

GREENERY IN MINERAL AREAS, HISTORY AND CASE STUDY OF INTERIOR COURTYARDS TIMISOARA

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Abstract

European urban centers are characterized by densely built areas where the minimal green space percentage cannot be attained on the horizontal surface. The Medieval origins of most cities resulted in urban planning that imposed narrow streets and walkways, close proximity of buildings and small interior courtyards that determined important urban constraints for the following restoration, retrofitting and landscaping projects, therefore leading to the search of alternative vertically greening solutions.

The paper addresses two main challenges of the contemporary urban environment: urban vegetation and interior courtyards of historical centres. Based on a historical analysis of the origins, evolution and constant transformation of the vertical garden, from Antiquity to the Modern Age, the study aims to define the potential connection of vertical greenery with architecture in historical areas. Regarding the importance of greenery in urban planning and the major role it plays in the optimal functioning of a city, the study will focus on the situation of interior courtyards and the dialogue that can be created with the pedestrian streets.

The proposed case study is the historical center of Timisoara, the capital of Banat region, located in western Romania. Following a complete urban restructuring by the Habsburgic Empire in the XVIIIth century, the urban fabric of the old center, also known as the "Cetate" (Citadel) district, is based on rectangular blocks made of public and private buildings with inner courtyards. The migration towards the newly-built satellite neighborhoods, lead to a functional mixture of dwellings and institutions that must be taken into consideration when discussing the situation of interior courtyards in the historical city center.

A broad remodeling project, ended in 2015, included the redesign of the urban spaces of the historical center as well as the pedestrianization of the streets. The project completely modified the perception and atmosphere of the urban space, from a car oriented area to an exclusive pedestrian-friendly zone, entirely mineral and void of vegetation of any kind. Considering the interdiction to plant vegetation on the pedestrian streets, one of the solutions to open this neighborhood towards nature and greenery is by activating the relation with the existing interior courtyards that could accommodate various species of vegetation. Thus, by developing and opening these enclosed spaces to the city, the newly created urban connections could become important elements in the ecological, social and cultural activation of the entire district and city.

The paper aims to present rules and directions for designers, public and private investors for an enriched life in historical centers and to create viable and achievable solutions integrated in the new and retrofitting construction sites.

Keywords: Greenery, history, interior courtyards, mineral area, public spaces

1. INTRODUCTION

Over time man has longed for the proximity to nature (Wilson, 1984), but recent urban developments have

gone in the opposite direction, creating vast mineral and austere urban landscapes, dominated by buildings and cold materials, with greenery being constantly isolated from the city.

Considering that most people spend a great part of their time indoors, whether in an office or at home, the lack of nature connectedness is causing illnesses such as high stress levels, mental health and respiratory problems. According to the « Attention Restoration Theory » elaborated by Stephen Kaplan (Kaplan, 1995), vegetation and natural views have a major contribution to the well-being, physical and psychical health of people. The potential of interior courtyards in city centers consists in reconnecting these otherwise forgotten and neglected spaces to both interior and urban spaces using vegetation.

1.1.1 History of Vertical Greenery from Antiquity to XVIII Century

Man has attempted to bring nature closer to his habitat from the early ages. Archeological surveys have confirmed “evidence of interior plant use from at least two thousand years ago in the perfectly preserved ruins of Pompeii, Italy”, while it is believed that “the Chinese used plants as interior decorations as long as three thousand years ago”. (Rebecca L. Henn, 2013, p. 307)

Referring to the etymology of the « garden », one must return to Ancient Greece to find the Greek denomination of “kepos” or “hortus” (Latin). Verticality is a general characteristic of the growth direction of all vegetation species although their roots are firmly connected to the horizontal plan. Changing the way we look at gardens, the switch between the classic horizontal plans to the unconventional vertical plan has been a challenge since ancient times. Thereupon, men have attempted to detach greenery from the ground for various reasons: agriculture, decoration and landscaping, shading or physical separation of certain areas.

Free standing or architectural-related, these structures can give shape to or complement terraces, walls and facades, pillars and beams, balconies, logias or canopies. Nowadays, vertical greenery depicts an actual necessity in the grey contemporary cities and occasionally, an exclusive solution to integrate nature in the built environment.

1.1.2 The Italian Canopy – Ancient Rome

The canopy system is first used in Ancient Rome under the term “pergola”, to embellish the monumental villas of the period, being the oldest garden design continuously used to the present day. “Pergola” refers to a structure covered in greenery with its primary role in agriculture, of supporting grapevine on a structural grid, a system later transposed to residential areas. (Anna Lambertini, 2007, p. 11)

1.1.3 The Green Canopy – Antiquity – Medieval Era – Present

Related to the Italian Canopy, the green canopy is first used in Ancient Rome and Greece, while the European territory, notably France and the Netherlands, embrace it in the XIV-XVth centuries, and currently used on the Mediterranean coast (Anna Lambertini, 2007, p. 11). Distinguished from the Italian canopy by the supportive structure, this system aimed to guide vines on a natural support made of previously shaped living tree branches, framing a green shaded shelter.

1.1.4 The Artificial Bower – Sec. XIX

Beginning with the XVth century, the bower is supported by a wooden structure, thus creating the “artificial canopy”. The dawn of the XIXth century is influenced by technological innovations, including metallic structures and experiments in fields like transportation, architecture, infrastructure and design, determined by these new findings. The architect Hector Horeau ennobles the airy space of the Crystal Palace exhibitional pavilion in London (Anna Lambertini, 2007, p. 14), with cascading plants hanging from the metal structure and using an innovative irrigation system based on rain water collectors.

1.1.5 Vertical Vegetation In XX-XXI Centuries

New technological innovations of the XXth century have opened new directions and possibilities in the research, design and implementation of vertical gardens. In 1930 the Brazilian landscape designer Roberto Burle Marx (Fig. 1c) explores the usage possibility of local tropical plants that do not require soil to grow. Another novelty of his work is the introduction of graphic design in landscape architecture, using the visual particularities of various vegetation species, mineral surfaces and water (Anna Lambertini, 2007, p. 18). Thus, vegetation becomes a design element part of large natural artworks.

Postwar Architecture brings a mass expansion of the built environment, oriented towards quantity rather than quality, highly functional, cheap and lacking any kind of ornament. The result and aspect of modern cities was consequently cold, impersonal and frequently void of vegetation. In 1958 the naturalist artist Friedensreich Hundertwasser (Fig.1a) aims to contradict the new brutalist trend through his “Mould Manifesto

against Rationalism in Architecture”, practiced in Vienna (Anna Lambertini, 2007, p. 30). Besides his usual live green urban interventions and nature-inspired shapes, the artist-architect inserts the tree as an awareness element for the absence of urban greenery (Fig. 1b), an idea published in his 1972 manifesto: “Your window right — your tree duty”.

The modern hot air balloon allows Francis Halle, a french botanist, to travel above the amazonian forests in 1980, observing the tree crowns and the resilience capacity of lower vegetation living under the thick shade of these high trees. Thus, he highlights the importance of tropical forests for the planet, also bringing his contribution to the development of green walls by introducing adaptable plants that can be placed at the base of green walls in low light and high humidity conditions.

Known as the father of modern vertical gardens, the french botanist Patrick Blanc, reinvents the green wall in a contemporary manner and makes it widely popular starting from the 1990s until the present day. He emphasizes the constant decrease of green surfaces in cities, the high density in built environments and lifeless atmosphere and proposes his vertical gardens as possible solutions for this on-growing modern concern. Blending all fields studied by his predecessors with his passion for tropical forests and overlapping of vegetal species, he creates live artworks using both exotic and local plants in balanced compositions with highly esthetical, ecological and graphical qualities (Anna Lambertini, 2007, pp. 211, 22). The "Vegetation-Bearing Architectonic Structure and System" patented in 1938 is reinterpreted by Patrick Blanc in an artistic manner and introduced in both residential and public architectural programs enhancing the environmental quality of these spaces.

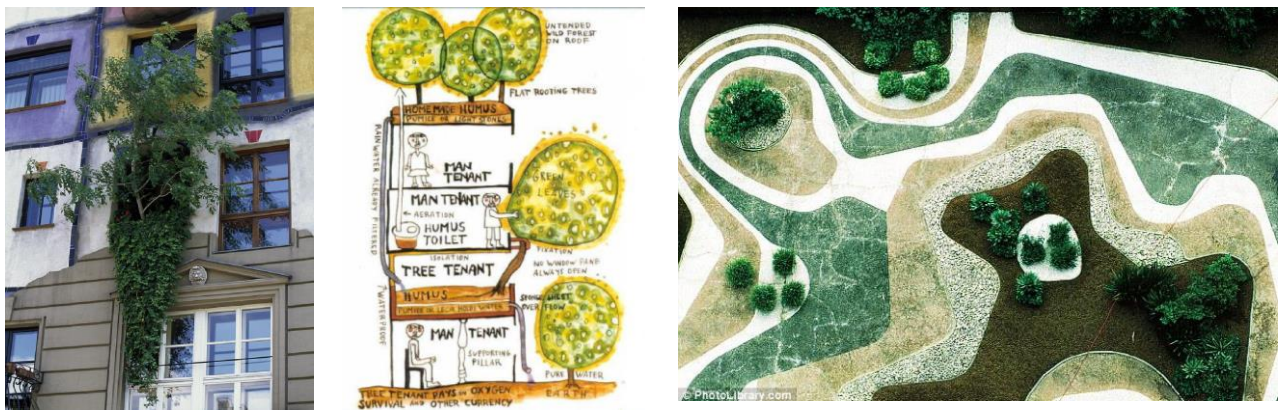


Fig. 1 – 1a, 1b: Hundertwasser Haus tree tenants sketch, 1c: Roberto Burle Marx landscaping project in Brazil

2. THE FUNCTION OF GREENERY IN THE BUILT ENVIRONMENT

Urban vegetation is an important contemporary topic regarding urbanistic developments, analysed and integrated in recent masterplans as networks of Green Infrastructure, complementary to the built tissue. Understanding the importance of urban greenery is of high interest during the last decades, to all involved actors such as municipalities, investors and private parties, as a result of the undeniable isolation of man from the natural world.

Although plants were mostly perceived as unnecessary and costly elements during the XXth century, when efficiency and standardisation were key aspects of design, nowadays we begin to appreciate their actual value on multiple levels, of which the most significant are detailed in the following points.

2.1 The Ecological Function

Frequent extensive disruptions in the Green Infrastructure determine visible imbalance in both local and global Biodiversity, rise of pollution levels and other negative effects that impact the population and natural world, increasingly evident during the last decades (Paris Municipality, 2017). A sensible approach towards urban vegetation considering the ecological aspect as well as esthetics, could contribute to heat island and greenhouse phenomenon reduction, natural protection of buildings (natural heating and cooling), retention of rainwater through permeable surfaces, the absorption of suspended air particles and the rise of biodiversity and natural habitat variety.

2.2 The Therapeutical Function

Among the most concerning effects of pollution and harmful interior and exterior built environments is the

degeneration of human health worldwide. Urban greenery generates mental and physical health improvement, participating in the overall healing process and restoration. Edward O. Wilson studies "The Biophilia Hypothesis", defining it as "the urge to affiliate with other forms of life" (Wilson, 1984), while Stephen Kellert adapts and integrates biophilic principles to design (Kellert, 2008). Both Kellert and Terry Hartig support the hypothesis, showing that the presence of greenery inside and outside participates in the enhancement of wellbeing and stress reduction. The "Attention Restoration Theory" (Kaplan, 1995) confirms that spending more time outdoors surrounded by nature or just having access to a well oriented window view overlooking a natural landscape could participate in mental restoration. Another aspect is the considerable difference between natural and urban views, the natural, notably vegetated ones, being of great contribution to general well being (Lottrup *et al.*, 2015).

2.3 The Economical Function

Alternative energy systems were aimed to reducing natural resource consumption, pollution and costs for both heating and cooling, without taking into account material waste, high costs and pollution due to production and maintenance of these equipments. Few years of exploitation later one could notice a lack in efficiency of these costly systems (solar pannels, intelligent facades, etc.) regarding indoor quality improvement (Altomonte and Schiavon, 2013). Consequently, a return to traditional interventions such as green terraces and green walls are becoming better appreciated in architecture and interior design.

The real estate market and private investors regard positively towards well integrated vegetal elements, for these represent healthy amenities for future users and imply a raise in estate value comparing to conventional buildings in the same urban area. Vegetal elements can be taken into consideration from the design phase, in retrofitting projects, interior and exterior renovations, for many of these systems do not impose structural connection.

2.4 The Social Function

University of Tampere Finland has studied the importance of practicing physical activities in nature compared to passive experiences outdoors. The conclusions show that an active outdoor life is more beneficial to well being than a static one, enhancing the importance of sports facilities in natural environments (Korpela *et al.*, 2017). "Active design" is a concept based on the encouragement of movement through space and the connection between public and private spaces to the benefit of the community (City of Amsterdam GGD Amsterdam Public Health Service, 2016, pp. 106, 113, 117). It emphasizes the importance of indoor courtyards as transitional spaces with great potential in facilitating connections, motion, social and cultural life.

By opening interior courtyards to the public space, events and dialogues of cultural, social and spacial interaction are created together with their transformation from isolated circulation areas to semi-public active territories. These are imperative actions for the revitalization of these in a non-invasive manner. The visibility of these newly implemented facilities is mandatory for a good spacial connection; therefore, a certain transparency should be taken in account for new proposals.

3. CASE STUDY OF THE HISTORICAL "CETATE" DISTRICT TIMISOARA

Typical to the city centre of Timisoara is the typology of the urban tissue, entirely restructured after the Austrian Conquest of 1716 that focused mainly on the central part of the city, the "Cetate" district, surrounded by fortifications until their demolition at the end of the XIXth century. Buildings facing the street form a continuous frontage with rectangular block volumetries, including interior courtyards within each plot. (Brătuleanu, 2016, p. 19). The street structure is homogenous, with continuous profiles and no urban tree alignment, a specific aspect reflected in the historical mineral landscape.

The beginning of the XXth century brings a certain attention to the preservation and maintenance of urban green areas, parks and Bega's river banks, however, the Cetate district and its potentially green but confined interior courtyards are left neglected. Except from the public and semi-public courtyards that show certain maintenance to the present day, the private ones are left to the owners' care with no implication from the municipality.

A new urbanistic concept is defined in Timisoara by the urbanist Otto Bodascher at the dawn of the XXth century: the "garden-street" was created for the usage and maintenance effectiveness of urban green space. Entrusting a certain percentage of urban greenery to the landlords, they were expected to manage the plot, while keeping it accessible to the city as well. Thus, his vision assumes that "the street-garden is a way to ensure acces to green space at both individual and community level." (Brătuleanu, 2016, p. 36)

3.1.1 The Functional Structure

A main characteristic of the Cetate district is the heterogeneous structure, defined by a mixity of functions: the ground floor spaces were given commercial destinations open to the general public, while the upper floors were given residential purposes; thus, the interior courtyards were used as transitional areas with covered corridor entryways that linked it to the street. The auxiliary character of the courtyard was also given by the secondary usage buildings such as “barns, workshops, wood storage spaces or sheds” (Municipality, 2013, p. 261; Opris, 2014).

The historical center of Timisoara has gone through several phases of deterioration during the last years. Initially, the nationalization of properties typical to the Communist era has led to substantial irreversible interventions especially over historical buildings: multiple divisions of space, addition of interior walls or closure of door and window openings. These apartments could be reclaimed starting from the post-communist period, each owner being free to personalize his property inside and outside, without any constraints regarding building, urbanistic or structural regulation. This aspect has been emphasized by Mihai Opris in his studies about Timisoara’s historical center: “Some contemporary owners have severely altered the aesthetics of architecture, adding kitsch ornaments” (Opris, 2014). These aspects have immediately shown major repercussions over common spaces: the access corridors, exterior stairways, interior courtyards, basements and attics that have all remained transitional or storage spaces with high continuous degradation risks.

The main purpose of the recent rehabilitation of the Cetate district, finalized in 2015 (Fig. 2), was to give the historical streets back to the citizens, through an apparently simple act of pedestrianisation and rehabilitation of two socially and culturally important public squares: The Union Square and Liberty Square. This intervention was well received by pedestrians who saw the decision of excluding all motor vehicle from the center as invigorating for the entire area. Consequently, the neighbourhood regained its lost glow and energy, inviting to promenades and contemplation. The new challenge is now the rehabilitation of the now visible historical buildings and common spaces that show a high contrast with the newly paved streets



Fig. 2 A typical street from the “Cetate” district Timisoara, before and after the 2005 rehabilitation project

3.2 Dysfunctionalities of the city:

Timisoara’s historical center is losing its attractiveness for several reasons: low commercial activity in the center due to the development of large shopping malls, inadequate and unattractive functions for tourists, very few spaces with local specificity, the absence of proper urban furniture, high noise levels and traffic (now improved in the historical area), lack of parking spaces and high prices leading to the migration of residents from the center to the outskirts. One of the biggest concerns is the mineral appearance of the Cetate district, lacking in vegetation, the main subject that this paper aims to address. The absence of urban vegetation is visibly resented by the local community, through freely expressed public discontent. One pertinent example is the appearance of the “tree stickers” on forbidden circulation signs in the central pedestrian area. (Fig. 3)



Fig. 3 The way the lack of green is felt by the locals in Timisoara central district

3.3 Current Legislation

The documents that regulate the percentage of vegetation required for a parcel are generally formulated according to the specific area. Thereby, the regulations in the historical district for a plot require that the green spaces organized on the natural soil should occupy a minimum of 5% for percentage of land occupation of maximum = 65% and minimum 10% for percentage of land occupation of maximum 85% of the total area and will include exclusively vegetation (low, medium and high) (Municipality 2013: 256). Alternative vegetation areas such as green walls and green facades, green terraces and other systems are not specified in local documentation, although in some situations these may be the only feasible solutions.

Regarding the city, in Timisoara year 2000, the green area per capita was 1,86m² compared to 1944 when the ratio was 13,1m² / inhabitant (Opris, 1987). These values are significantly lower as compared to the norm required by the World Health Organization of 26m² / inhabitant (Bingham-Hall and WOHA, 2016).

4. ASSUMPTION

The main subject of our study was focused on some major issues: dimensions and shape of the space, utility, accessibility (public/ private/ semi-public), natural light level, current function and most important the presence of elements that can be used to enrich the space, like vegetation, urban furniture, fountains, access galleries.

The assumptions that underlie the study are formulated around two important components in the reactivation and revitalization of the courtyards. The first component is the inappropriate situation of the interior courtyards regarding the absence of vegetation, although these spaces have a major potential to host various vegetal systems, as evidenced by the situations in which the vegetation exists. Secondly, we will discuss the rehabilitation of the interior courtyards from a functional point of view in order to introduce public and semi-public activities in these spaces that are mostly empty and lifeless. The aim is to achieve functional and visual connection between the courtyard and the street and between the courtyard and the building.

5. METHODOLOGY

The first stage of the study will focus on analyzing the existing situation of the 131 interior courtyards from the historical center of Timisoara and highlighting its dysfunctionalities. The analysis will serve to classify and identify the main types of interior courtyards, aspects used in the later phase for developing the proposals.

5.1 Typologies of Buildings with Interior Courtyards from the Historical Center of Timisoara

The interior courtyard is a characteristic feature of Timisoara's architecture, being found in the urban development from the 18th to the 20th century. (Fig 4a) (Anghel, Nicolau and Bica, 2016). The only buildings in the studied area that do not have a planimetric configuration organized around an inner courtyard are the churches and a public institution. Considering the number of 131 courtyards counted in this district, we can say that the interior courtyard is an emblematic element of the historical center.

In both cases, public and residential functions, the courtyard is the central space of the building. It ensures the connection between the interior and exterior space. Currently, these spaces represent, in most cases, simple areas of transition and distribution of vertical and horizontal circulation for the residential function, and for the public ones the inner courtyard has been transformed into parking lots.

The potential of these spaces lies in the central position in the planimetric composition, in its development on the entire height of the building, assuring the direct relation with all the floors through open horizontal circulation and in the possible relation with the surrounded urban space.

5.2 Analysis of interior courtyard typologies

The 131 courtyards of the historical center of Timisoara are spaces of semi-public transitions with galleries of

access, natural light and ventilation of many rooms. They differ mainly by shape, size and accessibility.

5.1.1 Planimetry and Orientation

The compact character of the military architecture that appeared with the occupation of the Austro-Hungarian Empire, accentuated in the nineteenth century, as well as the limited construction space in the area of the old Citadel, have imposed a vertical, multistory development and an irregular expansion within the block. So, some of the interior courtyards often resulted as residual spaces with irregular shapes and small size, but most of them can be general classified in rectangular planimetric typologies, "L" or "U" shape.

5.1.2 Size and Orientation

The presence of a diversity in the interior courtyard surfaces and size, can be classified in three general categories: small 21%, medium 68% and large size 11%. The average height regime is basement+ ground floor + 2 floors or basement+ ground floor + 3 floors, which results in a significant vertical surface in the form of blind walls or inner courtyards walkways, which can be used to accommodate climbing vegetation or green vegetation walls.

Orientation towards the cardinal points is dictated by the orthogonal street structure with a 5°NE-SW rotation. The interior courtyards develop according to the two main directions depending on the density of the constructions: N-S for large ones or E-W courtyards for small and medium ones (Figure 4b).

The variable areas of these courtyards can be exploited using diverse plant systems, different from the traditional horizontal planting on natural ground. The orientation and size of the courtyard will be important factors in determining the optimal plant system, species and location.

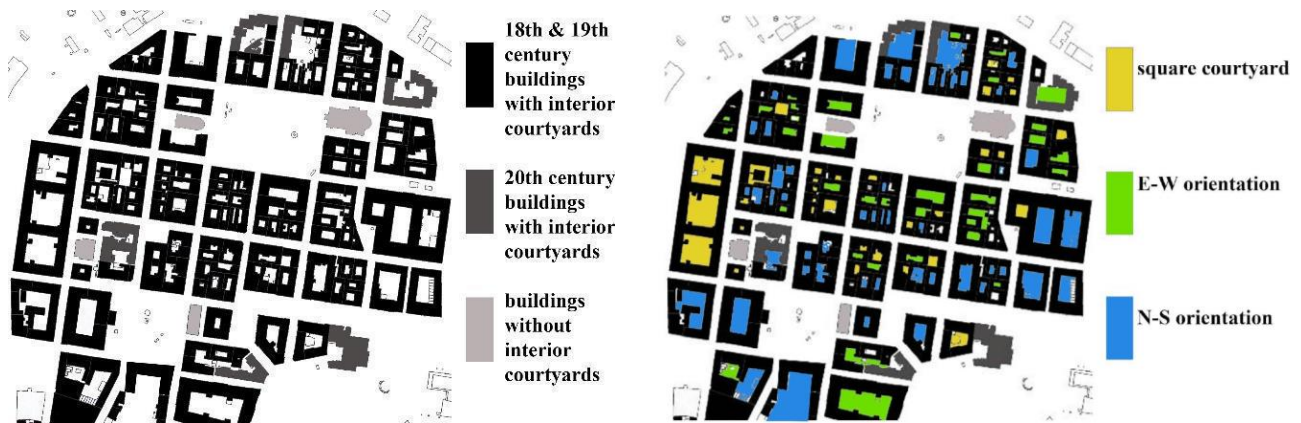


Fig. 4 - 4a Building typology study: with and without courtyards (Anghel, Nicolau and Bica, 2016)
 4b: Interior courtyards study: orientation typology

5.1.3 Accessibility

Field analysis has revealed that 67 interior courtyards have a semi-public character with limited accessibility, followed by a number of 38 private courtyards with controlled, restricted access and only 26 public courtyards, with open access. Since the public courts are now in best condition (being part of the process of restoration, revitalization and planning of the entire building, in order to ensure an attractive and pleasant environment for visitors), compared to private or semi-public ones, we can easily demonstrate the necessity of total or partial opening of these spaces to the community.(Figure 5)

Opening a larger number of courtyards to the public could encourage a two-way relationship: first of all it could help create a better dialogue of the inner courtyard with the public space and second it would allow the pedestrian to discover various urban events held in green oases, a more vivid, healthier and relaxing ambiance now entirely absent from the current urban space.

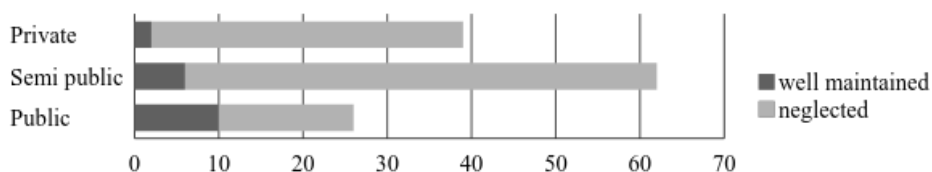


Fig.5 Study of the accessibility degree (Anghel, Nicolau and Bica, 2016)

5.3 Courtyards with Existing Vegetation

Planting vegetation on the natural ground would ensure the creation of more permeable surfaces, necessary for the central historical district, whose public space was completely covered with mineral materials following recent modernisation. There is an intention to introduce or preserve the vegetation from the historical buildings interior courtyards, but the type of vegetation and the systems used are not optimised for each existing situation, and so, usually the results end up being an elimination of any natural factor from these spaces in order to ensure paved areas for car parking.

Out of the total of 131 inner courtyards, only 29 (22%) contain high, low and climbing vegetation or vegetation planted in pots (Figure 8a). Usually, the large yards have central tree-like vegetation, the small ones generally serve as light and ventilation courtyards, which can not be obstructed by central vegetation. Only a single yard still preserves vertical natural vegetated walls, although poor lighting and high humidity in many small-sized courtyards could facilitate the growth of these plant species.

Whether they are secular trees or horizontal and vertical green surfaces, these become centers of interest for the compositional structure of the interior courtyard, serving as basis and background for organising cultural and social activities (Fig.8b). The windows of the perimeter spaces are oriented towards these focal elements, providing occupants with a micro-restorative natural landscape, so beneficial and healthy. (Kaplan,1995).



Fig. 6 – 6a: Interior courtyards study, by presence of vegetation,
6b: Existing tree in one of the interior courtyards

6. FURTHER RESEARCH AND LIMITATIONS

This paper covers a small part of what would mean a real and complete rehabilitation of the “Cetate” (Citadel) district; restoration of facades, structural rehabilitation of buildings and urban furnishing along with the introduction of vegetation are all strong components for creating a strategy for straightening the central district and heading it towards an attractive urban nucleus. We can not speak about interior courtyards without making a reference to the functional transformation of the pedestrian streets in ones with certain character: commercial, coffee shops, exhibition spaces, libraries with outdoor reading areas, children's streets, and so on. Only in this way can we achieve a unitary intervention, not just a single, isolated one. Therefore, a wider future study could seek to correlate interventions in interior courtyards with urban rehabilitation.

It is quite certain that not all the interior courtyards are eligible to shelter and support vegetation interventions, therefore, choosing the suitable locations for future proposals will be a strategic one based on: the socio-cultural potential of the plot, the degree of accessibility, the orientation of the court, the size, the identification of possible support structures for the proposed vegetation, and so on.

Appropriate implementation and maintenance of plant systems raises substantial costs for owners. So, for these kind of investments, the financial problem may be a public-private type, depending on the opening degree of the interior courtyard. (Brătuleanu, 2016, p. 36). The introduction of some attractive functions can also become a viable funding source while supporting the increase in the quality of life in the historical central district of Timisoara.

7. CONCLUSIONS

The article is based on an in-depth study in which we have tried to reveal the dysfunctions and to analyse

some possible directions of development of the “Cetate” (Citadel) district with the aim of creating a favourable environment, worthy of a historic legacy. The paper aimed to identify challenges raised by the historical district by introducing vegetation in a mineral area and creating connectivity between public space and interior courtyards. In a future study, some examples of interior courtyards will be further detailed by proposing different plant systems suited to each situation and by introducing functions that visually, architecturally and socio-culturally exploit the potential of these neglected spaces.

The situations chosen to be detailed will follow different planning directions and possibilities in order to provide various scenarios and feasible solutions to improve the historical area. The identified rules and proposals are part of a more detailed project analysis where each of these main directions is exemplified in real cases.

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