Increasing Energy Efficiency of Cultural Heritage Buildings within Historic Core of Split by Improving Current Management System and Implementing Revitalization Project

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ABSTRACT

Historic core of Split (on UNESCO-s World Heritage List since 1979; area: 216.613 m^2, closed space: 170.607 m^2) is faced with poor general condition of cultural heritage buildings, with trend of further deterioration, due to inadequate management system and lack of long term revitalization strategy. Energy efficiency, as global imperative in creating sustainable society, is also an important objective of sustainable development and integral conservation, both of which are indispensable building blocks of any modern revitalization strategy and historic core management systems. Taking above into account, possibilities for increasing energy efficiency of cultural heritage buildings, within Historic core of Split, by improving current management system and implementing revitalization project were analysed, and new management system was modelled.

KEYWORDS

Energy efficiency, cultural heritage buildings, urban historic centres, Historic core of Split, City of Split, management, revitalization

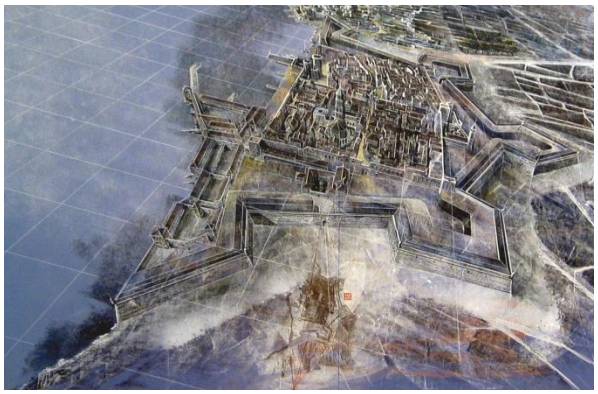


Figure 1 – Historic core of Split, 17th c.; B. Kaminski illustration

Figure 2 – Historic core of Split today; Aero image

Revitalization of urban historic centres constitutes of very complex multidisciplinary projects. For them to be successfully implemented, it is necessary that complete management system is being utilized, including systematic planning, organizing, leading, controlling and financing. Moreover, in order to assure long-term sustainability of these projects, it is necessary to follow both modern theoretical principals as well as international examples of best practice, in which sustainable development and integrated conservation, together with its implementation through fully professional, multidisciplinary management systems (while utilizing wide array of

available financial instruments), are highlighted as building blocks of long-term sustainable restoration and revitalization[1].
According to modern principles of sustainable development and integrated conservation of urban historic centres, implementation of energy efficiency measures, which are aligned with conservation requirements, is highly favoured and recommended[2]. Therefore, the Author of this Paper, believes in absolute necessity of implementing energy efficiency measures in all phases of revitalization projects (both built heritage and public utility infrastructure revitalization projects), as well as in need for systematic day-to-day energy management of historic centre's energy systems.

Because of its current condition, a full scaled revitalization project should be implemented in Historic core of Split, based on all above stated principles. On following pages, a special attention was given to analysis of the weaknesses of the current management system in the Historic core of Split, together with providing recommendations for its improvement, so that preconditions for implementation of energy efficiency measures as well as implementation of holistic revitalization project could be established.

HISTORIC CORE OF SPLIT

Historic core of Split with Diocletian's palace represents vibrant urban area of exceptional historical and cultural importance, which was recognised in 1979., when it was listed on UNESCO's World Heritage list.
Historic Core is located by the sea shore of the north (middle) part of Split's city port. The Core is outlined by the line stretching around 17th c. baroque fortifications, encompassing area of approx. 212.613 m^2 (21,26 hectares), divided into five characteristic urban zones shown on the figure below:

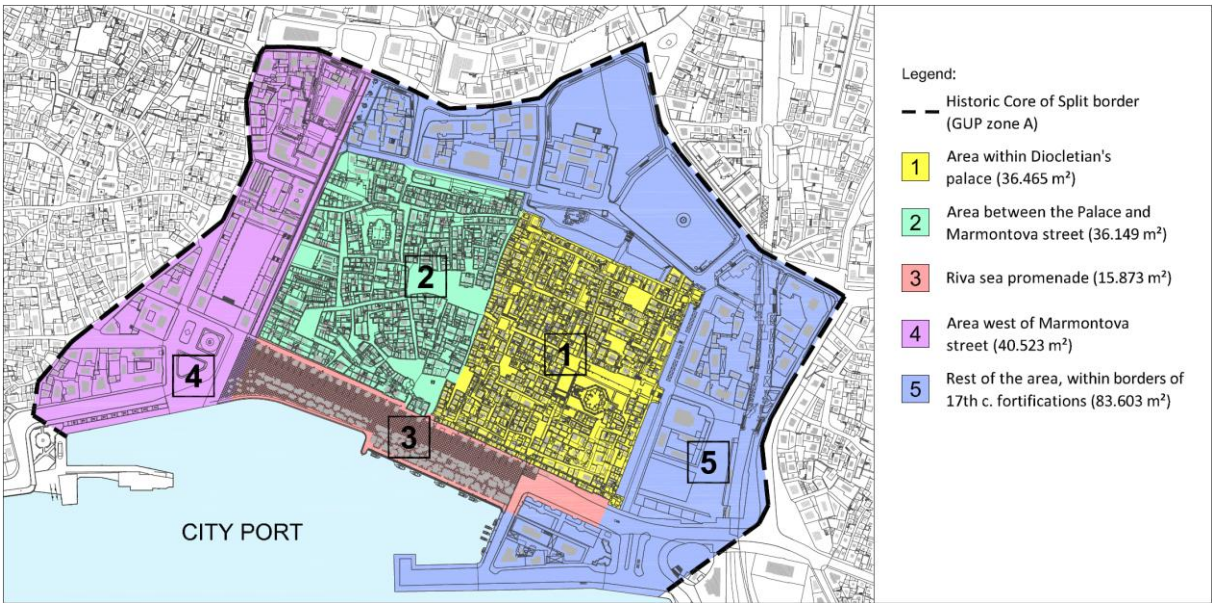


Figure 3 – Historic Core of Split with characteristic urban zones

[1] (Council of Europe, Directorate of Culture and Cultural and Natural Heritage, 2008); (Pickard, Management of Historic Centres, 2001); (Pickard, Funding the architectural heritage: a guide to policies and examples, 2009)
[2] (Pickard, Management of Historic Centres, 2001, pp. 271-272; 287-288); (Pickard, Funding the architectural heritage: a guide to policies and examples, 2009, pp. 149-152)

City of Split started developing at the beginning of 4th c. with construction of Diocletian's palace - one of the world's most important masterpieces of late antique architecture, characterised by continuous socio-urban existence to present times. Thanks to its undisrupted continuance, the Palace became world-grade urban monument and one of the most important examples of architectural transformation of native antique structure, into middle-age town, which main elements are preserved until today and also recognised as one of the most important living elements of national history and cultural heritage in general.

CURRENT CONDITION

Analysis of Historic Core's current condition shows its poor condition, which is a direct consequence of the natural deterioration process occurring faster than counter, human-triggered, revitalization activities.
This equally applies to built heritage (where inadequate structure stability is present on many buildings, especially those within Diocletian's palace, as well as poor state of façades, roofings and roof structures) and public utility infrastructure which by large is on the end (or beyond) of its lifecycle.

Throughout the history, built heritage within the Historic Core experienced various transformations, so that today it represents symbiosis of various styles depending on construction and/or extension period.

Today Historic Core is characterised by 29 building blocks of a relatively high construction density (especially within the very centre of Historic Core; blocks 1-22), shown on the figure below:

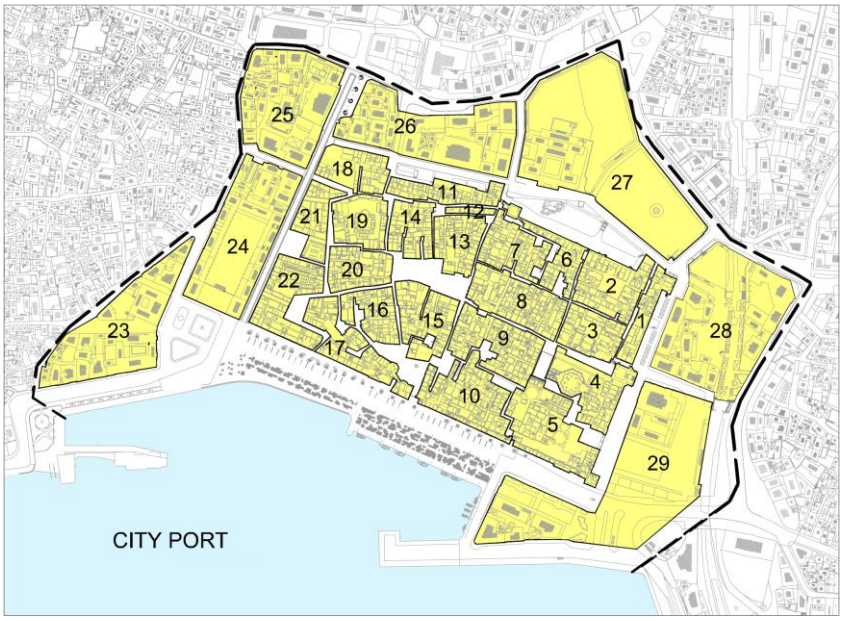
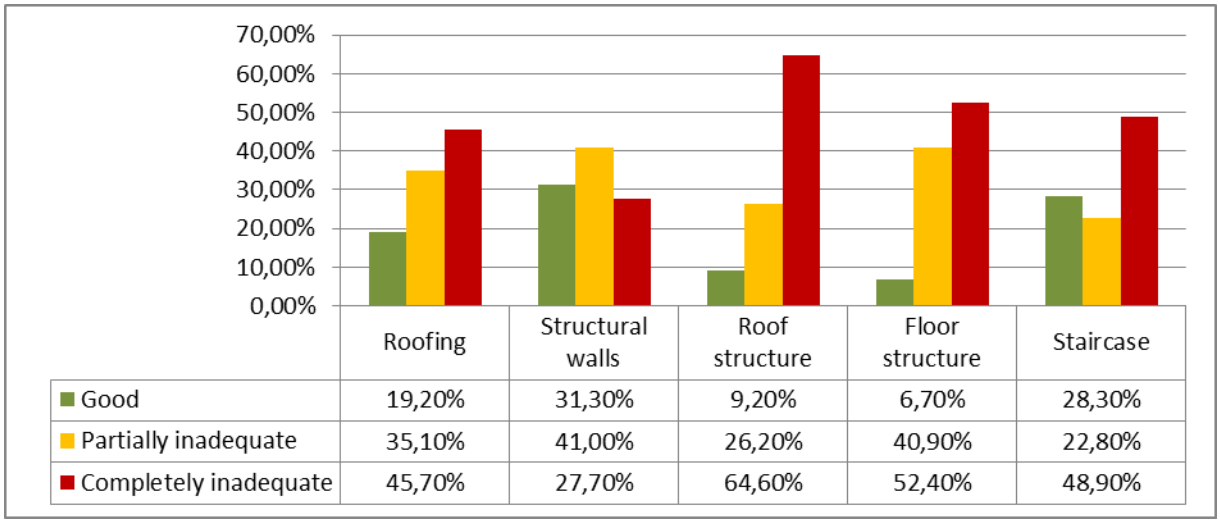


Figure 4 – Block division of Historic core of Split[3]

Based on current data[4], Historic Core of Split incorporates 66.372,25 m^2 of residential space, as well as 104.235,09 m^2 of business space, adding up to 170.607,34 m^2 of total closed space.

[3] (County of Split - The Investor, 1985)

Analysis of constructive elements' preservation state for buildings within Historic Core[5] indicates that the largest percentage of all roofings[6], roof structures[7], floor structures[8] and staircases[9] is completely inadequate, while the largest percentage of all structural walls[10] is partially inadequate. Results of this analysis are shown on the figure below:



	Roofing	Structural walls	Roof structure	Floor structure	Staircase
Good	19,20%	31,30%	9,20%	6,70%	28,30%
Partially inadequate	35,10%	41,00%	26,20%	40,90%	22,80%
Completely inadequate	45,70%	27,70%	64,60%	52,40%	48,90%

Figure 5 – Condition of different constructive elements

It is suspected that a current condition of buildings' constructive elements might be even worse today than in time when the main analysis was conducted; due to negative factor of time and nonexistence of systematic rehabilitation and revitalization of the built heritage. Current condition form energy efficiency stand point is also alarming; extremely poor thermal characteristics of the buildings are largely present within the Historic Core, especially Diocletian's palace.

While built heritage within Historic Core is in poor condition, public utility infrastructure is in even worse state, also as a result of missing systematic rehabilitation. This fact applies by large to water and sewage infrastructure which is inadequate, and together with fresh water network losses (estimated to over 40%) causes numerous indirect problems, such as deterioration of many buildings' foundations, jeopardising their constructive stability. Dimensions of existing water supply network are mostly adequate in terms of public consumption, but largely inadequate (especially within the Core's centre) for fire protection needs. In general, overall condition of water supply network is inadequate (although some parts of the network were recently repaired). It must be stressed out that condition of low profile part of the network, made of galvanised pipes (which corroded by the influence of

[4] Data acquired on 27.04.2010 from IT Section, Shared Services dpt., City of Split
[5] As a part of „Integrated plan of Historic Core of Split", developed in 1985. by: „Institute for Monument Protection, Split branch", „Dalmatians Institute of Urbanism, Split branch", „Zagreb University, Faculty of Architecture – Built heritage dpt." and" Institute for Development of Split"
[6] Prevails brick roofing; 88,4% of all roofings
[7] Prevails wood construction; 89,4% of all roof structures
[8] Prevails wood beam; 88,8% of all floor structures
[9] Prevails wood staircase (53,18%) and stone console staircase (34,55)
[10] Prevails stone structural wall; 84,7% of all structural walls

underground waters and faecal waste waters from damaged sewage network) is in very poor condition[11].
A large part of the present Historic Core's sewage system was built in 19th c. and at the beginning of 20th c., and until today it didn't undergone any larger restoration nor reconstruction; all interventions on the system were mostly urgent repairs and improvised short-term solutions.

Another big utility problem is a lack of adequate drainage system, which could protect buildings from underground waters (which are largely present within the whole Historic Core area). Currently, underground water is uncontrollably accumulated and drained through network of antique sewage channels. These channels present an astonishing archaeological finding in domain of antique sewage infrastructure, which was never adequately explored and presented to the public. Most of these antique channels are currently filled with mud and water, which makes them both inaccessible and dangerous for structure stability of built heritage above[12].

Current condition of electrical installations is also inadequate, especially within Diocletian's palace itself, where electrical network is visible on buildings' façades, being both safety and aesthetic problem. Telecommunication network is in similar condition and it doesn't meet present communication standards.

Through analysis of current condition of built heritage and public utility infrastructure, measures for increasing energy efficiency were identified. In the domain of built heritage, energy efficiency measures apply primarily to revitalization of respective building blocks (or individual buildings), with application of physical and thermal characteristics improvements (implementation of adequate roof, facade and window thermal insulation, as well as installation of energy efficient heating and cooling systems).
At the same time, measures for increasing energy efficiency, which could be implemented as a part of restoration/reconstruction of public utility infrastructure, apply to:

- Public lightning – usage of energy efficient lighting systems and automatic regulation systems,
- Water network – undergoing restoration and reconstruction to reduce uncontrolled water wasting,
- Drainage system – by implementing it, moisture would be largely reduced in many ground floors,
- Utilizing underground water present on larger area of Historic Core – its energy potential can be utilized by building adequate technological water network for heating and cooling needs of respective buildings.

By implementing above stated measures, energy consumption could be reduced by 30%-40%, while at the same time creating preconditions for implementation of aesthetically acceptable cooling and heating solutions (eliminating split area conditioning units from cultural heritage buildings' façades).
To assure successful implementation of recommended energy efficiency measures as well as generation of satisfactory results, their integration in all phases of future built heritage and public utility infrastructure revitalization projects is an absolute imperative.

[11] (Vidović, Rodoljub; Prolić, Ivica; Vidović, Luka, 2009)
[12] (Vidović, Prolić, Vuletić, & Vidović, 2009)

IMPROVING MANAGEMENT SYSTEM

Source of all problems outlined in “Current condition” chapter lays within flaws of the current Historic Core’s management system; more specifically in:

- Absence of holistic, systematically planned approach for revitalization and maintenance of the Historic Core; **inadequate planning issue**
- Inadequacy of the current organisational system, mainly in terms of lacking coordination between involved institutions, further emphasized by their internal organisational flaws; **inadequate organisational structure issue**
- Inadequately developed financing models, resulting in shortage of funds for systematic revitalization and maintenance of the Historic Core and overall vulnerability of the existing financial system; **inadequate financial system issue**

Inadequate planning issue is characterised by permanent discontinuity in preparation and implementation of needed strategic planning documentation. Integrated Plan of Historic Core of Split was presented in year 1985., with a main goal of raising awareness for a needed systematic and continuous revitalization activities within the Historic Core. Although analysis results from Integrated Plan, showing catastrophic condition of the built heritage, did awake short-lived public interest, no appropriate reaction from relevant institutions was triggered and no steps for intensifying renovation were taken. Not until year 2007., appropriate awareness of a need for developing strategic plans was present. In that year, Old City Core department within City of Split, launched an initiative for development of Historic Core Management Plan[13]. Although this strategic Plan was completed in year 2009., at the moment of writing this Paper (January 2011.) it was not yet officially adopted by relevant institutions (City of Split and Split Conservation Department of Ministry of Culture).

Inadequate organisational structure issue is another key issue which hinders needed revitalization of the Core. There are two dominant institutions in existing organisational structure: City of Split and Ministry of Culture, represented by Split Conservation Department. Conservation department is responsible for issuing permits and approvals for construction activities within the Core, and performing conservation supervision during implementation of any project or activity related to built heritage. City of Split preforms its activities within Historic Core primarily through *Old City Core Section* – a highly specialised body responsible exclusively for preservation and protection of the Historic Core. City’s *Department of Public Utility Infrastructure* as well as *Department for Assets Management and Legal Affairs* are also involved in managing different aspects of Old City Core. According to current organisational structure, there is no single body in charge of coordinating activities and establishing communication channels within wide array of stakeholders involved within Historic Core. These stakeholders include: utility companies and organisations in charge of maintaining built heritage, institutions which utility infrastructure is installed within the Core (electrical, telecommunication, water and sewage networks), organisations within cultural and tourism sectors, potential and existing investors, etc. With nonexistence of central coordination body systematic planning cannot be easily achieved, making revitalization projects more difficult to implement. Establishing of such body would create preconditions for holistic planning and execution of more integrated activities within the Historic Core.

[13] (Solar & Solar, 2009)

Inadequate financial system issue is mainly characterised by high dependency upon one single source of financing – Monument Rent, which by budget plan for year 2010., makes up to 72,92% (1,18 million €) of the Old City Core Section's budget. This dependability makes existing financial structure vulnerable, especially if it is taken into account that future income from Monument Rent will be significantly lower (over 27,6% on annual level), as a result of recession and Government's Anti-Recession measures[14]. Another fact that points to inadequacy of the current financial system, is a total annual budget of City's *Old City Core Section*, which was in last 3 years 1,57 million € on average, which is insufficient for financing any larger Historic Core revitalization project. Therefore it is necessary to (in parallel with technical planning of revitalization activities) design and implement sound financial models so that full scale revitalization of Historic Core could be executed. Some of suggestions for diversifying and increasing income inflow for realisation of revitalization activities is given later in this Paper.

As a response to problems identified within current Historic Core's management system, appropriate improvements are suggested. All suggestions are based on main principles of sustainable development and integrated conservation, also taking into account modern theoretical principles and common guidelines of international examples of best practice in urban historic centres management[15]. Improvements presented below focus on planning, organising and financing aspects of Historic Core Management.

In order to improve **planning function**, a systematic and continuous approach towards developing and updating strategic planning documentation, must be taken.
Recently *Historic Core Management Plan* was developed and presented to general public. Development of this Plan was required by UNESCO standards[16], according to which, development of Management Plan is required for every cultural site enlisted within World Heritage List. It is Author's opinion that *Historic Core Management Plan*, as a fundamental strategic planning document, should be supplemented by two additional strategic documents: *Organising and Financing Plan* and *Revitalization Plan*, which currently do not exist. It is highly suggested that *Revitalization Plan* incorporates measures for increasing energy efficiency which are aligned with conservation requirements (to be set by Ministry of Culture / Split Conservation Department) so that further practical implementation of these measures could be streamlined.
These three interconnected plans should form strong foundation of strategic management of Historic Core of Split. After completion of these Plans, it should be proceeded towards development of operational-execution documentation and ultimately towards actual realisation of planed project activities.

In order to **improve existing organisational system**, Author of this Paper recommends establishing of the "Historic Core Agency" (further on: Agency) which would be a central institution, responsible for planning, organizing, leading, controlling and financing full spectrum of revitalization and maintenance activities (within the Historic Core); building its operations on project bases. It is recommended to legally constitute Agency as a public institution *(Cro. javna ustanova*), with City of

[14] (Vidović L. , 2010, p. 151).
[15] (Vidović L. , 2010, p. 131)
[16] 1972. World Heritage Convention

Split as its founder. Internal organisational structure would be based on groups of activities, therefore maximising organisational flexibility; as shown on the figure below:

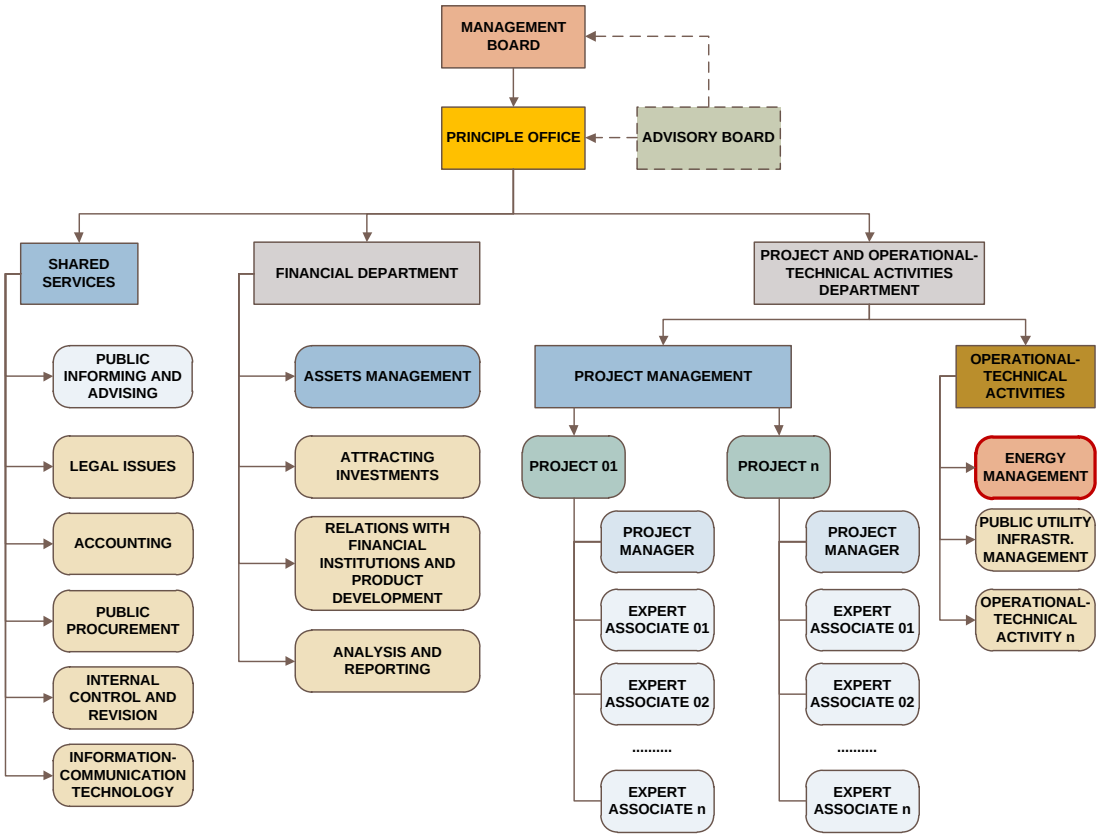


Figure 6 – Organisational chart of Historic Core Agency

Management Board, as a leading executive body, would be in charge of managing Agency together with **Principle** as a leading executive, while **Advisory Board** would be responsible for providing advisory services to the executives.

All Agency activities would be based on projects and/or project oriented, with **Project and Operational-Technical Activities Department** as a backbone of the whole operation. Projects will be executed within **Project Management** group of activities, divided into two main categories: internal projects and external projects. Goal of Internal projects will be building Agency's internal capacities, as well as developing specialised operational groups of activities. At the same time, goal of external projects will be revitalization and/or maintenance of the Historic Core. While planning specific projects, especially those in built heritage or public utility infrastructure domain, close attention should be given to integrating measures for increasing energy efficiency into respective project solutions. All active projects should be looked into as a joint project portfolio, proactively balancing available resources and monitoring key performance indicators. In this way, optimal resource and budget allocation can be assured, keeping projects within set time limits and fully compliant to respective project charters. After successful completion of a specific project, it can evolve into permanent operational-technical activity, as a part **of Operational-technical Activities** group of activities. For example, *Project of Increasing Energy Efficiency*, upon its completion could evolve into permanent activity called **Energy Management** within Historic Core of Split. Similar could occur with *Project of Public*

Utility Infrastructure Restoration, which could evolve into **Public Utility Infrastructure Management** permanent activity. If a respective project evolves to a permanent activity of a (to) high complexity, and therefore becomes a strain for Agency and its resources, it could be separated from Agency and transformed into stand-alone organisation.

Another very important role within Agency would be performed by **Financial Department**, which would be responsible for financing projects and operational-technical activities. This department would perform its duties within following groups of activities: **Assets Management, Attracting Investments, Relations with Financial Institutions and (Financial) Product Development, Analysis and Reporting.**
Shared Services organisational unit would be responsible for providing support to all other departments and other organisational units, as well as providing public informing and advising services to all stakeholders within the Historic Core.

Agency would coordinate all of its project and operational-technical activities with City of Split and responsible Conservation Department, while at the same time establishing communication and coordination channels with broad spectrum of stakeholders engaged into activities within the Historic Core. For Agency to be able to successfully establish and maintain needed coordination, it is necessary for legal framework on City level to be established, enforcing the obligation upon various interest groups to coordinate their activities with Agency; therefore promoting Agency as a central body in charge of the Historic Core.

As a response to the identified **issue of inadequate financial structure**, all Historic Core's financial affairs should be consolidated within Agency. Also, existing financial sources should be restructured and new one should be introduced, based on following suggestions:

Monument Rent
- Aligning Monument Rent income projections with objective political and business-financial environment changes,
- Transfer all Monument Rent related income from City of Split to Agency,
- Continuously work on introducing new financial sources, therefore minimising dependency upon one single financial source (Monument Rent).

Income from tickets and other related goods and services
Currently main income from tickets is generated from utilization of Substructures of Diocletian's palace – largest and most important presentational area within Historic Core. This practice should continue in future as well, taking into account following recommendations:
- Develop and implement complete *Revitalization Project of Substructures of Diocletian's palace*, so that presentational and interpretational value of Substructures is increased, allowing generation of higher ticket and related goods and services income,
- Continue with implementation (within Agency) of *Place Walls Walkway Project*, so that income could be generated from this tourist attraction,

- (Partially) Delegate management of specific privately owned cultural monuments on Agency, so that larger, more integrated tourist oriented programs could be developed, from which Agency could raise income.

Domestic and foreign grants and other financing sources

- Develop projects and programs suitable for financing by relevant domestic and foreign institutions,
- Apply for relevant domestic and foreign tenders and grant programmes,
- Promote and represent interests of Historic Core in front of relevant domestic and foreign bodies.

Leasing and selling real-estate assets

- Develop and implement City's real-estate strategy towards Historic Core,
- Introduce transparent price system (based on actual market prices) for leasing City owned resourced within Historic Core; introducing new category of business space rent control, stimulating occupancy by small trades and craftsman's whose services increase everyday life quality of Core's residents,
- Continuously rationalize City's real-estate portfolio; selling/exchanging those real-states which don't align with set strategy, for does which do concur.

With implementation of adequate management system, backed up with sound financial model, realization of a full scaled multidisciplinary revitalization project with incorporated energy efficiency measures, built on foundations of sustainable development, integrated conservation and international best practice, could become reality for Historic Core of Split.

REFERENCES

Council of Europe, Directorate of Culture and Cultural and Natural Heritage. (2008). *Analysis and reform of cultural heritage policies in South-East Europe.* Strasbourg: Council of Europe Publishing.

County of Split - The Investor. (1985). *Integralni plan Povijesne jezgre Splita [Eng. Integrated plan of Historic Core of Split].* Split.

Pickard, R. (Ed.). (2001). *Management of Historic Centres.* London: Spon Press.

Pickard, R. (2009). *Funding the architectural heritage: a guide to policies and examples.* Strasbourg: Council of Europe Publishing.

Solar, G., & Solar, S. (2009). *Grad Split - Plan upravljanja povijesnom jezgrom [Eng. City of Split - Historic Core Management Plan].* Split: City of Split.

Vidović, L. (2010). *Unaprjeđenje sustava upravljanja zaštićenim povijesnim cjelinama na primjeru Povijesne jezgre Splita [Eng. Improving Management System of Protected Cultural Sites on Example of Historic Core of Split].* Split: Faculty of Economics.

Vidović, R., Prolić, I., Vuletić, A., & Vidović, L. (2009). *Studija revitalizacije antičke kanalizacije Dioklecijanove palače [Eng. Revitalization Study of Diocletian's Palace Antique Sewage System].* Split: Old City Core ltd.

Vidović, Rodoljub; Prolić, Ivica; Vidović, Luka. (2009). *Grad Split – Stara gradska jezgra: Studija komunalne infrastrukture vodovoda i kanalizacije [Eng. City of Split – Old City Core: Study of Water and Sewage Public Utility Infrastructure].* Split: Roterm ltd.