Revitalization Proposals for Green Interior Courtyards in the Historical Centre of Timisoara

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Abstract. The historic district “Cetate” is the greenest district of Timisoara, with a 52% coverage of green areas, due to the presence of parks and green banks of the Bega River. The “City of roses” or “Little Vienna”, as Timisoara is known locally, has gotten its names from the abundancy of greenery and flowers that used to embellish the urban landscape, private gardens and parks, as an important part of the urban identity. Nowadays, along with the constant development of the infrastructure and retrofitting projects proposed by the municipality, there is a constant deteriorating situation of the overall vegetation ratio as well as a lack of maintenance on individual plots. Consequently, mineral and non-permeable surfaces, which are easier to maintain, dominate pedestrian areas and interior courtyards, detrimental to the presence of urban vegetation. Beginning with the study of the main advantages of greenery in the built fabric near daily activities, the paper emphasizes urban, social and architectural aspects as well as building and human health, using selected design criteria inspired by Active Design and Biophilic Design, both concepts that aim to bring people closer to the natural environment. The selected French case studies aim to show examples of good practice and helped us furthermore develop the investigation. The second step was the on-site analysis of several interior courtyards highlighting their weaknesses and potential to develop for a better social and functional connection. Courtyards with a problematic state concerning the presence and use of greenery were the ones that inspired us to proceed to the presented proposals. The methodology was based on the analysis of Timisoara’s local masterplan for the identification of new developmental directions and the potential of our proposals to align with these and enhance connections between city life and nature. The Green Space Factor served as an actual validation for the quantity and quality of existing and projected vegetation. Four different situations were chosen for development and further study and helped draw conclusions on the greening potential of interior courtyards in central neighbourhoods, as well as the most advantageous vegetative systems for the various types of spaces.

1. Introduction
Located in western Romania, Timisoara, a field city of nearly 320 000 inhabitants, has been developing on a territory resulted from a drained swamp and on the banks of the River Bega. First mentioned in the Middle Ages as Castrum Temesiense, Timisoara is characterized by a central historical core entirely restructured after the Austrian Conquest of 1716 [1]. The historical “Cetate” district, or the “Citadel”, was surrounded by fortifications until their demolition at the end of the XIXth century, when the residential and industrial suburban neighbourhoods could finally connect with the center through its
already existent gateways. However, the Cetate district remained the main attraction point from a social and cultural point of view, concentrating most of the public functions and social interaction devices.

Being surrounded by the city’s urban parks on the North-Western, Southern and Western sides, the historical center claims to be the greenest district with 52% green space coverage. Regarding the small scale of individual plots, the vegetation status is not as balanced as the general situation predicts, showing most sites with little or no vegetation. Furthermore, along with the new rehabilitation projects of the center, a massive pedestrianization of the area has been implemented, meant to encourage social interaction and promenade, without offering an actual urban framework for this: there is a lack of urban furniture and most of all, the much-needed cooling and shade-providing greenery.

Characteristic to Timisoara’s historical built fabric are constructions facing the street, described by rectangular block volumes that include interior courtyards within each plot. [2, p. 19]. The street structure is homogenous, with continuous profiles and no urban tree alignment, a specific aspect reflected in the historical mineral landscape. Considering the typological aspects of the urban landscape and the absence of vegetation perceived by the community as a negative trait of the city, there is a continuous search for solutions to this situation, one of which is the subject of this paper: the greening potential of interior courtyards of Timisoara’s historical city center.

1.1. Ecological and green space status of Timisoara

According to the European Union law, a minimum green surface per inhabitant should be 26m² to obtain a healthy urban environment and a balance between built and green areas. In the European Union the surfaces sometimes rise to 120m², the situation of Vienna, considered the greenest European city of its size.[3] As the Austrian origins are highly visible in architecture and urban planning, Timisoara, also known as “Little Vienna” shall furthermore take its positive examples from Western Europe regarding a cleverer integration of vegetation in the urban environment.

The city’s location on an open plain allowed a constant urban-sprawl type expansion of its limits, with new residential districts built over agricultural and natural areas, that resulted in fragmented landscapes and diminished biodiversity. According to the Pollution Control Commission, the causes of air pollution in Timisoara are: traffic, industrial plant emissions, construction and demolition waste management, unused areas in the urban fabric and lack of green belts and connected vegetated areas.

Timisoara’s Green Space Strategy for 2010-2020 provides main directions from the local municipality regarding the development of green areas of the city. Thus, the main strategical objectives are: the improvement of an attractive business environment, Timisoara’s development as a competitive regional economic pole of Western Romania, the formation of a beneficial social and cultural atmosphere and lastly, a friendly environment for its inhabitants. The progress and business-oriented vision aims to attract important foreign investments, overseeing a healthy growth for the local community. [4]

According to architect’s Mihai Opris Monography of Timisoara, the city has undergone a constant decrease of green areas since the post-war period. Considering only the inner city green surfaces (without the Green Forest of 700 hectares), the vegetation ratio has decreased from 13,2 m² per inhabitant in 1944 to a minimum of 1,86m² in 2000 [5] and currently 15,8m² (including the Green Forest), according to the National Institute of Statistics. Considering the latest decisions of the local municipality regarding road enlargement and the creation of new parking lots, Timisoara has gone from a green city to a city dominated by motorized transport with all its downsides like pollution, heavy traffic, lack of greenery and public space. Neglecting such an important aspect of urban life, the city was ranked among the most polluted South-Eastern European cities, due to the above-mentioned reasons and the heavy industries in the immediate proximity of the center.

1.2. Courtyards with existing vegetation

The beginning of the XXIst century brings a certain attention to the preservation and maintenance of urban green areas, parks and Bega’s river banks. Along with Romania’s adherence to the European Union and the change in urban and environmental regulations, some intentions of urban and ecological
rehabilitation have been noticed. The pedestrianization project of the historical streets finished in 2015 has brought a new dynamic to this district by opening a variety of social venues but disregarding the potential of the existing interior courtyards that are mostly left enclosed and neglected. Few exceptions are found in public and semi-public courtyards that show certain maintenance to the present day, while the private ones are left to the owners’ care with no implication from the municipality.

Despite some intentions to insert vegetation in historical patios, in most situations the vegetation species and technical systems are not optimized for each case, so after a short period of time, greenery is replaced by easier to maintain parking lots and mineral surfaces. Planting vegetation on natural soil would guarantee the creation of permeable surfaces, needed to balance the increasing paved surfaces.

Out of the total of 131 inner courtyards in the Cetate district, only 22% contain high, low, climbing or potted vegetation. Usually, the large yards have central tree-like vegetation while the small ones generally serve as light and ventilation courtyards, which cannot be obstructed by central vegetation. Only a single yard still preserves vertical 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 organizing cultural and social activities. The windows of the perimeter spaces are oriented towards these focal elements, providing occupants with a micro-restorative [6] natural landscape, so beneficial and healthy.

2. The potential of green courtyards in historical districts

2.1. General characteristics of interior courtyards

Green interior courtyards are part of the city’s green infrastructure, relaxation oasis contrasting to the mineral landscape. These natural spaces represent small cores of vegetation that connected to tree alignments and green river banks assure a necessary continuity of the green urban grid. Considering the absence of urban trees in the historical district, the vegetated interior courtyards grow in importance for the health and continuity of the natural landscape.

A first analysis of these courtyards shows that their sizes range from very small, few square meters (for ventilation purposes) to over 250 square meters, but there is mostly a lack of free soil space available which makes planting on horizontal surfaces sometimes impossible. Consequently, the emphasized solutions of this paper will pursue alternative greenery variations exploring the verticality of these spaces on surfaces such as blind walls, fences or open corridors.

2.2. Functional aspects of interior courtyards

Originally, the functional profile of historical interior courtyards was linked to daily household activities as well as communal meetings, social and cultural events. The patio offered a sheltered retreat from the busy urban life while maintaining a certain semi-public character as a space of transition between street and house. A typical patio in Timisoara is inhabited by several occupants which form a small community, connected through this central shared space that also serves as an access device, vertical and horizontal circulation distribution. Whether the patio is used as an interaction means or just another empty ventilation ad lightning system, depends on the social degree of the neighbourhood as well as its visual attractiveness.

The general tendency nowadays is to isolate the patio from indoor activities and from the public space, transforming it into a simple transition or storage area, so even the existing vegetation is left unmaintained. Consequently, the lack of social activity and maintenance start a vicious cycle turning the courtyards into unpleasant and unlivable spaces. [7]

This negative attitude towards urban nature and spaces that could host such elements are detrimental to human health and well-being and must be changed through education and noninvasive interventions that prove their actual potential. Few interventions have been noticed during the last decade that impacted the character and functionality of interior courtyards. By introducing public or semi-public functions as cafes, art galleries, cultural venues, offices and other services linked to one or more patios, private or public investments have aimed to enhance the aesthetics and potential not only of the buildings.
but of the exterior spaces as well. Open to the public and their direct beneficiaries, these spaces offer pleasant semi-public destinations on the urban pedestrian trail when they feature a set of urban facilities: urban furniture for short breaks, water features and various vegetation for shade, cooling and fresh air. [7, p. 111]

2.3. Psychological potential of vegetated interior courtyards

In addition to the mentioned physical, ecological and functional advantages of interior courtyards, there are social and psychological aspects to be considered of no less importance. Although less quantifiable than energetic performance and with less immediate results, the presence of nature in proximity of stressful human activities is shown to have great potential in cognitive, creative stimulation and stress reduction.

Restorative environmental design [6] aims to firstly reduce the adverse effects of modern design and development on natural systems and human health; and secondly promote more positive contact between people and nature in the built environment. Scientist Roger S. Ulrich demonstrates in 1991 [8] that exposure to natural elements aids in psychological and physiological recovery, better than prolonged exposure to any type of built environment.

American ecologist and researcher Stephen R. Kellert states in his book “Building for life” that there are multiple possible relations between the built environment, nature and man, so a certain balance can be created with proper design methods based on Biophilic principles. The three main levels of interaction can be summarized as direct, indirect and symbolic experiences [9, p. 133] of which the most beneficial and desirable is the direct experience of nature. Practically, this implies natural ventilation and lightning, direct views to exterior natural landscapes made up of vegetation, fauna, water and fire, organic or biomimetic inspired design in furniture and space configuration.

Another interaction level explored in the present paper is place belonging, historical and cultural connection, essential aspects for historical site integration [9]. Vernacular design in this sense, is a type of connection that assures a strong architectural - site correlation, resulting in a strong sustainable approach and a better perception of the result from the local public and its users.

“The spirit of a place is revealed through a locality’s distinctive buildings and landscapes” [9, p. 169]

Emotional and intellectual attachment of a building to its site are very similar to the rooting experienced by man to his place of belonging, as cultural, ethical and hereditary traits shape his character, so shall architecture be shaped according to these same aspects, further considering that a building is confined to one place for all its existence, changing according to its surroundings.

A recent study undertook by the international carpet tile producer, Interface on 7600 employees worldwide, shows that among the most wanted and missed aspects of a workplace design are: natural light 42%, interior greenery 18%, views to natural landscapes 20% and bright colours 15%. [10, p. 12]

Along with the beneficial effects stated above, there is general interest in implementing biophilic principles in design, as the presence of such elements has the potential to enhance man’s closeness to nature, determining positive behaviours towards nature, a healthy lifestyle and the limitation of the ecological footprint. In order to achieve the anticipated effect of greenery and vegetative systems there are certain aspects to be taken into consideration in the project phase: choice of vegetation species, irrigation systems, actual system configuration and location in the urban fabric or within an existing or projected building.

Whereas the proper functioning depends on the irrigation and vegetation choice, the project location has three levels of repercussions: environmentally, psychologically and socially, which are the main subjects of this paper. Several case studies [11] have shown living walls reach their highest potential if located in a common space such as atriums, foyers, interior courtyards, lobbies or other spaces with good visibility from both interior spaces and exterior or public space. Thus, offering a glimpse of natural sight to its inhabitants, the green wall encourages social interaction and ecological responsiveness, while attracting visitors.
2.4. Accessibility and functional correlation
Location is directly related to accessibility and function, two key features of any design. Furthermore, green design features require specific attention in choosing the right place and proximity to complementary functions. An additional component highlighted by a recent Dutch study is activation of movement through space, as an important aspect of human health and well-being. Active design relies on the presence of nature as a setting for healthy habits and behaviours while the right layout of functional landmarks and circulations promotes physical activity, a necessary aspect, become scarce in modern lifestyles. Any access to nature, whether in a park or natural area, or simply viewing green space during daily life, positively affects mental health and facilitates social connection. [12, p. 70]

Green spaces confined in interior courtyards, shall become accessible in order to ensure union between public and private realms, encouraging physical activity, social interaction, restorative and aesthetic experiences. Thus, visibility, functional correlation and optimal positioning of green features are essential for the desired interaction to occur. It also encourages projects to address social equity in their design and development choices. The intent is to build stronger communities and create or renew a sense of environmental stewardship. [12, p. 70]

3. Case studies of revitalized historical patios
Western European countries and their cities offer important examples of urban development in both grey and green infrastructure, managing an optimum balance between buildings and vegetation. The local municipalities have introduced new regulations aiming for a growth in urban green area surface to finally mitigate pollution and its negative effects over the population. Consequently, after various public and private investments and a series of urban interventions, the landscapes of great capitals have changed from densely built to greener in a few years, the results showing in increased green area ratio per inhabitant: London – 45 m², Paris -14.5 m², Amsterdam – 36 m², Vienna - 120 m². Although the French capital is well known for its ecological approaches, famous parks and local green interventions, the green area ratio is very close to the low 15.8 m² per inhabitant that we currently have in Timisoara. Considering the low green space ratio in Paris the local municipality aims to add another 11 hectares of protected greenery to the existing 807 ha. Having this in mind, the latest regulations impose the use of proportional green space relative to the projected surface of either new or retrofitted buildings, encouraging ecological-oriented approaches from both professionals and citizens. Large investments such as industrial site retrofits as well as smaller scale interventions accessible to locals are all aimed to create a strong network of greenery within the city. These being considered, along with the typical historical French architecture shaped by buildings with interior courtyards, two examples will be analyzed as case studies, representing different interventions on patios in historical French sites.

3.1. Hotel Pershing – atrium with vertical garden by Patrick Blanc, Paris
The rehabilitation of the XIXth century building implied an interesting green addition to the covered six-story atrium: a vertical garden visible from all the main spaces of the hotel. Thus, the green wall becomes a focal point for the entire building, attracting all events and interactions within the building towards it and the space surrounding it. The unexpected vegetal exotic oasis is an event in the densely built fabric which maximizes its effect to the viewers and guests of the hotel. In his characteristic style, the French botanist Patrick Blanc creates a composition with a mix of 360 species of tropical and local plants. [13]. The position of each plant is well thought, depending on the light and humidity requirements, thus, the base is filled with low carpet vegetation adaptable to humid and shady environments, while the upper part hosts big foliage plants demanding less irrigation and more sunlight. Thereby, the well-planned setup of vegetation not only forms a natural layout, but also optimizes water consumption.

3.2. Interior courtyard of the Rhin Palace by Agnes Daval, Strasbourg
The restoration of the former royal residence of the Hohenzollern family in Strasbourg was a process of merging patrimony restoration and urban regulations concerning historical buildings [13]. Along with the prohibition of planting high or medium vegetation and any structural alteration of the building,
landscaping the interior courtyard became an actual design challenge. Thus, with the recalled restrictions and a tight budget, the landscape architect Agnes Daval projects the transformation of a 100 m² void into a reinvented vertical garden. Assuming the neo-renaissance architectural line of the XIXth century though a symmetrical composition of square pots arranged on the ground. Choosing carpet vegetation without high requirements in natural light the designer meets both needs of greening the patio floor in a balanced composition without planting any vertical vegetation. Adding another green element to the courtyard enhances the spectacular effect: a steel cable system attached to the building facade holds light flowing vegetation that dresses the space and brings an illusion of vertical vegetation without charging the existing structure.

3.3. Existing courtyards valorized through vegetation in the historical center of Timisoara

The rehabilitation project of the city centre has recently transformed almost all streets into pedestrian spaces. Increasing the urban space for visitors and pedestrians’, freedom of movement encouraged healthier and more environmentally friendly activities like walking or cycling. To enrich this large area of public space, several functions are required, apart from typical cafes, so that the centers do not lose attractiveness. The appropriate functions are: cultural as exhibition spaces for artists, craft workshops and places suitable for various events. Since the ground floors, accessible from street level, are already occupied by more profitable activities, the interior courtyards may be suitable for cultural functions and eco-friendly activities.

There is a low percentage of ecologically valorized interior courtyards, according to the empiric study made prior to this paper. Although some spaces are newly rehabilitated, their design does not always make use of natural vegetation not existing or proposed, often using mineral interventions which are quicker and cheaper to install and maintain.

Figure 1a) shows a typical patio in the Cetate district with a central vegetal element that has dictated the layout of the whole space around it. Hosting an art gallery, open air event space and offices, the unique character of the courtyard resides mostly in the presence of a live vertical element: the chestnut tree. The low covered gangway access leads directly to the vertically open patio that visually communicates with the perimetric circulation and all the adjacent interior spaces. “The Arts’ House” courtyard is easily identified by the locals through its identity and pleasant natural atmosphere inserted and well-kept between the historical walls.

Figure 1b) shows another example of well used exterior space, one of the few interior courtyards with walls covered in vines. Although there are not many flat surfaces for planting, the inhabitants chose to have an abundance of greenery by using grape vines climbing on the southern facades. The vegetation serves as natural thermal insulation in winter and a cooling system in summer while offering a gardening spot and fruit to the small community. Multiple benefits are withdrawn from the simple presence of natural elements in the courtyard that also unite the neighbours in common activities like gardening and maintaining the grapevine.

Figure 1c) represents a more common example of Timisoara’s central interior courtyards, newly rehabilitated but with no vegetal intervention. Adding to its length and longitudinal development, the patio serves as nothing more than a hallway or transition space with significantly less appeal for passersby to stay and enjoy the space. This example shows a striking contrast in comparison to the two others, with less character but much potential for a proper green design.
Hypothesis and presumptions

- Linear paved and predetermined routes through the historical built fabric that don't emphasize the actual potential of the medieval urban structure. Open courtyards call for further exploration, discovery and surprise of the unknown, while enclosed ones are valuable only for few inhabitants.

- The lack of vegetation or deficient maintenance of existing greenery call for action from the part of the local administration, landscape architects, private investors, architects and citizens, as these issues are not only a local concern at a plot level, but a problem of biodiversity, well-being and climate change.

- From a functional point of view there is a striking contrast between public and private patios. Considering that activity and the presence of people can harness a space, adding public functions or features related to interior courtyards could be a motor of spatial and urban activation.

4. Methodology

There are several calculation formulas to establish the most advantageous green surface on a specific plot or in a retrofitting project. Taking into consideration the type of vegetation, soil depth and green system to be implemented, the Biotope Area Factor (BAF) [14] is the ratio between the potential ecological surface and the total area of the respective terrain. Local urban regulation initially imposed a certain percentage of green surface per plot, regardless of the green system, but the BAF binds the correlation between the vegetated surface and its ecological contribution.

Significant at both legislative and administrative levels, the BAF encourages and aids professionals, municipalities and investors to practice a good green space layout based on a solid and clear framework, thus participating in the revival and development of a healthy and sustainable green infrastructure for their cities.

The Biotope Area Factor is currently used in Germany and France, but a widely used formula introduced by the European Commission is the Green Space Factor (GSF) applied in countries as Sweden, Italy, Austria, Greece, The Netherlands, The United Kingdom, [15]. Similar in role to the BAF, the Green Space factor aims to satisfy the need of greenery on every plot, thus reducing paved surfaces to a minimum. All public and private spaces are subject to this regulation, bringing together a well-connected green infrastructure and increased biodiversity.

In Romania, the general regulations concerning green spaces are composed in the “24/2007 Law concerning the administration and regulations of green space, republished in 2009”, and locally established by local master plans. The analyzed central district of Timisoara has an average demanded value ranging between 5-10% of green space depending on function and building occupancy ratio. [4, p. 265], [16]. As the majority of the built fabric is composed of buildings with interior courtyards directly accessible from the pedestrian area, the only unbuilt zones left are the discussed interior courtyards.
Consequently, this ratio is seldom being reached in the “Cetate” district as an outcome of increasing built density, paved surfaces and patios transformed into parking spaces. As a result of these on-site observations, the following proposals will take advantage of existing vertical surfaces that are left unexplored and more generous in size than horizontal ones.

5. Proposed systems and results
The following section approaches four cases of historical interior courtyards subjected to analysis and proposal. Basing the choice of these examples on the criteria of size, shape and the potential to host a green system, the scope was mainly to observe the actual influence of greenery from a visual and legislative point of view. By applying the Biotope Area Factor calculation method for the projected situation and comparing the results to the local green space percentage demand in Table 1, we could conclude whether the effort of implementing living walls or other green systems in interior courtyards would have a real positive outcome.

5.1 Type 1: Proposal of wall covering vegetation with soil substrate and potted trees
The first courtyard, Figure 2a), serves as an access device for several offices, is in a good existing state, being recently rehabilitated. The design included the pavement of the entire surface and painting the facades without any treatment applied to the high blind wall. Vegetation is present in the shape of a small potted tree in an isolated position. Being given a narrow space, the only potential surface to be exploited is the blind wall that will serve as support for the living wall system. There are two solutions presented in Table 1, a non-expensive solution using potted trees with no significant impact and a second solution complete by a living wall with more ecological impact. The project allows views to the green wall from most interior spaces, as the longitudinal development of the courtyard shows. The proposal will serve as a psychological restoration motor for the employees while providing visual access from the public space through the gangway.

![Figure 2](image)

Figure 2 a) Type 1: Narrow patio without vegetation b) Type 2: Rectangular patio with existing vegetation

5.2 Type 2: Proposal of horizontal and vertical wall covering vegetation
The second courtyard, Figure 2b), belongs to the Arts Museum, is situated close to one of the biggest public spaces in Timisoara, the Union Square, but has no connection to the building or the exterior space, being used only as a secondary patio with no actual function. By proposing the greening of the existing blind wall and replacing deteriorated pavement with plants on the existing horizontal area, we obtain more than the required percentage of greenery. Table 1 presents two possible solutions, which acquire
a good vegetation percentage. Considering functionality, the courtyard could host art exhibitions and workshops, meeting spaces or relaxation areas ensuring a better connection to the existing museum.

### Table 1. Comparison between existing and projected situations of two interior courtyards

|   | Existing green area (20% / plot surface) | Required green area | Proposed green systems | Calculation | Resulted vertical green area | Resulted horizontal green area | Total green area |
|---|------------------------------------------|---------------------|------------------------|-------------|------------------------------|-------------------------------|-----------------|
| **Type 1** | 0 m² | 195 m² / 976 m² | solution no1: potted trees | 10m² * 0.7 = 7 m² | x | 7 | 4% (7m²) |
| | | | solution no2: potted trees + green wall | 10m² * 0.7 + 160 * 0.5 (wall) = 87 m² | 80 | 7 | 45% (87m²) |
| **Type 2** | 40 m² | 170 m² / 850 m² | solution no1: green wall + courtyard planting | 100m² * 1 (patio) + 165 * 0.5 (wall) = 182 m² | 82 | 100 | 110% (182m²) |
| | | | solution no2: green wall + existing grass | 40m² * 1 (patio) + 165 * 0.5 (wall) = 122.5 m² | 82 | 40 | 72% (122.5m²) |

#### 5.3 Type 3 and 4

The third and fourth examples, Figure 3 and Figure 4, aim to show the spatial and functional potential of interior courtyards through the implementation of more complex systems. The chosen situations completely lack vegetation and show different levels of degradation. It is easily noticeable that the semi-public patio in Figure 3 is better maintained than the private, residential patio in Figure 4.

A central vegetal installation system in the first situation, inspired by Agnes Daval’s project in Strasbourg creates focal interest in the central part of the courtyard. The orthogonal wooden structure supported by the existing facades, refers to the neoclassical architectural style while the cascading greenery dresses the central space. Functionally, the ground floor is transformed in a restaurant related to the urban space through the open gangway which allows visible access to the central greenery. Similar to the situation in Figure 2a), the residential courtyard in Figure 4, is a narrow and elongated space, where we emphasized interior-exterior correlation by adding a restorative function composed by the axis of the open gangway and animated by the presence of natural vegetation.

![Figure 3. Type 3: Proposal of vertical central vegetation](image-url)

### 6. Conclusions, limitations and further research

Prior to any similar project, a series of studies are to be done for a valuable outcome. In this manner, sociological and cultural studies are mandatory in order to identify the local needs, while specialized structural studies are necessary to determine the existing building condition and support capacity. Sunlight and shade studies are to establish the actual position of vegetation within the courtyard as well as the vegetation type. These imply a team of experts in the following fields: architecture, urban planning, botany, structural engineering, sociology, psychology, interior design.
To strengthen the present study and confirm the presumed directions, surveys or interviews shall be addressed to various inhabitants that relate to an interior courtyard. Hence, we could draw conclusions on weather a vegetal intervention is seen as necessary, mandatory or irrelevant. The results shall also direct towards the desired vegetal systems and functions resulting in better sustainable approaches.

Regarding the proposed green systems, we could observe that in the majority of cases there is a reduced soil surface, due to elongated and narrow shapes or already paved areas which diminish the options of regular planted vegetation. Thus, optimized and adapted systems are required, such as living walls, hanging planters or flowing vegetation, installations that take advantage of height and length rather than horizontal surface.

The present paper aimed to establish guidelines and draw attention over the situation and potential of interior courtyards in historical areas. There are no general formulas to be applied, for every site is unique and has unique demands that must be identified through the above-mentioned preliminary studies. The facts taken into consideration are related to fundamental human necessities concerning man’s connection and interaction with the natural environment, that represent important aspects of sustainable design and wellbeing.

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Figure 4. Type 4: Proposal of vertical surrounding courtyard vegetation
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