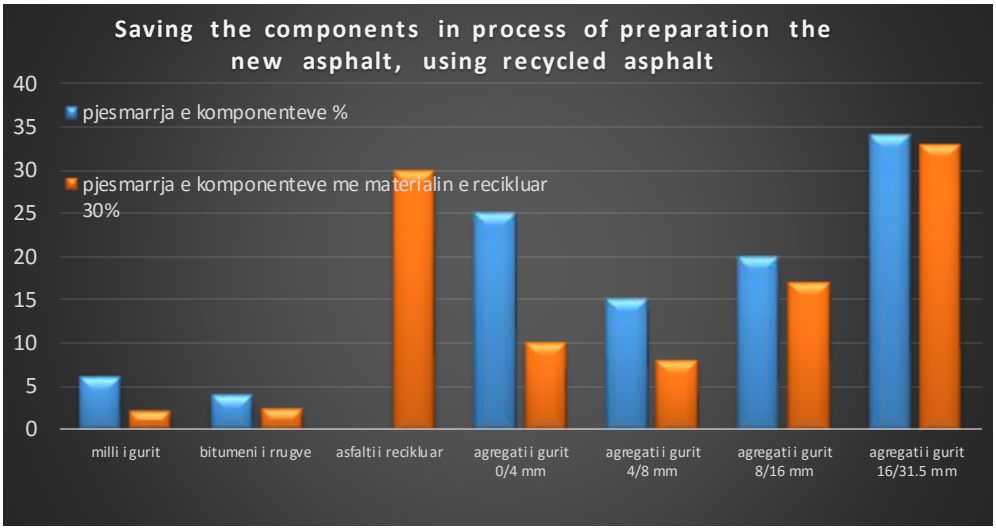


Figure 3. Saving the components in process of preparation the new asphalt, using recycled asphalt

1.3 Economic benefits using recycled asphalt

Laboratory tests obtained from asphalt recycling, which was obtained by milling and removal of layers of asphalt removed from parts of the roads that are being extended to just extensions in Kosovo are provided about 231 km, according to these analyzes we can ascertain and found that the share of bitumen in asphalt mixture component participates with 4.75%.
Recepture for designed for asphalt, which used as making the support layer BNS - 32s our goal is that, this percentage to be 3.8%.
With the use of asphalt recycled with a share of 30% we use to measure that bitumen 37.5%, and we have is the use of the amount of aggregate that is used for the preparation of asphalt will be: 66.67% of flour of stone, and 30% have use of fractions of aggregate: 0- 4, 4- 8, 8-16, 16- 31.3 mm
We have also saving the main components of asphalt for asphalt-recycled participation with participation in mass by 25% and 20%.

Benefits from using recycled asphalt – case Kosovo roads.

- Dimensions of roads that have begun to expand or are planned for expansion are 7 m,
- The thickness of the asphalt to be removed is approximately 20 cm,
- The distance of roads planned to expand is 231 Km ,
- Amount of asphalt to be removed is about 323 400 m3,
- Landfill site will be spared 323 400 m3 ,
- Can be spared reserves of stone rocks 323 400 m3 ,
- Will save more great power, which the former used for processing, transport and placement of aggregate in asphalt plant.

Construction of new asphalt

- Aggregate spared if used 30% of recycled asphalt 478 170 m3 (23 m)
- Bituminous spared if used 30% of recycled asphalt 13.388,760 400 liter

SAVINGS WILL BE MILLIONS AS THE FINANCIAL ASPECT, ALSO AS WELL AS ECOLOGICAL ASPECT TOO.

Conclusions and Recomendations:

In this paper were analyzed the results obtained in the laboratory examination of the materials in Croatia, these tests are simulated and the same receipts used in Kosovo for the preparation of asphalt, are also analyzing the quantities of asphalt recycled in percentage 30% , 25% and 20%, based on this analysis and research can be verified as follows:

• Using recycled asphalt will have to reduce the storage of asphalt removed from areas where routes expanded or repaired roads,

• Reduced amount of aggregate used for preparation of asphalt, there is a reduction in energy and reduction of greenhouse release energy, which we need to be excavated, milled, and transported to the asphalt plant.

• Reduced amount of that production bitulitet trailer considerable energy we need,

• Protecting the environment from waste from bitulitit that are in asphalt away, where these wastes are harmful to the surroundings as well as flora and fauna in places where stored, where according visit and monitoring in Kosovo these wastes are deposited in place deposition, without specifying severely damaging the surrounding ecosystem,

• The use of asphalt recycling, reduces from 25 to 30% of the energy required in the production of asphalt, which have the savings noted the release of CO2 into the atmosphere, diversity and mixture of asphalt recycling is difficult to control % dosage and millie stone aggregate and bitulitit distinction, necessary for preparation of asphalt for the road support layer;

• Issuance of bitulitit of recycled asphalt, have the deviation in up to 13.99% of the amount needed for the preparation of asphalt;

• The deviation of the granulometric curve of samples taken by 25% of recycled asphalt sizes appear in parts of the aggregate occurs in aggregate size of 0.71, 8.00 m and 20.11 mm until 22:40 where granulometric curve has won a composition with thick aggregate asphalt mixture compared with the projected normal asphalt;

• Reducing the amount or portion of the recycled asphalt it is much easier to achieve value (designed) to mix asphalt;

• All laboratory samples to analyze the mix asphalt designed and samples of asphalt designed by adding amounts of asphalt recycled in percentage set at 30%, 25% and 20%, meet the limit values specified by standards European preparation of asphalt laid for the roads with large loads to transport;

• Savings in the amount of the sum of the components of asphalt (bitumen gravel, sand and powdered stone) depends primarily on the type of asphalt that is recycled,

Taking values bitulitit to layer the final asphalt, where the percentage of bitulitit ranges on average from 4.75% to Bitumen, the use of recycled asphalt for savings brought from 25% to 37.5% depending on the amount of recycled asphalt was taken as part of the composition of asphalt designed.

Recommendations

1. Recommended the Ministry of Infrastructure, to prepare a Law for recycling of inert materials with a specific gravity of the recycling asphalt awarded.
2. Non-compliance with this law, penalties against violators of the trailer
3. Ministry of Infrastructure should be obliged companies that deal with the production of asphalt use of recycled asphalt, obliging them to a certain percentage, as well as to comply with recycling companies to support by the ministry.
4. The amount of the use of recycled materials to define the working contract, acording type of recycled material, ways of recycling and the amount of recycling.

Results of asphalt mixtures using recycled asphalt to produce bitumen asphalt layers type BNS-32s in very heavy traffic load shows that this technical solution is justified by the economic and ecological aspects.

Future research should focus on analyzing the possibility to produce such a mixture of asphalt mixing and production of new shares and testing recycled asphalt applications in other asphalt mixtures.

References

1. Šimun, M., Škerlj, S: Reconstruction of asphalt pavement in Croatia, 10 Slovenian Congress on Roads and Transport, Portoroz, 2010.
2. Drezgić, S: Reform of the system of financing public roads, the Croatian Treasury, RFF, Zagreb , 2008., str. 22- 28.
3. Arand, W: Behavior of asphalt aggregate mixtures at low temperatures, 1990.
4. Schwabe, Ž:Recycling of asphalt road pavements 2009., Management of transport infrastructure, Civil Engineering, Department for Transportation 2009.
5. Dridarski, D: Recycling existing asphalt pavements .
6. Schwabe, Ž., Halle, M: The process of cold recycling in road reconstruction, Collection 2008.
7. HRN EN 12697-1:2003 Bituminous mixtures - Test methods for hot mix asphalt process - Part 1: Soluble binder content.
8. HRN EN 12697-8:2003 Bituminous mixtures - Test methods for hot mix asphalt process - eighth part: Determination of the voids in asphalt mixtures\
9. ASPHALT IN FIGURES 2013 - www.eapa.org

Climate Change and Drinking Water

Muhamet Ahmeti[1], Ilir Abdullahu[2]

[1,2] UBT – Higher Education Institution
{muhamet.ahmeti[1], ilir.abdullahu[2]}@ubt-uni.net

Abstract. The period June 2012 – March 2014 saw a prolonged deficit of precipitation below normal. This led to a major continental scale drought across southern Europe, and in eastern Kosova in particular. E.g. see figure 1 below for the month of December 2013, from Drought Monitoring Center for SEE. In fact December 2013 was the fifth driest month in the recorded history of Kosova.
February registered the driest month in the recorded hydro-meteorological history of Kosova, since 1927 with only 2.1 mm precipitation, which expressed in Standardized Precipitation Index (SPI). The chance of getting this value in February was 1 in 156. So, since June 2013, consecutively there were dry month, i.e. there was rainfall deficit (a meteorological drought) that consequently led to a hydrological drought. By March 2014 the water supply reservoirs of Batllava, Badovc were at 20% of normal levels, and nearly exhausted. There was approximately not more than 6-8 weeks of water supply remaining for upwards of 500,000 citizens.
Situation of drinking water supply was becoming much more difficult to citizens of Prishtina, Podujeva, Kastriot, Fushe Kosova and Gracanica. Thus, water supply restrictions hours were growing and there was a fear to citizens for the lack of water and at the same time were aware for a maximum of water saving. The Government Local and Central authorities, other Institutions, NGO's, were mobilized in order to find a solution, even for a temporary time, to deal with drought periods. There were few choices as the underground water level was affected by droughts and the only hope was the alternative supply from the Lake Ujmani (Gazivoda) where through the steel pipe fill Badovc Lake. Although, the pipe was not in a good condition because since year 1986 only once was included for operation to the system to fill Badovc Lake in 1996 as the water level fell at this Lake.

Keywords: Drought, Standardized Precipitation Index (SPI), Reservoirs levels, water losses

1. Introduction

The period June 2012 – March 2014 saw a prolonged deficit of precipitation below normal. This led to a major continental scale drought across southern Europe, and in eastern Kosova in particular. E.g. see figure 1 below for the month of December 2013, from Drought Monitoring Center for SEE. In fact December 2013 was the fifth driest month in the recorded history of Kosova.

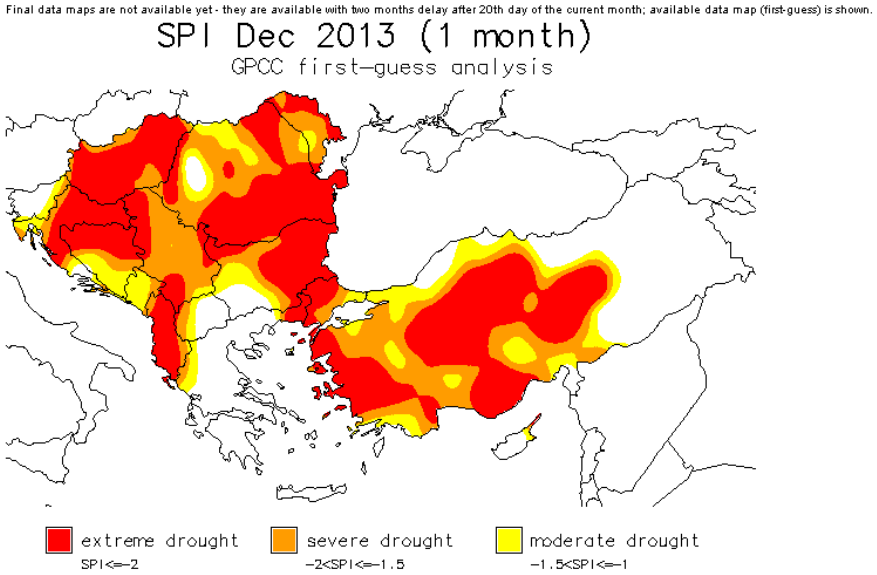


Figure 1 December 2013 continental drought

1.11 Analyze the situation.

February registered the driest month in the recorded hydro-meteorological history of Kosova, since 1927 with only 2.1 mm precipitation, which expressed in Standardized Precipitation Index (SPI) was -2.49 (fig. 2). The chance of getting this value in February was 1 in 156. So, since June 2013, consecutively there were dry month, i.e. there was rainfall deficit (a meteorological drought) that consequently led to a hydrological drought.

One of the most effective Early Warning Indicators is a simple measure of monthly precipitation expressed in terms of its deviation (from the average value for the last 1, 3, 6, 12 months). This is the **Standardized Precipitation Index - SPI**. The index ranges between +3.0 to -3.0. The SPI is used throughout Europe as an early indicator of precipitation deficits or surpluses, which, if they continue, may lead to significant water scarcity (or flood) conditions respectively.

SPI Value (σ)	Cumulative Probability	Description	Colour Code
+ 3.0	0.0014	Extreme flood conditions	
+ 2.5	0.0062		
+ 2.0	0.0228	Severe flood conditions	
+ 1.5	0.0668		
+ 1.0	0.1587	Moderate flood conditions	
+ 0.5	0.3085	Precipitation slightly above normal	
0.0	0.5000	Precipitation conditions fit long-term average	
- 0.5	0.6915	Precipitation slightly below normal	
- 1.0	0.8413	Moderate drought conditions	
- 1.5	0.9332		
- 2.0	0.9772	Severe drought conditions	
- 2.5	0.9938		
- 3.0	0.9986	Extreme drought conditions	

Fig.2 Standardized Precipitation Index (SPI

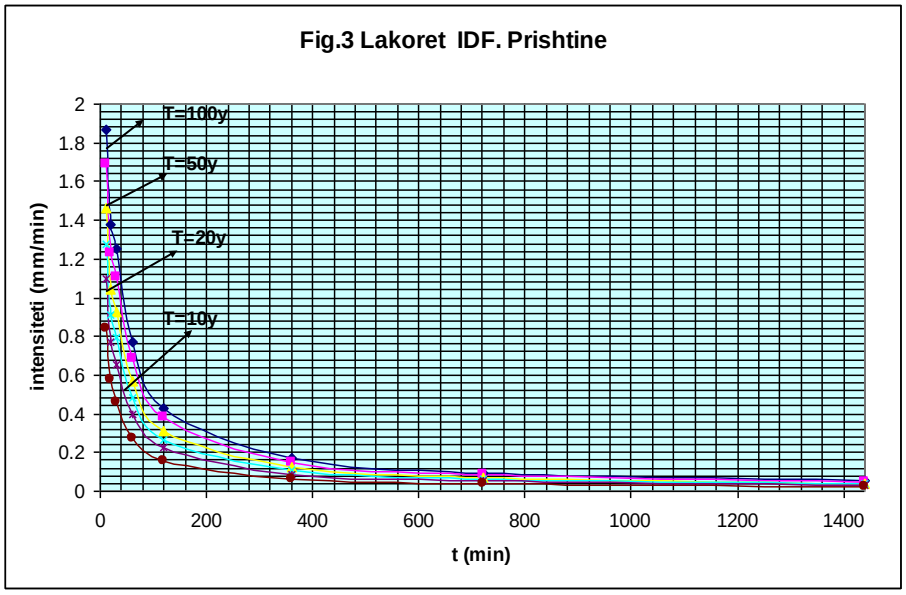
February registered the driest month in the recorded hydro-meteorological history of Kosova, since 1927 with only 2.1 mm precipitation, which expressed in Standardized Precipitation Index (SPI) was

-2.49 (fig. 2). The chance of getting this value in February was 1 in 156. So, since June 2013, consecutively there were dry month, i.e. there was rainfall deficit (a meteorological drought) that consequently led to a hydrological drought.

2002	-99	-99	-99	2.12	-0.92	-3.06	-0.17	-0.62	-1.24	0.09	-0.36	0.49
2003	1.36	-0.04	-1.34	1.23	0.85	0.85	0.18	-0.44	-0.06	0.79	0.63	0.49
2004	-0.46	1.33	-0.64	-0.01	0.22	0.72	0.28	0.98	0.24	0.49	1.05	-0.66
2005	-0.42	-0.30	1.13	0.18	1.26	1.17	0.96	-0.70	0.21	-0.16	1.30	-0.27
2006	-0.19	-0.85	-0.65	0.65	-0.50	-0.14	-1.02	0.64	-1.19	-1.73	-0.32	-0.69
2007	1.21	1.85	-0.74	-0.57	-1.92	1.77	-1.63	0.15	1.64	0.81	-0.48	0.21
2008	-0.15	-0.12	1.54	0.91	0.60	1.38	-0.93	-0.03	1.16	-0.33	0.40	-0.90
2009	0.86	0.56	0.93	1.20	1.71	0.68	1.04	0.49	0.84	0.79	-0.19	-0.42
2010	0.77	1.06	1.66	-0.54	-0.47	-0.27	-0.55	0.19	-1.03	0.35	-1.75	-0.12
2011	-0.05	-2.64	0.74	1.93	0.27	-1.03	0.19	1.07	-2.54	0.43	-1.64	-1.07
2012	0.26	-0.75	0.41	-0.44	0.08	-0.25	-1.43	-0.11	-0.39	-0.22	-1.45	0.56
2013	0.36	-0.26	-1.54	-1.05	-2.49	0.68	3.90	0.32	-99	-99	-99	-99

Fig.3 Water Supply(min and max stats)

By March 2014 the water supply reservoirs of Batllava and Badovc were at 25% of normal levels, and nearly exhausted. There was approximately not more than 6-8 weeks of water supply remaining for upwards of 500,000 citizens.



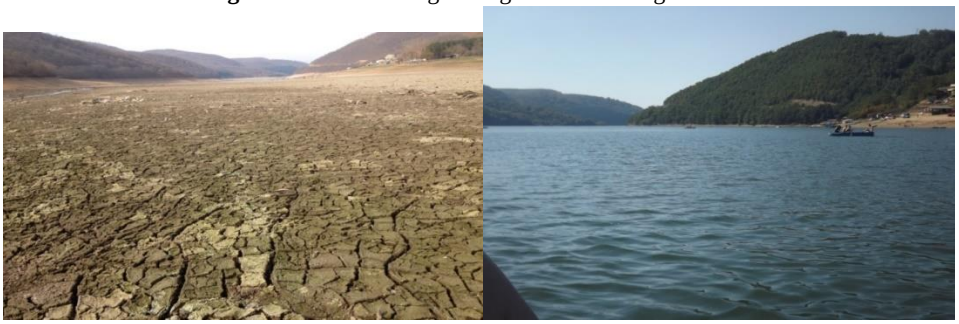
Graph.1 IDF Graphs

	2012			2013									2014							
Precipitation	Tet	Nen	Dhj	Jan	Shk	Mar	Pri	Maj	Qer	Kor	Gus	Sht	Tet	Nen	Dhj	Jan	Shk	Mar	Pri	Maj
Observed (mm)	60.4	29.6	60.8	21.4	31.3	25.7	18.9	56.2	37.5	32.6	5.6	56.6	64.8	42.6	15.9	11.9	2.1	50.1	220.0	
Normal (mm)	59.1	58.3	53.5	37.4	35.1	37.0	51.0	65.7	54.0	46.4	42.3	45.0	59.1	58.3	53.5	37.4	35.1	37.0	51.0	
% of Normal	102%	51%	114%	57%	89%	69%	37%	86%	69%	70%	13%	126%	110%	73%	30%	32%	6%	135%	431%	
SPI-1	0.26	-0.75	0.41	-0.44	0.08	-0.25	-1.44	-0.10	-0.39	-0.22	-1.45	0.56	0.36	-0.26	-1.54	-1.05	-2.49	0.68	3.81	
SPI-2	-0.40		-0.07		-0.27		-1.01		-0.53		-0.30		-0.04		-2.13		-0.42			
SPI-3	-0.21			-0.64			-1.24			-0.42			-0.73			-1.07				
SPI-4	-0.48				-0.98				-0.58				-1.20							
SPI-6	-0.67						-1.17						-1.36							
SPI-12	-1.42																			

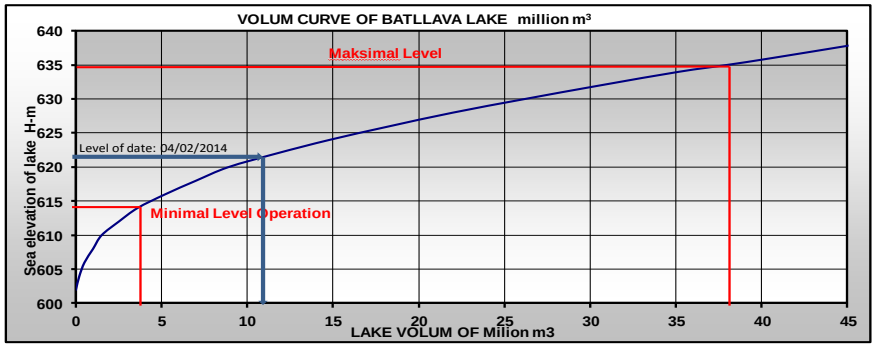
Storage	Tet	Nen	Dhj	Jan	Shk	Mar	Pri	Maj	Qer	Kor	Gus	Sht	Tet	Nen	Dhj	Jan	Shk	Mar	Pri	Maj
Observed (m)	630.36	630.07	629.69	627.9	628.08	630.57	631.53	630.98	630.15	629.02	627.87	626.74	625.55	624.49	623.49	622.53	621.83	621.35	630.04	*634.00*
Normal (m)	631.01	630.28	631.44	632.99	635.08	635.35	635.03	634.96	634.58	633.80	632.90	631.96	631.01	630.28	631.44	632.99	635.08	635.35	635.03	634.96
Observed (Mm^3)	26.200	26.200	25.150	21.075	22.000	27.300	29.500	27.300	26.200	24.100	21.075	19.225	17.425	14.800	13.250	12.475	11.000	10.300	26.200	35.200
Normal (Mm^3)	28.400	26.200	28.400	31.750	38.000	38.000	38.000	36.600	36.600	34.050	31.750	29.500	28.400	26.200	28.400	31.750	38.000	38.000	38.000	36.600
% of Normal	92%	100%	89%	66%	58%	72%	78%	75%	72%	71%	66%	65%	61%	56%	47%	39%	29%	27%	69%	96%

Production	Tet	Nen	Dhj	Jan	Shk	Mar	Pri	Maj	Qer	Kor	Gus	Sht	Tet	Nen	Dhj	Jan	Shk	Mar	Pri	Maj
Observed (Mm^3)	*2.100*	*2.100*	*2.100*	2.218	1.956	2.131	2.145	2.104	2.166	2.035	2.059	2.165	2.108	2.006	2.032	1.936	1.468	1.538	1.521	

Fig 4. – SPI Monitoring During Batllava Drought 2013/14



February-2014 The effects of drought-Batllava April-2014



By March 2014 the water supply reservoirs of Batllava and Badovc (fig. 3), were at 25% of normal levels, and nearly exhausted. There was approximately not more than 6-8 weeks of water supply remaining for upwards of 500,000 citizens.

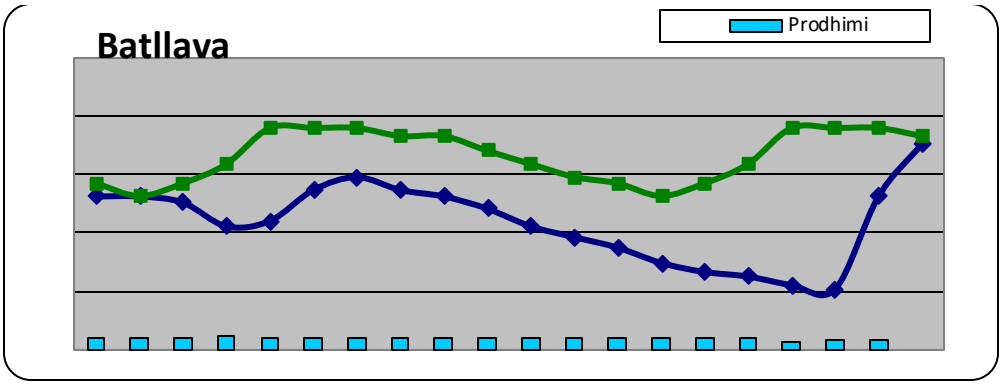
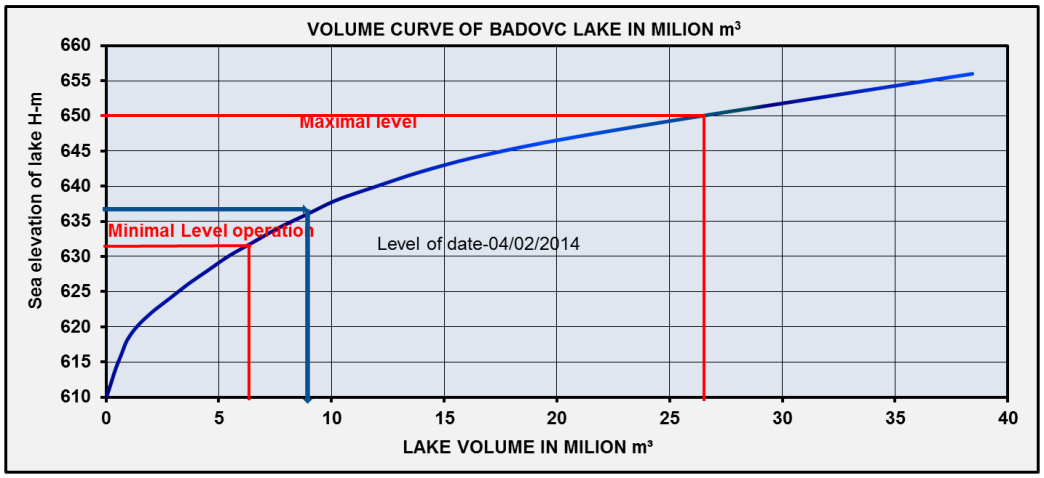


Fig 5. Batllava reservoir storage and production

February-2014 The effects of drought- BADOVC LAKE April-2014

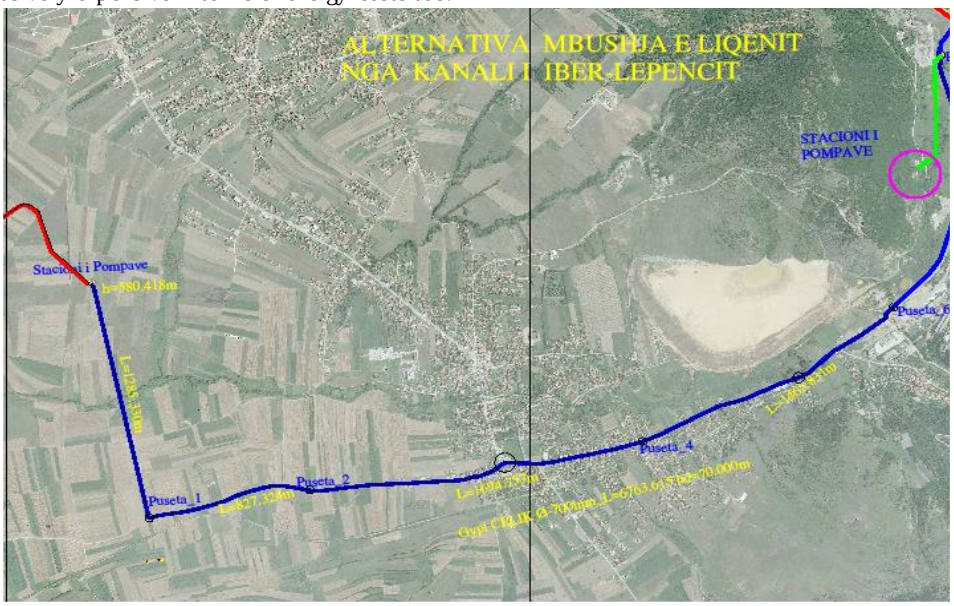


Graph 4.

Prishtina Regional Water Company prepared an emergency contingency plan to import water from Gazivoda - Ibër-Lepenc canal to the Badovc Reservoir which commenced in February 2014. This Plan, which involved considerable capital cost, IF fully operational would be able to import approximately 350 l/s (30.2 Ml/day or 907 Ml/month). The normal abstraction from Badovc is in the order of 710 Ml/month, therefore the Gazivoda import should have theoretically allowed the continuing operation of the reservoir to limited parts of the city.

However, Badovc was at critically low levels, and the import scheme did nothing more than allow a continued supply. It did nothing to increase or restore the reservoir towards normal levels. Due to settlements alongside the canal discharging wastewater directly into the canal, the imported water

risked being of very poor quality. Ministry of Environment and Spatial Planning together with the Prishtina municipality, Prishtina Regional Water Company and Ibër-Lepenc Company took measures to stop this practice. However, feedback from other municipalities alongside the canal, especially from Serbian upstream settlements indicated there was still some wastewater discharge. The water was nevertheless imported and was sent directly to the water treatment plant. This emergency measure was very expensive in terms of energy costs too.



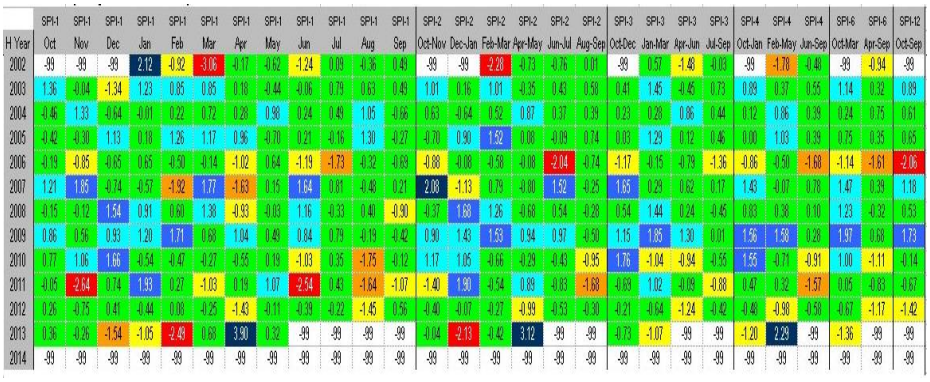
Ortofoto-Transmission pipe Iber-Lepenc canal to Badovc Lake

WATER FLOW TO LAKE

PIPE REPERATION

On the other hand, there was no ready 'Plan B' for Batllava Reservoir, which is larger and supplies a greater part of the city (60%), although there were a couple of measures proposed to bring water directly from other streams into the reservoir. Each required a proper study and risked being implemented too late. Termination of water supplies from Batllava would have caused significant disruption and hardship to citizens.Analysis of precipitation statistics for Prishtina (1926 – 2014) confirms that a severe or extreme meteorological drought of 4-6 months duration can be expected 21% of the time, or once every five years on average. 4-6 months of severe/extreme precipitation

deficit will cause depletion in surface water resources, possibly leading to the potential failure of water supplies if the resources are not better managed.
It should be noted that the two SPI-6 precipitation periods April-September 2013 and October 2013-March 2014 had values of -1.17 and -1.36 respectively (fig. 5). Since a Severe Drought technically starts only when SPI = -1.5, then the drought sequence in Kosovo was no more than a Moderate Drought. In spite of this all the reservoirs were brought to the point of failure through inadequate monitoring and inadequate understanding of precipitation versus reservoir supply-demand dynamics by the RWCs.
This raises concerns if Kosova was to be faced with an extended period of Severe Drought!



	SPI-1	SPI-1	SPI-1	SPI-1	SPI-1	SPI-1	SPI-1	SPI-1	SPI-1	SPI-1	SPI-1	SPI-1	SPI-2	SPI-2	SPI-2	SPI-2	SPI-2	SPI-2	SPI-3	SPI-3	SPI-3	SPI-3	SPI-4	SPI-4	SPI-4	SPI-6	SPI-6	SPI-12
H Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct-Nov	Dec-Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Jan	Feb-May	Jun-Sep	Oct-Mar	Apr-Sep	Oct-Sep
2002	-99	-99	-99	2.12	-0.92	-3.06	-0.17	-0.62	-1.24	0.03	-0.36	0.49	-99	-99	-2.28	-0.73	-0.76	0.01	-99	0.57	-1.48	-0.03	-99	-1.78	-0.40	-99	-0.94	-99
2003	1.36	-0.04	-1.34	1.23	0.85	0.85	0.18	-0.44	-0.06	0.79	0.63	0.49	1.01	0.16	1.01	-0.25	0.43	0.58	0.41	1.45	-0.45	0.73	0.89	0.37	0.55	1.14	0.32	0.89
2004	-0.46	1.33	-0.64	-0.01	0.22	0.72	0.28	0.98	0.24	0.49	1.05	-0.66	0.63	-0.64	0.92	0.87	0.37	0.39	0.23	0.28	0.86	0.44	0.12	0.86	0.39	0.24	0.75	0.61
2005	-0.42	-0.30	1.13	0.18	1.26	1.17	0.96	-0.70	0.21	-0.16	1.30	-0.27	-0.70	0.90	1.52	0.08	-0.09	0.74	0.03	1.29	0.12	0.46	0.00	1.03	0.39	0.75	0.35	0.65
2006	-0.19	-0.85	-0.65	0.65	-0.50	-0.14	-1.02	0.64	-1.19	-1.73	-0.32	-0.69	-0.88	-0.08	-0.58	-0.08	-2.04	-0.74	-1.17	-0.15	-0.79	-1.36	-0.86	-0.50	-1.68	-1.14	-1.61	-2.06
2007	1.21	1.65	-0.74	-0.57	-1.92	1.77	-1.63	0.15	1.64	0.81	-0.48	0.21	2.06	-1.13	0.79	-0.00	1.52	-0.25	1.65	0.29	0.62	0.17	1.43	-0.07	0.78	1.47	0.39	1.18
2008	-0.15	-0.12	1.54	0.91	0.60	1.38	-0.93	-0.03	1.16	-0.33	0.40	-0.90	-0.37	1.88	1.26	-0.68	0.54	-0.28	0.54	1.44	0.24	-0.45	0.83	0.38	0.10	1.23	-0.32	0.53
2009	0.66	0.56	0.93	1.20	1.71	0.68	1.04	0.49	0.84	0.79	-0.19	-0.42	0.90	1.43	1.53	0.94	0.97	-0.50	1.15	1.85	1.30	0.01	1.96	1.58	0.28	1.97	0.68	1.73
2010	0.77	1.06	1.66	-0.54	-0.47	-0.27	-0.55	0.19	-1.03	0.35	-1.75	-0.12	1.17	1.05	-0.66	-0.29	-0.43	-0.95	1.76	-1.04	-0.94	-0.55	1.55	-0.71	-0.91	1.00	-1.11	-0.14
2011	-0.05	-2.64	0.74	1.93	0.27	-1.03	0.19	1.07	-2.54	0.43	-1.64	-1.07	-1.40	1.90	-0.54	0.89	-0.83	-1.68	-0.69	1.02	-0.09	-0.88	0.47	0.32	-1.57	0.05	-0.83	-0.67
2012	0.26	-0.75	0.41	-0.44	0.08	-0.25	-1.43	-0.11	-0.39	-0.22	-1.45	0.56	-1.40	-0.07	-0.27	-0.99	-0.53	-0.30	-0.21	-0.64	-1.24	-0.42	-0.46	-0.98	-0.58	-0.67	-1.17	-1.42
2013	0.36	-0.26	-1.54	-1.05	-2.49	0.68	3.90	0.32	-99	-99	-99	-99	-0.04	-2.13	-0.42	3.12	-99	-99	-0.73	-1.07	-99	-99	-1.20	2.29	-99	-1.36	-99	-99
2014	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

Fig 5. Monthly, bimonthly, quarterly, semi-annual and annual SPIs for Prishtina

The situation was only rescued by an extraordinary occurrence of extreme surplus precipitation in April that averted a catastrophe. In fact, April 2014 registered the wettest month in the recorded hydro-meteorological history of Kosova, since 1927 with 227 mm precipitation, which expressed in Standardized Precipitation Index was 3.90! This means, that the chance of getting this value in April was 1 in 2000! Normal precipitation for the month of April would be 51 mm.
This is a massive fluctuation from only 8 weeks earlier, in February 2014. Complacency that this was always going to happen has already rapidly set in.In order to avoid contentment and possible future failures, important lessons must be learned from the recent crisis. Precisely the same issues were encountered in 2007, and no action was taken to learn from that experience, with the consequence that almost the same lack of preparedness occurred six years later. Droughts (and floods) cannot of course be prevented. However, by continuous monitoring of precipitation and water levels in strategic rivers, more effective data processing, and the use of simple early warning systems, these can significantly improve regional level preparedness and resilience to floods and droughts.
Detailed analysis of the Prishtina precipitation record 1927-2014 confirms the statistical severity of the current meteorological drought. For example, the long-term annual average precipitation value for Prishtina is 582mm/year. Annual values of less than 480mm represent moderate to severe drought situations. The hydrological year October 2012 – September 2013 (436mm) was the fifth driest year since 1927 and December 2013 was also the fifth driest December since 1927 (16mm compared to the average 59mm). August 2013 received 6mm compared to the more normal 38mm.
The need for water conservation measures could therefore have been identified already in August 2013, if not earlier, if an Early Warning System (EWS) had been operating. With earlier conservation of water in the Batllava and Badovc

Reference

1. RWC"Prishtina"j.s.c
2. Kosovo Hydrometeorological Institute
3. GIZ

Motorizing CBD of Tirana. A Before and After Study in Tirana from Sustainability Point of View

Edison Barhani[1]

[1]Epoka Univeristy, Rr. Autostrada Tiranë-Rinas, km. 12, 1000, Tirana,
barhani.edison@gmail.com

Abstract. The Center Business District of Tirana (Skanderbeg Square) plays a crucial part in Tirana Transportation System. After a closure of about 2 years, being under reconstruction, CBD opened to traffic on November 14th, 2011. This study analyses performance parameters like: travel time for both cars and buses, waiting time at bus stations, and passenger boarding/alignment for bus passing through or around the CBD before and after it was opened to traffic. Route that follows Kinostudio-Kombinat bus line has been selected as a representative of all other lines passing through the center of Tirana. Opened to traffic for the supply to meet the demand differently with sustainability approaches, this significant structural change in transportation system of Tirana has deteriorated the total transportation system of Tirana City. Higher travel speeds were observed within CBD but slower ones out of it. In addition, although this change has led to a slight improvement in east part of Tirana, travel speeds at the west part which is a main entrance to Tirana of intercity commuters has been significantly deteriorated (20-25%). Moreover, this change indirectly has changed flow distribution at signalized intersections thus making the system less efficient. Last but not least, capacity of public transport services has not been increased to cope with the increase of number of public transport commuters, hence making the mode less attractive. Providing the supply to meet the demand is not anymore the solution, but the sustainability is permanent solution.

Keywords: Public transport, Sustainability, Travel speed, Passenger accumulation

1. Introduction

Tirana as Albanian Capital city has rapidly developed last two decades. Tirana population (city only) doubled approximately every decade and according to Census 2011 536,998 inhabitants lives in Tirana (Instat, 2012). The same data source revealed that the number of dwellings have increased by 67% during the last decade. In reply, Tirana Municipality has been continuously investing in its transportation systems by constructing now roads, widening the existing roads and maintaining them. The same solution, where supply has to be increased to meet the demand, was decided by the new Mayer in 2011 by changing the plan of the CBD from car-free to an automobile oriented one.
This decision has pushed away the principals of sustainable transportation as the better solution in these typical circumstances. Litman (2003) in his study indicated that road widening is not a solution for decreasing the congestion level. However, improving public transport and designing High Occupancy Vehicle (HOV) lanes decrease the congestion level. On the other hand, European Conference of Ministers of Transport (ECMT 2004) defines the sustainable transport system as one that is accessible, safe, environmentally-friendly, and affordable. In Europe a majority of citizens are calling for changes to promote modes of transport which are more respectful of their environment (European Commission - Eurobarometer). Sustainable transport should be the use of transport and other factors in helping to meet present needs without jeopardizing future generations (White Paper, 2001). When the roads under consideration are already highly congested, it is typically assumed that reducing the capacity available for cars will result in increased traffic congestion in the surrounding streets. However, as the evidence in the previous applications this is not necessarily the case. Some pioneering cities, for example Copenhagen in Denmark, have adopted such a policy for many years with great success (Gehl and Gemzøe, 1996). There is a growing body of evidence that where well-planned measures to reduce road space for private cars are implemented in congested areas and where

no alternative network capacity is available, over the long term the predicted traffic chaos does not occur (Cairns at al., 1998).

2. Study Area and Data Collection

The purpose of this study was to measure and compare performance parameters like: travel time for both cars and buses, waiting time at bus stations, and passenger boardings/alignments for bus passing through or around the CBD before and after it was opened to traffic.
Skanderbeg square is Tirana's most important square, where most of the governmental buildings, national museum and historic buildings are located around. This center has been under construction for more than two years in compliance with the plan considering it a fully pedestrianized and a car-free square. However, this plan was suddenly changed in 2011, making this square again motorized. The car-free area was measured to be 200,000m2, later decreased to 16,000m2, almost not usable by pedestrians serving only like a roundabout after it was open to the traffic.
Bus line from Kombinat to Kinostudio (Fig. 1) was considered to be a representative line for other ones passing through this center. The length of this line is about 8.7km (shortenend to 8.4km) and comprised 17 bus stations. The roads where buses travel vary from arterials to collectors and from two to six lanes, with and/or without street parking. They travel through commercial, industrial, residential, and through the Skanderbeg Square.

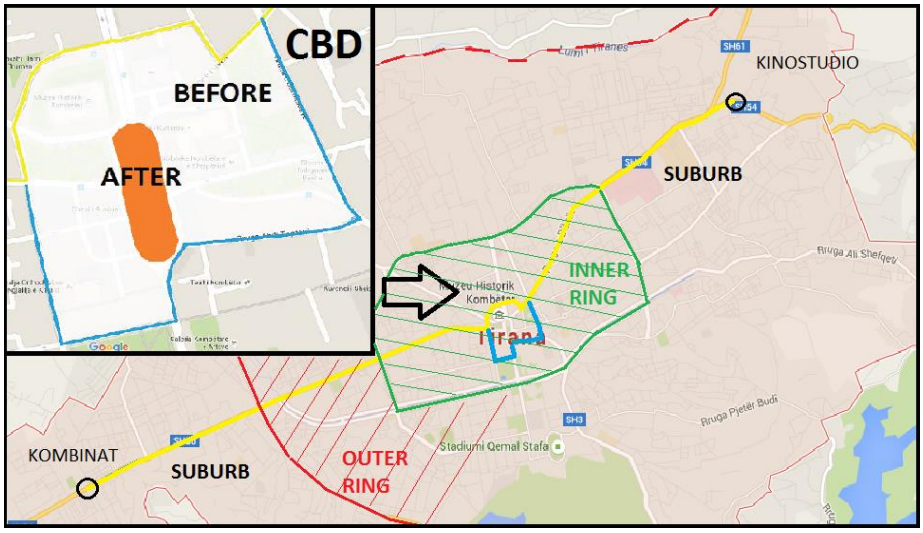


Fig. 1. Study area; Kombinat-Kinostudio bus route.

Teams of two people collected data by driving buses during randomly selected times of the day starting from 7:00 till 19:00. Bus operation characteristics; travel times, stop time in the bus station, boarding and alignment of passengers' information were collected manually for each direction at each bus station. At the same time, two cars have been driven through the same route in both directions and time incremental for each station was measured. Distance from each station was obtained from topographical maps. All the data were collected within three days from Tuesday to Thursday and the weather was cloudy. The same measurements were conducted after the opening to traffic of CBD almost two years latter to avoid any bias; again within three days from Tuesday to Thursday where the weather conditions were the same and traffic characteristics were considered adjusted.

3. Analysis and Discussion

Travel speed of the bus is one of the most important indications of the level of service of the transit operation. The data collected on the field were processed and summarized in Fig. 2 and Fig. 3 showing the travel speeds for buses and cars before and after CBD was opened to the traffic.
Apparently travel speed of the bus within the CBD has increased from 11km/hr to 15km/h in the west direction and 10km/hr to 13km/h in east direction. In addition, improvement was done for auto mode in the east direction (from 12km/h to 18km/h); whereas in the west direction was not (12km/h). This may have resulted because the automobiles had to use the same route as before in the west direction. Interesting figures were observed out of the CBD area. Opening to traffic the CBD has led to an improvement of travel speed in the east part of Tirana for all modes. On the other hand, the situation in west side of Tirana has been deteriorated. The travel speeds has been decreased probably because people coming from east part, which is a main entrance to Tirana, has found traveling through CBD more attractive especially for commuters from long distances (inter city). Previously, these commuters had only public transport option to travel to and/or back from CBD. In addition, currently they are less sensitive to extra traveling costs within the CBD and thus chose automobile mode rather than bus mode.

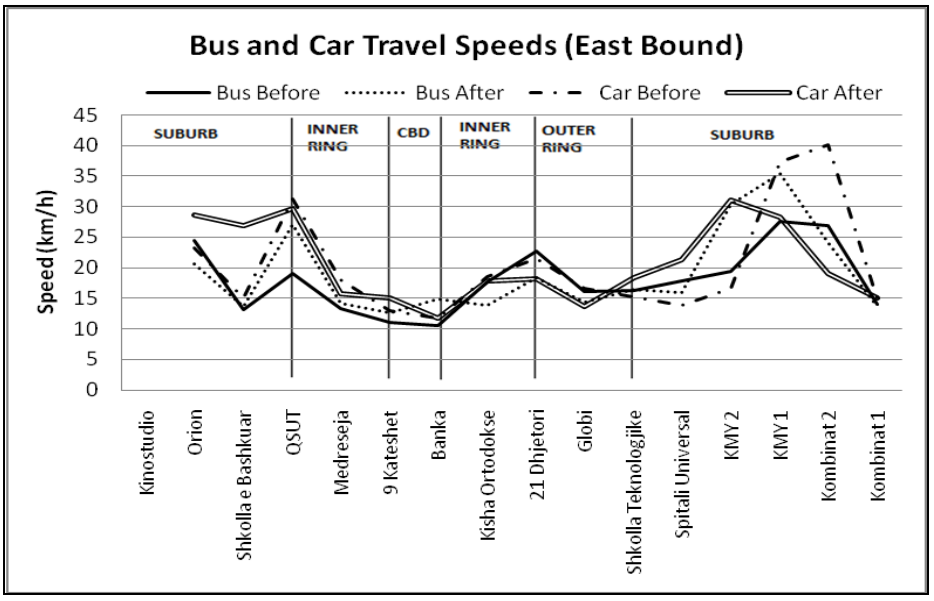


Fig. 2. Travel time of bus and car before and after (Kinostudio-Kombinat - west direction)

Moreover, this significant change in travel speeds, directly affect traffic light signalization timing which need to be re-optimized. Furthermore, parking demand is expected to have been increased in the vicinity of the CBD, hence slowing down the traffic flow by increasing flow friction.
Fig. 4 shows average passenger accumulation per trip. The maximum accumulation of 80 passengers is reached at Bank Bus Station, for the west direction. On the other hand, the maximum accumulation of 82 passengers is reached at 21dhjetori bus station for the east direction. It should be noted that the number of the passengers in the east direction has been increased for the east direction from 60 to 82.

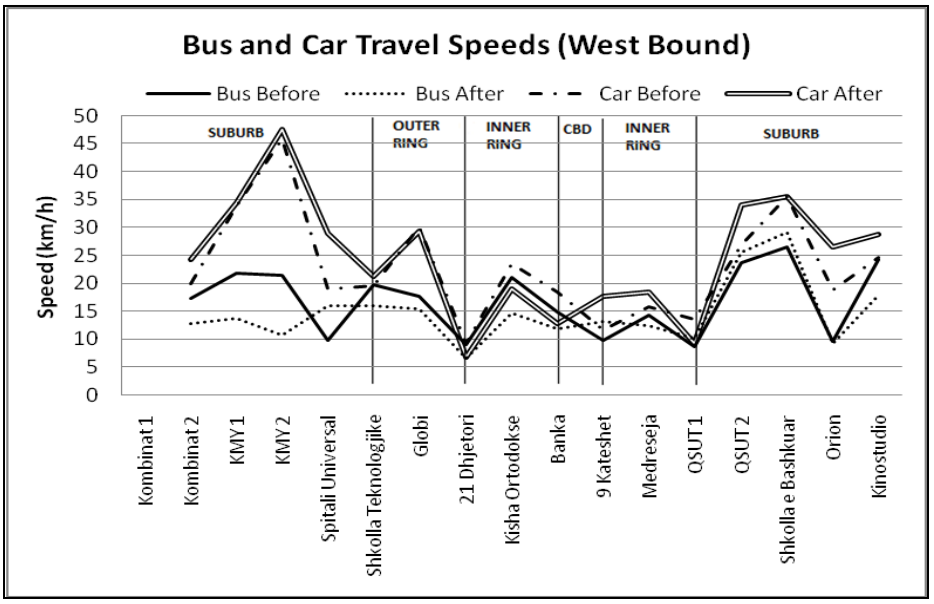


Fig. 3. Travel time of bus and car before and after (Kombinat-Kinostudio - east direction)

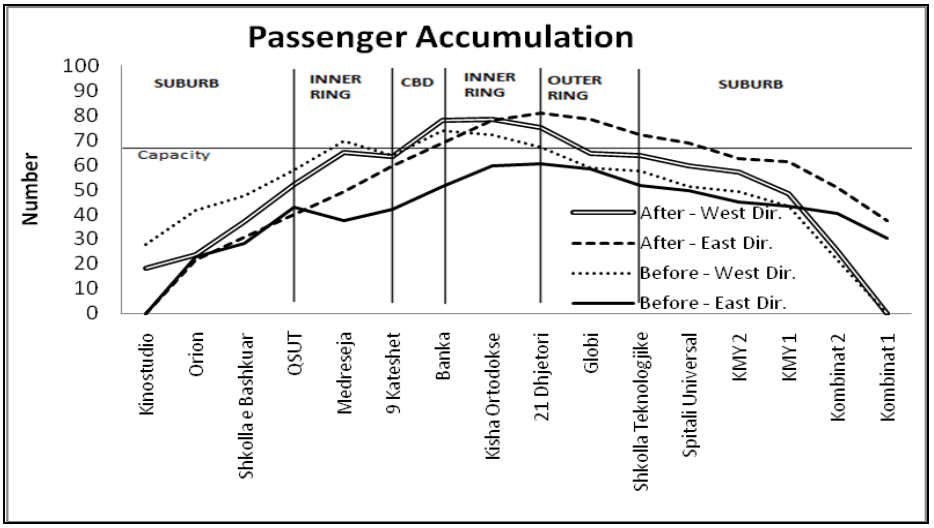


Fig. 4. Passenger Accumulation

The bell shape of the distribution shows that most of the passengers come into the Square for different purposes from both directions. As a result of this type of distribution bus stations near the square serve as terminal stations. Adding another line from Medresea to Shkolla Teknologjike would have improved the comfort of public transportation mode, thus making it more attractive.

In addition, the maximum number of passengers at the same time in the bus has been measured to be 82. This is standard type bus is designed to carry about 60-65 passengers. This high number of passengers above the bus capacity shows that a lot of people are using the bus mode. However, nothing is done to increase the caring capacities of mass transportation, making this mode less comfortable.

Moreover, the longest waiting time is observed in Bank station; appearantly showing that this station is used as a terminal station or for schedule adjusting purposes. This situation discourages bus users.

Conclusions and Recommendations

Benefits of creating additional road capacity are not as significant as it was previously believed, (Litman, 2003). The road widening is not a solution for decreasing the congestion level. The actual transportation system in Tirana does not take into account the fundamentals of the sustainability. Therefore, the need for a detailed and comprehensive transport policy, to encourage sustainable transport and sustainable mobility, is essential and crucial. The increase of road capacity in the center has improved the travel speed within the square. However, travel speeds in west side significantly deteriorated whereas in east side has been slightly improved. The longest waiting time is observed in Bank station; appearantly showing that this station is used as a terminal station or for schedule adjusting purposes. This situation discourages bus users.A high number of passengers above the bus capacity observed during this study shows that even though people are using bus mode nothing seem to have been done to increase the carrying capacities of mass transportation. This situation forces passengers to use other modes of transportation like passenger cars minibuses.

References

1. McKnight E. C., Levinson S. H., Ozbay K., Kamga C., Paaswell E. R., The Impact of Traffic Congestion on Bus Travel Time in Northern New Jersey, 2004
2. Bertini L. R., and El-Geneidy M. A., Modeling Transit Trip Time Using Archived Bus Dispatch System Data, 2002
3. Buehler R., and Pucher J., Sustainable Transport in Freiburg: Lessons from Germany's Environmental Capital, International Journal of Sustainable Transportation, 5:43–70, 2011
4. M. El-Geneidy A, Hourdos J., Horning J., Bus Transit Service Planning and Operations in a Competitive Environment, Journal of Public Transportation, Vol. 12, No. 3, 2009
5. Vuchic R. V., Urban Transit Operations, Planning and Economics, John Wiley & Sons, 2005

Katalogimi në botim – **(CIP)**
Biblioteka Kombëtare e Kosovës "Pjetër Bogdani"

72(496.5)(063)"2015"
711.4(496.5)(063)"2015"

Proceedings of the 4th UBT Annual International Conference on Business, Technology and Innovation : Architecture and Spatial Planning : Civil Engineering, Infrastructure and Environment / Editor Edmond Hajrizi. - Prishtinë : UBT, 2015. – 212 f. : ilustr. ; 30 cm.

1.Hajrizi, Edmond

ISBN 978-9951-550-13-0

Recognised for excellence

Recognised for Excellence

IC - CSCE

IC - EEE

IC - MBE

IC - MSER

IC - ISS

IC - ASP

IC - CEIE

IC - LAW

IC - PS

IC - MC

Lagjja Kalabria p.n KS - 10000, Prishtinë

+381 38 541 400; +377 44 541 400

www.ubt-uni.net | conferences@ubt-uni.net

ISBN 978-9951-550-13-0