Wood as a Sustainable Building Material in Residential Buildings in Albania

Denisa Hajnaj

***Abstract*— The European Commission has played an important role for the EU countries on the construction sector helping them in selecting new ecological materials,technologies and building codes. Our country has experienced many transition periods but the past solutions on the construction sector have shown for contemporary solutions. Why not referring to the valuable past applications in interior spaces and exterior architectural building language? Nowadays,helping the urban environment of our country,results to be unreachable goal. Building legislations,General Regulatory Plans ,the Strategic Environmental Assessment are instruments that can succefully lead to a sustainable environment and a healthy life.**

***Index Terms*— ecological materials, past solution, sustainable environment, traditional, wooden structures.**

I. INTRODUCTION

Albania–along with other Western Balkans countries–was identified as a potential candidate for EU membership during the *Thessaloniki European Council* summit in June 2003. In 2009, Albania submitted its formal application for EU membership. In October 2012, Commission recommended that Albania be granted EU candidate status, subject to completion of key measures in the areas of judicial and public administration reform and revision of the parliamentary rules of procedures.

In June 2014, Albania was awarded candidate status by the EU(*European Commission,Enlargment Policy).* A very important issue for sustainable development is the building issue.It affects directly on a sustainable environment.The European Commission presented the Albanian Report of 2015 in Brussels, 10.11.2015,where in chapter 27*(Environment and climate change),*was cited that Albania is at an early stage of preparation in this area. There was some progress on environment and climate change, however, industrial control and monitoring of emissions and waste management remain poor. According to the building material appliances in buildings, the Eurocodes for the design of buildings and civil engineering works, cover in a comprehensive manner all principal construction materials *(concrete, steel, timber, masonry and aluminium*), all major fields of structural engineering *(basis of structural design, loading, fire, geotechnics, earthquake, etc)* and a wide range of types of structures and products *(buildings, bridges, towers and masts, silos, etc).*

But if we would have a look at the past we would analyze the sustainable materials for which we are fighting for nowadays. The beginnings of the eighteenth century marked the new era of residential building constructions. Materials used unified the architectural language spoken. Different cities, especially cities that were considered economic and social potentials, marked the Albanian architecture history. Traditional lifestyles clearly defined the morphology of residential architecture.

In this context,residential buildings were organized not only by living spaces and functions but also by crafts spaces,farming,agricultural and reservation spaces. Relations between these spaces were almost equal. The economic factor used to define the technology applied in the respective building constructions and materials. Natural ecological materials such as wood and stone were used massively by increasing the economic,social, architectural and aesthetic values. Referring to these

values Berati and Gjirokastra were inscribed as rare examples of an architectural character typical of the Ottoman period. From 2005 and 2008, respectively Gjirokastra and Berati are part of UNESCO-World Heritage Center. Use of wood occupied an important role for the seismic durability and thermal insulations.

II. BUILDING TYPOLOGIES

Typology of buildings where wood was the dominant material were knows as *"houses with çardak".*

Wood applications were chosen for cost effects,facilitation during construction and its positive impact in the urban landscape.This building typology spread simultaneously in Tirana,Shkodra,Berati and Gjirokastra. They were organized in two or three levels : a) the first floor organized with crafts or agricultural functions; b) the upper floor organized with the living spaces such as dinning room,bedrooms,etc. The "çardak" represented the connecting area between the two storeys. This connection was found in two schemes with :

1) one direction scale, 2) two direction scales.

Due to the connecting role, the "çardak" was divided in two sub areas: the noisy and the quiet one,knows as "sofaja" and "qoshku".

Orientation of these residential buildings were realized in such a way that the main façade could see

the yard and parts of the city. Avoiding from the main road was intentional. The main facade was oriented south-east. During the eighteenth century the çardak residences appeared in three types:

a) Dwelling with çardak across the forehead
b) Dwelling with çardak on one side
c) Dwelling with çardak at the center

a) Dwelling with çardak across the forehead were characterized for the connection established between the çardak's space and living spaces against the agricultural or farming functions 1:2.5. The living spaces and the fireplace room were the mos important parts of the building. Over the years the lifestyle changed. This led in organizing interior spaces in different proportions.

Denisa Hajnaj, Department of Wood Industry, Agricultural University of Tirana,Tirana,Albania,00355692309109

b) Dwelling with çardak on one side were characterized for the 1:4 proportion determined between the çardak's space against the other spaces.
c) Dwelling with çardak at the center represented the 1:5 proportion determined between the çardak's space against the other spaces.
However, dwelling with *çardak* have had different features for different cities.

III. USE OF WOOD IN URBAN CENTERS-RESIDENTIAL BUILDINGS IN GJIROKASTRA AND BERAT

Residential buildings in Gjirokastra appeared with a fortified character. The main building construction material was the stone. Wood was mostly applied in the upper floor, by making the functional separation through facade. The çardak was build in wood and was used for crafts and agricultural purposes. Wood material was applied in window frames,roof constructions and floors. The fir and oak were the main woods used in Gjirokastra.

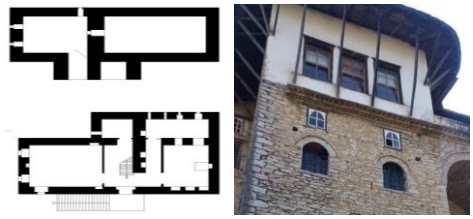

Figure 1: The main façade of a fortified residential building, main floor plans and materials applied in exterior.(Source: Historia e Arkitektures Shqiptare,UNESCO,Denisa Hajnaj)

Figure 2: Dwelling with çardak on one side; House with çardak at the center but changed after restoration phases(Source: Denisa Hajnaj)

Due to the geographical position residential buildings in Berat were characterized for a horizontal development. Dwellings were organized in two or three levels and due to the sloping ground were developed with unilateral ventilation. In order to ensure thermal comfort the main facades were designed with numerous wooden frame windows, for which the city is named the "City of windows". The dwellings were projected with the "çardak" element in wood construction. Application of wood was found massively in walls in three types ensuring successively high stability for many years: a) clay mortar + wooden panels/beams, b) lime mortar +wood panels/beams.

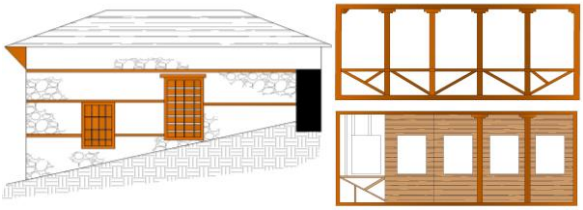

Figure 3 : Stone wall with clay mortar (Source: Historia e Arkitektures Shqiptare)

Figure 4 : Wall with wooden framework "çatma"(Source: Historia e Arkitektures Shqiptare)

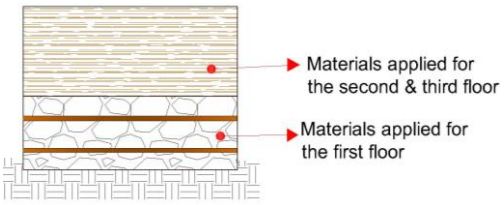

Figure 5 : Detail of materials applied in different levels of dwelling's construction (Source: Denisa Hajnaj)

Construction of masonry with clay mortar + wooden panels were applied in two techniques which consisted in combinations of the above mentioned elements as well as small stones or wood panels. Wood beams were used in longitudinal and transverse links to reinforce resistance to earthquakes. The type of wood used in adobe dwellings was the oak. Dwellings in Berat were also introduced for the wooden frames called "çatma". These wooden structures were created for the:1) constructive function; 2) dividing spaces. The dividing spaces were realized on the finished floor by using small wooden beams.

Figure 6 : Berat dwellings with çardak (Source : Denisa Hajnaj)

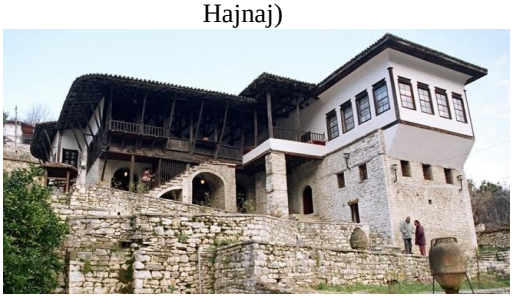

Figure 7 : Dwelling with çardak - nowadays Ethnographic Museum of Berat (Source : Municipality of Berat)

Diversity of trees used in dwellings was clearly to maximal utilization of natural resources of the country. Some types of trees for the dwellings in Berat were:

a) The oak - usage of which was found in the columns with retaining function,
b) The juniper tree- was used for the fillings of walls in wood frames (çatmate)
c) Poplar - was used for door and window frames,
d) Pine - was used for dividing windows panels.

An example of the dwelling with cardak on one side (late eighteenth century), was analyzed for many uses of wood such as :masonry of wooden frames on the upper floor,the main façade of the invitation room (known as "*oda e miqve*"),the external wall of çardak,space dividers on the living space-fireplace (known as "*oda e zjarrit").* In some of the dwellings, wood flooring material was selected only for the special room-guest room. Roof construction was with wooden beams. The ceiling was a decoration element especially with the wooden rosettes.

IV. WOOD IN DWELLINGS OF SHKODRA

Dwellings of this city,in addition to the massive use of wood,were characterized for the development of typical buildings with çardak. The construction of scales used to make the differences between dwellings.First it was with one direction and after some years it was developed with two directions. The support of wooden stairs was realized through the wooden columns. By adding the second direction of scales the çadrak's surface was reduced. This constituted a compositional scheme and the second type of dwellings for the city. In other schemes the upper floor war organized in more than four rooms which ones dealed with each other by the çardak's space. The wood pillows were additional elements positioned between the floor and the roof. They helped to increase the sustainability of the building. The walls were also in wooden structures. An important architectural element for these dwellings was the gateway which possessed considerable area,in wood material and sheltered in two sides(inside and outside the courtyard). The timber gates treatment was simple, often represented by vertical elements connected to one horizontal binary and one brace in diagonal direction.

V. WOOD AND ADOBE MATERIAL-APPLICATIONS IN DWELLINGS OF TIRANA

Also,dwellings in Tirana speaked clearly for wood in the interior as well as exterior. The wood panels combitanions were applied with adobe material. This type of mansory was applied to each wall except those of meeting room which wall's construction was of wooden frames. To ensure high seismic stability,optimal thermal and acoustic insulation binaries were combined with adobe material in a repeated technique,each 70-100 cm. The wooden binaries were used also for the courtyard walls. Another important element in the design of dwellings in Tirana was "mafili" - the interior balcony built entirely in wood and elements such as: wooden beams, wooden floors, decorative and constructive wooden columns and balustrades. The stairs that enable the connection in altimetry were realized also in wood providing sustainability.

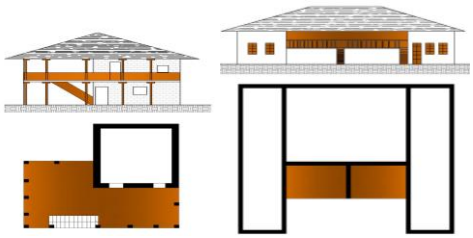

Figure 7: Typical dwellings in Tirana. Proportions between raw and ecological materials (Source: Historia e Arkitektures Shqiptare)

Figure 8 : The strong connection between building and landscape (Source: Denisa Hajnaj)

VI. CONCLUSIONS

Referring to the sustainable development required nowadays,it is very important to have a full analyze situation ,begininig with the historical issues,urban design,architecture language used in the past .How was the building's performance using ecological materials at the past and which was their impact on the human health and environment quality. Secondly, the analyzes that deals directly with the development of new technologies on buildings with different functions,especially buildings where people have to spend a lot of time. Building codes must specify the ecological materials that building construction companies should apply. The buildings/dwellings with historical values offers acoustic insulation,thermal comfort and give an important accent to the landscape aound the dwelling.New dwellings in urban areas try to apply non ecological materials seriously damaging the environment.Ecological materials are an urgent need for the Albanian building legislation where none of these materials are specified.

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Denisa Hajnaj : Graduated in Architecture,Polytechnic Universtity of Tirana, Faculty of Civil Engineering. Lecturer at Agricultural University of Tirana,Department of Wood Industry for the modules of : Descriptive Geometry, History of Furniture and Furniture Design. Actually a Ph.D Candidate in the Department of Wood Industry , Faculty of Forestry Sciences, Tirana, Albania. My field of research includes wood applications in urban areas and its environmental impact.I have published six papers in International Conferences.