Assessment of an Office Building in Serbia by New Proposed Methodology - „OPEN HOUSE“

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Short Summary

The Construction Cluster „DUNDJER“ participates in the 7th FP European project entitled OPEN HOUSE (7th FP ENV - 2009.3.1.5.2). The overall objective of OPEN HOUSE is to develop and to implement a common European transparent building assessment methodology, complementing the existing ones, for planning and constructing sustainable buildings by means of an open approach and technical platform. OPEN HOUSE will develop a transparent approach able to emerge collectively in an open way across the EU. This approach will be communicated to all stakeholders and their interaction and influence on the methodology will be assured in a democratic way. The baseline will be existing standards (both CEN/TC 350 and ISO TC59/SC17), the EPBD Directive and its national transpositions and methodologies for assessing building sustainability at international, European and national level. This paper deals with practical assessment of an office building after reconstruction in Serbia.

Keywords: building assessment, sustainable building, european norms, ecologic building, energy efficiency, location

1. Introduction

Open house project involves 11 countries of the EU and the Western Balkans. Active partner at the project (FP7-ENV 2009) is a Construction Cluster Dundjer from Nis.

The scientific and technical objectives of the project OPEN HOUSE are:

• to define OPEN HOUSE approach: open and transparent european platform for sustainable construction,
• to promote OPEN HOUSE approach and define the mechanisms of interaction between the project and the decision-making factors,
• to build OPEN HOUSE platform: to support pan-european effort for a common view of sustainable construction,
• to consolidate the method of application and evaluation methodology: the choice of test examples and decision-making mechanisms,
• to evaluate and improve the methodology by using the results of the test examples and other similar cases, as well as other observations of decision makers,
• further development and use of OPEN HOUSE methodology.

Basics methodology consists of the following assessment:

• environmental quality,
• social-functional quality,
• economic quality,
• technical characteristics,
• process quality (design and construction),
• the position of the building (location).

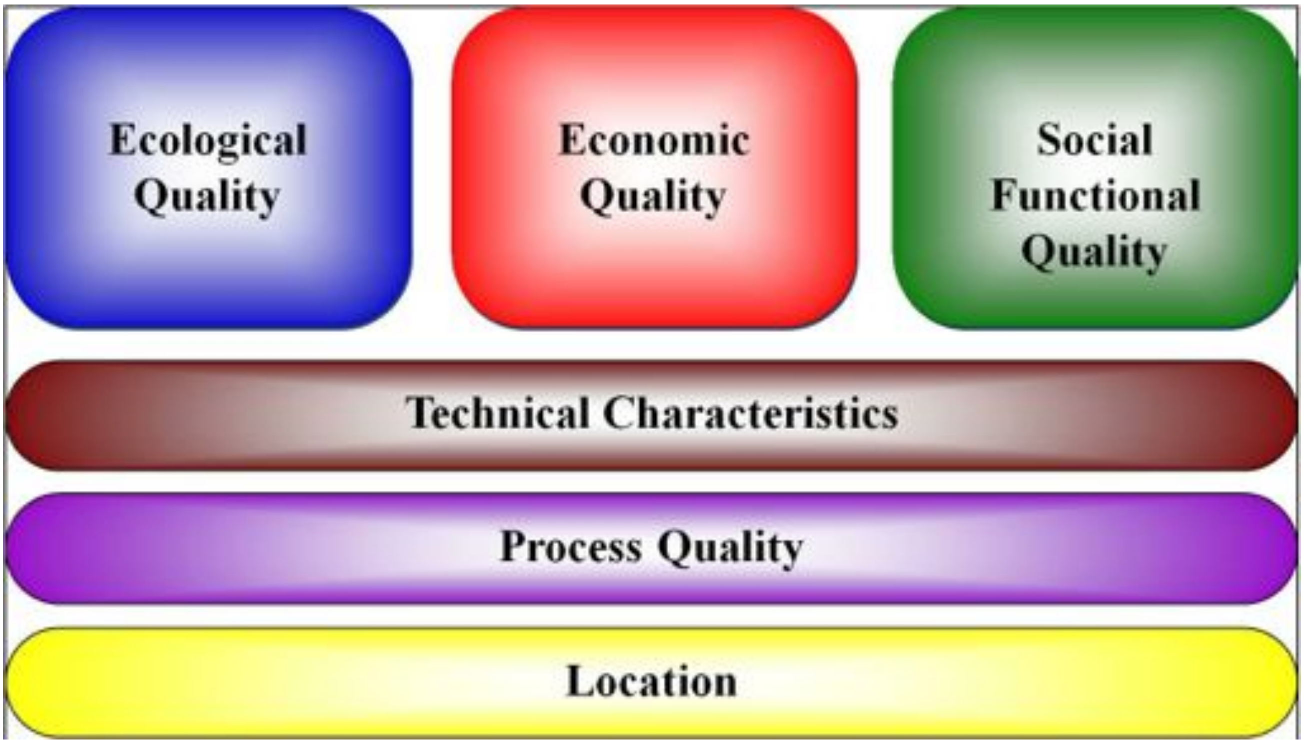

Fig. 1: **Open house shema**

Construction with emphasis on the cost during the building exploatation period is an economic method that aims to provide information before decisions making and to point out the savings when choosing the appropriate design solution including the cost of the product, service, energy efficiency.

During the analysis of the costs of the exploitation of the facility one should consider the costs that should be in accordance with the description and size of the object known in the evaluation. For the purposes of this analysis, the calculation period is limited to 50 years. The initial investment can be considered when the building is delivered to the investor, and is ready to use. This price includes the design of the structure, systems, installations, components, connections with suppliers and energy, and commissioning. These are costs that are presented to the investor.

When evaluating a particular attention has been given to the life cycle of the building - Life Cycle Assessment (LCA). LCA results of the building which is estimated, will be counted in a standardized manner and evaluated using benchmarking assessment. The goal of all LCA study is to analyze and subsequently evaluate the corresponding performance of "life cycle" of the building.

<table>
<tr><td colspan="16">BUILDING ASSESSMENT INFORMATION</td></tr>
<tr><td colspan="15">BUILDING LIFE CYCLE INFORMATION</td><td>SUPLEMENTARY INFORMATION BEYOND THE BUILDING LIFE CYCLE</td></tr>
<tr><td colspan="3">A1 – 3</td><td colspan="2">A4 – 5</td><td colspan="5">B1 – 7</td><td colspan="4">C1 – 4</td><td>D</td></tr>
<tr><td colspan="3">PRODUCT STAGE</td><td colspan="2">CONSTRUC TION PROCESS</td><td colspan="5">USE STAGE</td><td colspan="4">END OF LIFE STAGE</td><td>Benefits and loads beyond the system boundary</td></tr>
<tr><td rowspan="4">A1 Raw materials Supply</td><td rowspan="4">A2 Transport</td><td rowspan="4">A3 Manufacturing</td><td rowspan="4">A4 Transport</td><td rowspan="4">A5 Construction – installation process</td><td>B1</td><td>B2</td><td>B3</td><td>B4</td><td>B5</td><td rowspan="4">C1 Deconstruction</td><td rowspan="4">C2 Transport</td><td rowspan="4">C3 Waste processing for reuse, recovery or recycling</td><td rowspan="4">C4 Disposal</td><td rowspan="4">Reuse
Recovery
Recycling
Potential</td></tr>
<tr><td>Use</td><td>Maintenence</td><td>Repair</td><td>Replacement</td><td>Refurbishment</td></tr>
<tr><td colspan="5">B6 Operational Energy use</td></tr>
<tr><td colspan="5">B7 Operational Water use</td></tr>
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Fig. 2: **Building assessment information**

2. Project description

The case-study building hosts J.P. “Razvoj” (Public/Municipality Enterprise “Razvoj”). The Eterprise supports urban development of Municipality Knjaževac, and controls public investments, including design of major projects and objects. The Enterprise takes part in regional development and supports research in collaboration with research institutions, usually with University of Niš.

The building is located in the downtown of city Knjaževac, in pedestrian zone, close to main administrative municipality institutions. Face of the building is west-southwest oriented, without shadowing obstacles. The view from the building front side is to the small city central park and river Timok. The building has 3 main floors and an attic. In the 3rd floor are located offices, and in attic small conference hall, which is used also as a design studio for working team consultations.

The reconstruction of building was accomplished in the year 2005, with steady improvemen especially in energy consumption. This is the only office building with heating/cooling system based on heat pump. In addition, there is design of using solar energy (PV system) on the south oriented part of the roof. The design draft for using PV solar energy shows ability for using 200 m^2 (roof area) for PV panels. After completing, it would enable saving up to 15-20% of total energy consumtion.

Modeling the thermal energy balance of buildings is recently a challenging task for local architects and engineers. Directive EPBD (2002/91/ES) is recently enforced by local Energy Law, but in the time of building design and construction, the elements of design like glazing areas or windows thermal characteristics, the climate zone, the orientation, and the type of construction (e.g. high or low thermal inertia) have not been considered in a way to optimize their thermal contribution to the whole building’s energy balance. The measuring system, necessary for proper assessment and improvement, has to be realized in near future.

All the sustainability aspects (environmental, social/functional, economic, technical, process, location), are assessed “as is”, according to given scale. For Economic Quality assessment, the

bill of quantities is now out of date, due to unrealistic prices of some materials and works, and using some not any longer used materials (with not standardized quality) and equipment with not strictly defined efficiency, and, finally, local rate of inflation (over 10 %). Sensitivity analysis, being considerable politically dependent, is even more complex, and somehow rather unpredictable.
It is worthy to mention that this building was chosen, it seems, occasionally, and not as an example of good practice. The building is located in underdeveloped part of Serbia with all consequences to quality of building and, consequently, building sustainability. But, it is, in a way, representative case of construction technology in southeast Serbia.

RS.2 Knjazevac – JP DIREKCIJA SERBIA			
1	**Environmental Quality**	**Indicator Score %**	**Indicator Weight**
1.1	Global Warming Potential (GWP)	0	1
1.2	Ozone Depletion Potential (ODP)	0	1
1.3	Acidification Potential (AP)	0	1
1.4	Eutrophication Potential (EP)	100	1
1.5	Photochemical Ozone Creation Potential (POCP)	0	1
1.6	Risks from materials	0	2
1.7	Biodiversity and Depletion of Habitats	40	2
1.8	Light Pollution	100	2
1.9	Non-Renewable Primary Energy Demands (PEnr)	0	2
1.10	Total Primary Energy Demands and Percentage of Renewable Primary Energy	0	2
1.11	Water and Waste Water	10	3
1.12	Land use	50	3
1.13	Waste	10	3
1.14	Energy efficiency of building equipment (lifts, escalators etc.)	0	3

2	**Social / Functional Quality**	**Indicator Score %**	**Indicator Weight**
2.1	Barrier-free Accessibility	0	4
2.2	Personal Safety and Security of Users	7	4
2.3	Thermal Comfort	28	3
2.4	Indoor Air Quality	19	4
2.5	Water Quality	80	4
2.6	Acoustic Comfort	65	3
2.7	Visual Comfort	71	2
2.8	Operation Comfort	86	3
2.9	Service Quality	20	4
2.10	Electro Magnetic Pollution	50	4
2.11	Public Accessibility	100	4
2.12	Noise from Building and Site	100	3

2.13	Quality of the Design and Urban Development of the building and Site	0	4
2.14	Area Efficiency	100	3
2.15	Conversion Feasibility	44	2
2.16	Bicycle Comfort	0	2
2.17	Responsible Material Sourcing	0	2
2.18	Local Material	0	2

3	Economic Quality	Indicator Score %	Indicator Weight
3.1	Building-related Life Cycle Costs (LCC)	44	4
3.2	Value Stability	26	4

4	Technical Characteristics	Indicator Score %	Indicator Weight
4.1	Fire Protection	0	4
4.2	Durability of the structure and Robustness	50	4
4.3	Cleaning and maintenance	95	3
4.4	Resistance against hail, storm high water and earthquake	0	4
4.5	Noise Protection	10	4
4.6	Quality of the building shell	7	4
4.7	Ease of Deconstruction, Recycling, and Dismantling	3	3

5	Process Quality	Indicator Score %	Indicator Weight
5.1	Quality of the Project's Preparation	31	4
5.2	Integrated Planning	100	4
5.3	Optimization and Complexity of the Approach to Planning	21	4
5.4	Evidence of Sustainability during Bid Invitation and Awarding	5	2
5.5	Construction Site impact/ Construction Process	0	3
5.6	Quality of the Executing Contractors/Pre-Qualification	50	3
5.7	Quality Assurance of Construction Execution	50	4
5.8	Commissioning	50	4
5.9	Monitoring, Use and Operation	36	3

6	The Location	Indicator Score %	Indicator Weight
6.1	Risks at the Site	91	2
6.2	Circumstances at the Site	71	2
6.3	Options for Transportation	25	4
6.4	Image and Condition of the Location and Neighbourhood	78	3
6.5	Vicinity to amenities	86	4
6.6	Adjacent Media, Infrastructure, Development	56	3

Fig. 3: **Case study building**

Source: Construction cluster DUNDJER Nis, Serbia

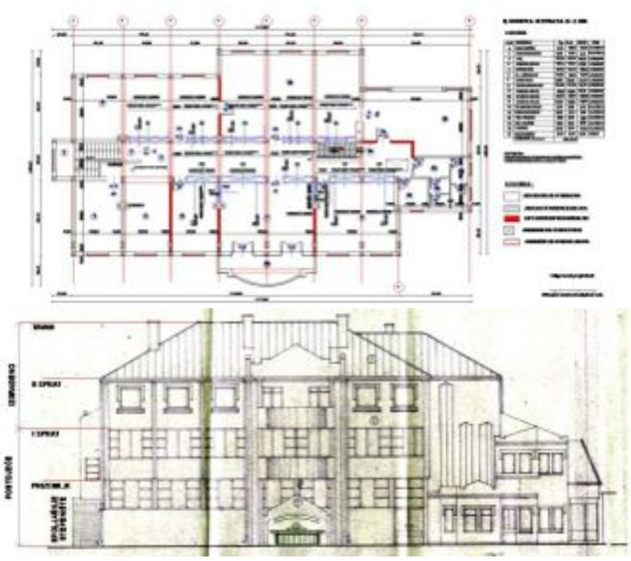

Fig. 4: **Ground plan and front look of the building**

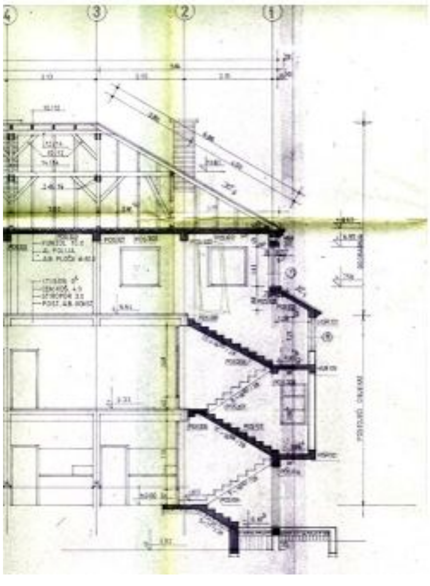

Fig. 5. **Section of the building**

Building Type
Office

Building Phase
In use
Date of Completion: 2005

Building Characteristics
Total Floor Area: 340 m²
Number of stories: 3

Address
Street Kej Dimitrija Tucovica 30
City Knjazevac
COUNTRY Serbia

Assessor
Name: Biljana Avramovic
Company: Construction cluster DUNDJER Nis, Serbia

Building Owner
Name: Municipality Knjazevac
Company: JP Direkcija Knjazevac

Architect
Name: Nebojsa Ivankovic
Company: JP Direkcija, Knjazevac

Assessment Methodology
OPEN HOUSE v1.1 (01/2012)
Basic & Quick Sustainability Assessment - Complete Sustainability Assessment

Fig. 6. **Building designer: Dipl. Ing. Arch. Nebojsa Ivankovic**

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