

# Sustainable development – applied to inhabited medieval towns

Gabriel Valentin Georgescu

PhD student, Department of Urban Planning, University „Ion Mincu”, București, România

**Abstract.** This paper aims to present a view based on specialized literature and personal observations regarding the concept of heritage in the context of the current requirements of transforming cities into sustainable urban entities. The paper presents ways of integrating the medieval city of Sighisoara into this general trend. The development of the concepts of heritage and sustainability through the prism of specialized literature was preferred and the study comes with viable proposals of rethinking the medieval fortress of Sighisoara by highlighting successful policies implemented in several similar European cities. The main objective was to carry out an initial applicability study in Sighisoara concerning the methods and techniques used in the still inhabited medieval cities. This transformation should be thought of without affecting the heritage value. The study of techniques and methods applied at European level in cities with a similar history was also considered. For this purpose, on-site observations were necessary both in Sighisoara and in other cities that are the subject of comparative surveys, as well as discussions with local competent bodies. The results obtained led to conclusions, both regarding the measures required to be immediately applied, and the sustainable future evolution of the city of Sighisoara.

**Key words:** ecological practices, medieval cities, built heritage, eco-systems, sustainability.

## 1. Introduction

More than half of the world's population now lives in urban areas - increasingly in extremely dense cities (Fig. 1). Urban environments as today are a relatively new phenomenon in human history and this transition has profoundly and irreversibly marked the way we live, work, travel, communicate. It all started in the past 120 years.

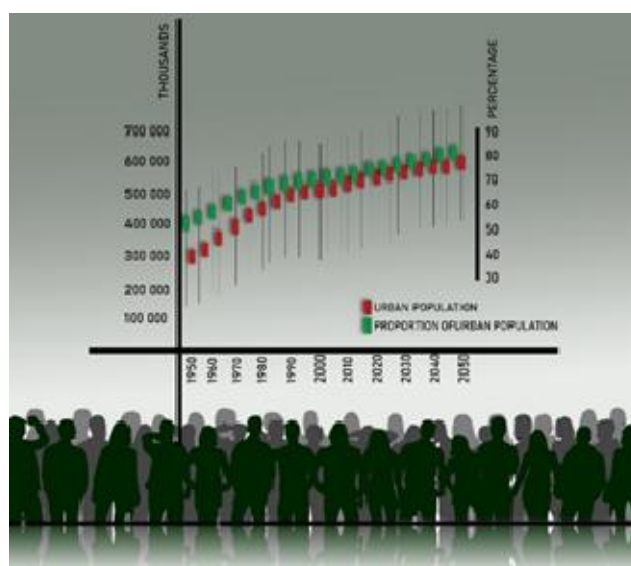


Fig. 1. Proportion of urban population of the overall population in Europe and the absolute numbers of urban population over time.

For most of human history, most of the world's population lived in small, rural communities. But the last two centuries and especially the last few decades have brought about a major change due to mass migration from rural to urban areas. More than 4 billion people now live in towns and cities. This means that over half of the world's population lives in urban environments.

The UN estimates that this major event – when the number of people in urban areas exceeded the number in rural areas – occurred in 2007. The rapid growth of the world's population, the high density, especially in the urban environment, has led to an obvious decrease in the quality of life. The allocation and distribution of existing resources—from housing and access to transportation, to healthcare, education, and employment opportunities—heavily depend on where people live.

But what do we mean by urban density? There is some difficulty in finding a standard definition of the urban area. The standard adopted and accepted by the UN for urban density is the so-called "population density of urban agglomeration". According to UN definition of an "urban agglomeration", the term refers to the population contained within the contours of a contiguous territory inhabited at urban density levels without regard to administrative boundaries. It usually incorporates the population of a city plus that of suburban areas outside but adjacent to the city limits.

The UN's 11th SDG (Sustainable Development Goal) is to ensure that cities are inclusive, safe, resilient, and sustainable.

The attitude of city dwellers is gradually changing, integrating a new perspective, based on the awareness that collective well-being is affected by individual behavior. But environmental practices and policies can be only established gradually, often under the pressure of public opinion. Sustainability is the only logical survival strategy left in today's environmental conditions.

The concern for the environment has become more pronounced in the last century due to an obvious decline in the quality of life because of general environmental decay. What we call the "ecological footprint" refers to the network economy, characterized by intensive trade and transport and massive use of fossil fuels that have led to excessive environmental degradation, especially within urbanized areas that have a higher concentration of population, urban functions and urban landscape.

If newer cities can be transformed without involving cultural ethics issues, heritage cities come with elements of urban difficulty generated precisely by their intrinsic value. There are no standard recipes for the changes we need to make, but methods and ways to mitigate the effects of climate change. It is essential to find a balance between individual, community and environment.

At the macro, institutional level, modern and historical cities can look very different. But now we are finding that what we know about contemporary urban processes may be applicable to the past because of the similarities in micro-level behaviors and the effects they have on the larger system, according to Luis M. A. Bettencourt<sup>1</sup>. For years, Luis M. A. Bettencourt and his collaborators in Santa Fe have built a theoretical framework for understanding modern urban clusters in their most basic form, starting with ancient cities<sup>2</sup>.

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<sup>1</sup> Bettencourt *et al* 2007a

<sup>2</sup> Bettencourt *et al* 2007b

Medieval cities should not be condemned to a purely testamentary existence. They can become vulnerable over time due to the various historical, social, economic, demographic, etc. changes. Some medieval cities reached the 21st century exhausted and remain alive only as an archaeological and/or touristic site. But those that have not lost their historical dimension need a different approach than that adopted for ordinary urban areas, in order not to affect the heritage and identity value<sup>3</sup>.

For this purpose, the work is centered on the idea of heritage and sustainability<sup>4</sup> and intends to be an overview of how sustainability and ecological discourses related to urban and peri-urban areas can be applied to still inhabited medieval cities.

## 2. Materials and Methods

### 2.1. General context

According to the UNESCO World Heritage Committee, while referring to the Comprehensive Preservation and Management Plan for the World Cultural Heritage developed by the Okinawa Prefectural Board of Education, the preservation plan is defined as follows: a plan that clarifies the relationships between the component parts (individual cultural properties) and establishes policies and measures for comprehensive conservation and management in a global context. In this sense, a thorough and complex conservation and management plan seems mandatory. The conservation and management of heritage is considered and the necessary policies and measures for integrated protection are established. Also, a study of the 17 Sustainable Development Goals completes the idea of a sustainable city, regardless of its age (Fig. 2).

Sustainable development became a topic of conversation only after the Brundtland Commission Report was released in 1987.



Fig. 2. The Sustainable Development Goals (17), adopted on 25 September 2015 as a part of the 2030 Agenda.

Lewis Mumford's description of a medieval city may seem pertinent: "It is not easy to describe it, as it is transforming: initially, it is a tiny social nucleus, then it experiences the

<sup>3</sup> Rollo-Koster 2016

<sup>4</sup> Smith 2021

complex stages of maturity, finally it grows old, collapses. Its origins are obscure: the traces of its past have too often been erased, and it is difficult for us to predict its future"<sup>5</sup>.

But one may not entirely agree with Lewis Mumford's statement. A city-citadel can remain an archaeological site, a tourist spot - which means a social collapse, but not a patrimonial collapse. On the other hand, it may as well move on, adapt to the times and become, in the end, a city with a future.

## 2.2. Working Methodology

This research uses mostly an inductive methodology to achieve a conceptual analysis, explaining the many meanings of the concept of "sustainable urban development" in medieval inhabited cities. A rather descriptive study has been conducted to demonstrate how sustainable urban development might be implemented in such cities.

The data were collected from numerous sources including literature review, library resources, public reports, interviews with urban executives (in Sighisoara, Marseille and Wangen im Allgäu) and urban management experts.

As a method of approaching sustainable development of historic city, still inhabited today, the comparison analysis findings have been discussed to explain the conclusions resulted and to provide a set of suggestions which might be implemented.

The example used in this study is that of the city citadel of Sighisoara (Fig. 3), as the oldest and best-preserved medieval town, still inhabited today, in South - Eastern Europe. Further on, a comparative view of other medieval European cities seemed appropriate. As mentioned before, a limitation of the research on medieval cities in Europe was preferred, considering the rich history and valuable architecture of the old continent and the common historical and cultural background.



Fig. 3. The city of Sighisoara.

The attitude of the city inhabitants is gradually transformed to integrate a hygienist perspective based on the awareness that individual behavior impacts the collective well-

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<sup>5</sup> Mumford 2011

being. Surprisingly, very few researchers have noted the potential convergence between medieval and contemporary environmental practices. Even if the economic and social organizations are very different, a common point appears: the environmental practices of the political authorities are progressively set up under the pressure of public opinion.

### 2.3. Depth analysis - Phases

Analyzing in depth, five key criteria in the transformation of the city emerged: exploitation, self-sufficiency, maintenance, rationalization and reuse.

The concepts mentioned above have been defined and contextualized within the Sustainable Development Goals.

Given the urgent need to develop a critical awareness of the spaces we live in, the educational activity on energy<sup>6</sup>, history, urban planning and environment issues carried out by institutions and authorities must start with a correct assessment of the heritage built and the actual possibilities of efficient and superior reuse of poorly managed spaces<sup>7</sup>, implying a revitalization of underused or abandoned buildings (Fig. 4). A SWOT analysis proved to be adequate in this case as such an analysis is a technique used to identify strengths, weaknesses, opportunities, and threats for a specific project.



Fig. 4. Phases of methodology.

<sup>6</sup> Tight 2016

<sup>7</sup> Porfyriou 2019

### 3. The Medieval City – evolution and current development

Despite the dramatic changes in economic and especially political structures over the last 700 years, a new look at medieval cities' population sizes and distributions suggest that some urban characteristics have remained remarkably consistent. Life in 14th-century cities centered around hierarchical institutions such as the crown, guilds, and churches. Today, companies, technologies, and a global economy dominate our lives.

Throughout the Middle Ages there has been recorded a certain environmental degradation, both in urban areas and in the surrounding environment. However, many medieval cities used to have environmental regulations that were observed. The urban settlements of the Middle Ages, especially before the Great Plague, were overcrowded and excessively polluted. This pollution led the authorities of the time to pave the streets, either with stone or with wood logs, install public toilets, ban littering and remove the most polluting activities (mainly butchery and tannery) from water points or the center of the city into the suburbs<sup>8</sup>.

According to Jorgensen<sup>9</sup>, numerous ordinances regarding the cleanliness of the city during the Middle Ages prove that the authorities were aware of the environmental problems and an attempt was made to remedy the general situation through public involvement<sup>10</sup>. Therefore, medieval cities still had a rhythm and a structure much closer to what we call a sustainable city today. The epoch and the conditions restricted, but not substantially, social mixing, economic integration, or the free movement of people, ideas, and information. At the same time, the medieval city was mostly self-sufficient.

Industrial development, social evolution, rural to urban migration, plus a multitude of other historical factors led to a structural change in the medieval city that either annihilated them as a viable space or condemned them to an existence of total or partial denial of patrimonial value in favor of a consumption existence.

Like most medieval European cities, Sighisoara became in time a space in-between. It means that the medieval city finds itself more than often suspended between memories and current or future possibilities. Analyzed through the categories of Edward Soja's "Third space," medieval urbanism reflects paradoxes of the relations of environment to urbanism<sup>11</sup>. Soja's theory of Third space concerns three urban spaces:

- First space is a physical built environment, which can be mapped and measured in the real world. It is the product of planning laws, political decisions and urban change over time.
- Second space is a conceptual space, or how that space is conceived in the minds of the people who inhabit it. It depends on social norms that determine how people might act or behave in that space.
- Third space is a real and imagined space, the way that people actually live in and experience that urban space. Third space according to Soja is a way of "thinking about

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<sup>8</sup> Gaballo *et al* 2021

<sup>9</sup> Jorgenson *et al* 2014

<sup>10</sup> Pache 2023

<sup>11</sup> Soja 1998

and interpreting socially produced space”, where the spatiality of our lives, our human geography, has the same scope and significance as the social and historical dimensions<sup>12</sup>.

Therefore, it is necessary to have a new understanding of how culture, history, spirit and space intersect while exploring new ways to redefine and re-structure a community or a city in accordance with current norms and regulations.

To what extent can environmental engineering learn from old times? Since the beginning of the 1990s, Rosen and Tarr 1994 have defended the relevance of observing the relationship between city and environment<sup>13</sup>.

### 3.1. Green city or sustainable city?

“A green city, or as it is sometimes described, a sustainable or eco-city, is an urban enclave where construction, design, and operation prioritise the preservation of the natural world alongside the social, physical, and economic health and wellness of the city’s inhabitants”<sup>14</sup>.

Researchers argue that green cities are not only achievable, but key to our survival. The main drive behind green cities is the need to protect the natural world/environment and humanity. The Intergovernmental Panel on Climate Change has made it clear that unless we make drastic changes in the next few years, environmental damage will worsen beyond repair and the planet will become inhospitable<sup>15</sup>.

About 3 decades ago, the old European cities, to avoid the roller coaster effect of history, started to adapt themselves to the new wave of requirements imposed by the European Union, in the race to sustain and transform themselves ecologically. Some of these medieval cities have become urban models that are part of the sustainable city movement. According to Frederic Heran<sup>16</sup>, they do not belong to the register of utopia but pursue objectives that are intended to be realistic. Therefore, they break away from the tradition of modern urbanism and come up with a necessary paradigm shift.

The sustainable city concept primarily integrates ecological practices: green spaces and technologies appropriate to the urban environment to reduce air pollution and CO2 emissions, improvement of air quality and protection of natural resources<sup>17</sup>. A sustainable city is an urban center which impact on the environment is minimal through adequate urban planning and management. It is enough to imagine cities with parks and green spaces, buildings powered by solar energy, balconies housing shrubs and plants, roof gardens and more pedestrians and cyclists than cars<sup>18</sup> (Fig. 5). It should not be seen as a futuristic utopia,

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<sup>12</sup> Soja 1998

<sup>13</sup> Andrade *et al* 2013

<sup>14</sup> Loughlin 2024

<sup>15</sup> Loughlin 2024

<sup>16</sup> Heran 2015

<sup>17</sup> Runhaar *et al* 2009

<sup>18</sup> Jafari *et al* 2021

but rather as the result of a joint effort to achieve greener urban eco-systems and superior environmental management<sup>19</sup>.



Fig. 5. Green buildings in Milan.

By gaining a deeper understanding of the meaning of the notions of "sustainability" and "sustainable development", their high significance as concepts for the betterment of communities and life within becomes apparent.

City planners are currently seeking to transform their cities, old or new, into Smart Sustainable Cities (SSC). This effort comes from the obvious need to face rapid urbanization and all the challenges that result from it<sup>20</sup>.

Green cities are a first step and proof of the potential of urban areas to become catalysts for sustainable development.

### *3.2. Application and comparison – target city: medieval city of Sighisoara*

The medieval city inhabited today comes with special issues (Fig. 6). On the one hand, a deep understanding of its place within the modern world is necessary, on the other hand the correct planning of a development in accordance with current requirements and a concerted effort to keep its value intact.

The urban structure of the Middle Ages was far from presenting the structure that cities have manifested in modern times<sup>21</sup>. At the same time, however, we can learn from the priority of cooperation in medieval society; from trying to find a balance between the individual and the community<sup>22</sup>. We also learn that individual action counts: the great infrastructure projects of the Middle Ages were all started by the energy and imagination of

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<sup>19</sup> Capotorti *et al* 2019

<sup>20</sup> Ibrahim *et al* 2018

<sup>21</sup> Arundel and Ronald 2015

<sup>22</sup> Kostof 1992

several people, or a community, often without being mentioned in history books, as the case of the great Gothic cathedrals<sup>23</sup>.

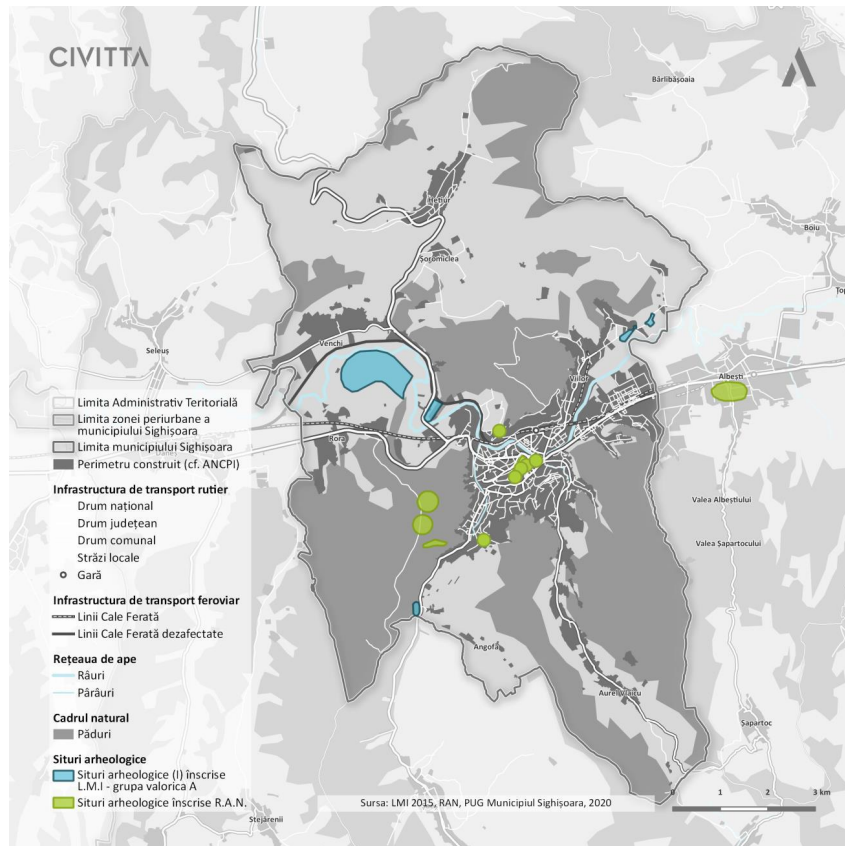


Fig. 6. Sighisoara, chart of historical monuments.

There is no single environmental solution that can be applied to all cities, regardless of their age. Their problems, needs and opportunities are different depending on location, social level, educational level, demographic issues, etc. And the list can go on. But a big problem that arises everywhere and constantly is obtaining energy and using it. Therefore, there are already established steps by which cities can become sustainable and greener, namely:

- Reducing the amount of energy and resources used by improving the efficiency of systems, for example transport and changing citizens behaviors
- Reuse and recycling energy and waste materials
- Obtaining energy from cleaner sources
- Bringing nature and biodiversity back to the cities.

It seemed necessary to provide a set of suggestions to be implemented in the city of Sighisoara, as an object of the study. There are several steps that need to be taken to support sustainable practices:

- Facilitate travel without an individual car
- Establish charging stations for electric vehicles
- Ensure access to public resources and green spaces
- Improve water conservation and smart wastewater management
- Support urban micro-agriculture.

<sup>23</sup> Alberti 2015

In Denmark, there is already a solution adopted for decades. "In Copenhagen, bicycles outnumber cars by more than 5 to 1, and nearly half the population commutes by bicycle. Municipal authorities have implemented this bicycle culture by building bicycle highways with numerous facilities, including traffic lights, air pumps and safer intersections"<sup>24</sup>.

Perhaps one should reflect more on the term "model", which possesses a disconcerting polysemy. Model primarily means exemplary, which deserves or should be followed or imitated. One can say that this common sense of the term has a moral connotation to which one should be careful, but which is often referred to when it comes to the "development model"<sup>25</sup>. In the case of medieval cities, a simple fashion reproduced in all territories, without concern for their identity is not applicable. Since territory, with everything it contains and represents from a social, historical, demographic, economic point of view is unique and it is not reproducible, the applicability of a model presupposes its adaptation to a specific territory.

There are viable examples in old European cities that can be successfully followed in the case of Sighisoara, on its way to become "green" and sustainable.

Since the 17th century, the integration of nature has played an increasing role in the design of the city of Strasbourg. Initially dictated by concerns for public health, the Green Belt of Strasbourg (La Ceinture Verte) has gradually become an essential element of the quality of life for residents.

A 1922 law designated the military fortifications of Strasbourg as a "non-constructible zone". This is how the green belt was born.

The city plans to build walkways and bridges to connect all the green spaces together. The expanded green belt will include parks such as The Orangerie. Some areas will become non-buildable to better protect nature (Fig. 7).

To what extent can the city of Strasbourg be compared with Sighisoara? Both fortified cities are of comparable age and were built for defense. However, their subsequent evolution was different. But the measures taken by the municipality of Strasbourg that led to the development of a sustainable city can be a source of inspiration.

Sighisoara benefits from the advantage of a reserve dating back to the medieval epoch - also known as the Breite Plateau - just 4km away from Sighisoara and covering an area of over 120 hectares. Just like La Ceinture Verte, this reserve is not a natural one, but man-made, a few centuries ago. Therefore, the comparison with Strasbourg ceased to seem accidental.

Sustainable green planning seeks to maximize environmental performance to improve and support the natural environment while enhancing social life and economic vitality of a city. The general efforts towards a "green city", come with the benefit on the health and well-being of urban populations, contribute to realizing sustainable cities.

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<sup>24</sup> Blais 2014

<sup>25</sup> Heran 2015

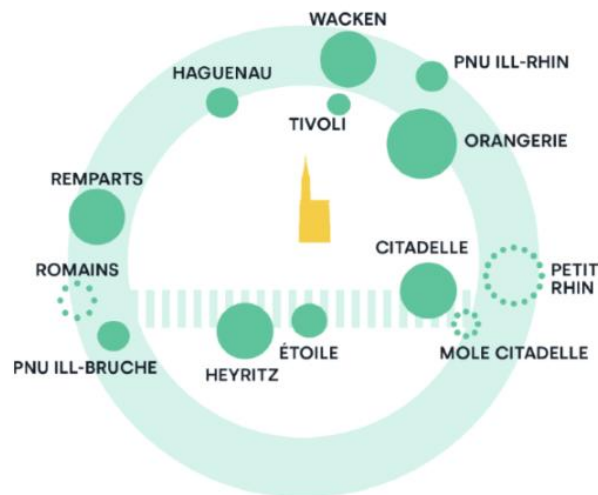


Fig. 7. La Ceinture Verte (The Green Belt).

The problem of the right balance between green spaces and high density was born with urbanism. In ancient, or medieval, cities, which rarely exceeded 20-30,000 inhabitants, people moved around on foot. The radius of the inner city was much reduced. In the case of some existing fortifications - such as the fortress of Sighisoara, the built perimeter was kept to a minimum, and the density was so high that it was almost impossible to create gardens, parks, or green areas that were not vegetable gardens. The garden was, first and foremost, a productive space: it provided the inhabitants with fruit and vegetables and sometimes even wine. Although green space was an indispensable element, it could not be introduced into the heart of the city, especially when the city was fortified. That is why gardens occupied a privileged place in the suburbs or on the outskirts.

The constant growth of cities has also been accompanied by an expansion that favours the close relationship of built spaces with green spaces. Without thorough reflection, the implementation of urban micro-landscapes<sup>26</sup>, often haphazard, sometimes proved unsatisfactory. The present need for extensive or concentrated green spaces has led to many successful experiments. In the 1970s, the Japanese ecologist Akira Miyawaki<sup>27</sup> developed a new method of forest regeneration, primarily aimed at restoring degraded sites and promoting resilience (Fig. 8). Because they require only small portions of space and can exploit to the maximum the vacant places, the space between two buildings etc., the Miyawaki mini forests are a viable solution for any type of city, even more so for the medieval city that has very little free space<sup>28</sup>. This method has been adopted in much of the world, especially to promote micro-afforestation in urban areas.

Bruges, another old, medieval European city with an agitated history and with an equally hectic present, chose to transform old railway or tram routes into routes for cyclists bordered by bushes and shrubs.

<sup>26</sup> Barton *et al* 2009

<sup>27</sup> Miyawaki 2004

<sup>28</sup> Poddar 2021

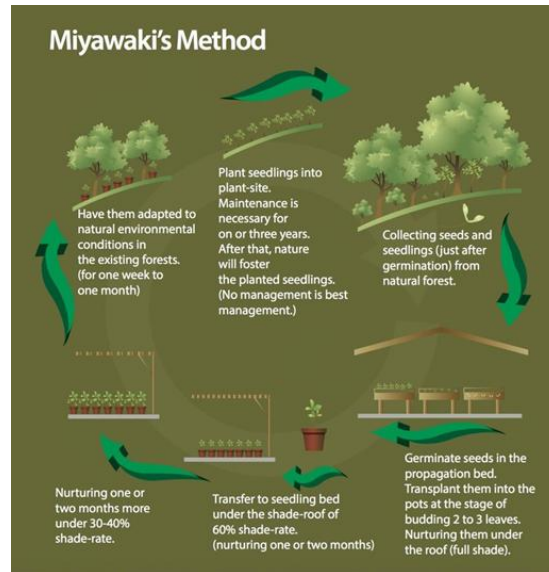


Fig. 8. Miyawaki's method.

Marseille, with a history that goes back to the Roman Empire, transforms its streets into green streets with the participation of the residents. The action "les rues jardins" (Garden Streets) started 4 years ago and continues with the support of the local municipality (Fig. 9).



Fig. 9. Garden streets in Marseille.

These are just a few examples of the possibilities of creating a green old city. This may be a subject for a broader approach.

### 3.2.1. Preservations and promotion of built heritage

As contradictory as it may seem, the transformation of an inhabited medieval fortress into a sustainable city begins with the preservation of the built heritage. The city of Sighisoara, for example, has undergone large-scale renovation projects aimed at preserving its ambiance while protecting its historic structures (Fig. 10). The city administration and various networks of cultural and marketing organizations have been trained together to strengthen the local economy and improve the quality of life for residents and visitors. These actions were started, unfortunately, relatively late, after the end of the communist period.

"A sustainable, economically feasible and replicable evaluation model can be proposed. Thus, an evaluation of the possibilities of adaptive reuse of a certain element of historical-

architectural heritage incorporates spatial implications that are relatively flexible and easy to replicate. By doing so, the evaluation model can be redefined based on a constant dialogue between the project and the market analysis; replicability of design strategies for "families" of historic buildings; and the need for the project's ability to change and adapt to emerging requirements"<sup>29</sup>.



Fig. 10. Medieval City walls of Sighisoara.

This is necessary since conservation and sustainability objectives do not always coincide. It is mandatory to identify and discuss the possibility of transforming a built heritage element into an opportunity for urban and territorial development, after a careful analysis of its architectural characteristics. Necessarily, there will be constant dialogue between the project and the market, with the involvement of local authorities competent in the field. Sustainable and resilient urban regeneration also includes the transformation of heritage areas or buildings, whenever the case, considering recognized environmental, economic and social consequences.

When it comes to managing urban growth and preserving land, repurposing abandoned structures is the most important component. It is also important to keep in mind that future generations will benefit from the preservation of land, buildings, and infrastructure that have been abandoned.

Hereunder an eloquent example has been chosen: the medieval city of Wangen im Allgäu, Germany, similar in many respects to Sighisoara (historical course, demographic structure, area, number of inhabitants). The transformation of an old abandoned weaving mill, considered to be part of the city's history, into a residential space that preserves the old

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<sup>29</sup> Lami *et al* 2023

architecture and benefits at the same time from all modern facilities, becomes thus an excellent model of sustainable and efficient transformation (Fig. 11).



Fig. 11. Residential space, revitalization of the old weaving mill in Wangen im Allgäu.

### 3.2.2. The medieval city; traditional methods of restoration, renovation, rehabilitation

According to Rodwell, conservation and sustainability have parallel meanings and are frequently used interchangeably to express the need to manage the world's natural resources and the biosphere first, to ensure long-term harmony between man and nature; and second, to achieve continuous improvement in the environment and the conditions and quality of life for humans and other life forms. Conservation is above all about protecting what remains and what speaks to our identity<sup>30</sup>. Sustainability is what can be consistently better in the long run, without depletion in any place or direction, and while it is a parallel concern with conservation, it is a step beyond conservation and more toward future.

Cities, either old, inhabited fortresses, such as Sighisoara, or new cities, need a new construction strategy, a new architectural and urban vision, in accordance with the requirements and norms developed for a sustainable city. New, specific paradigms come into play.

"The contribution of heritage buildings to the three principles of sustainability has not been sufficiently and comprehensively explored and, as a result, there is a conflict of interest between preserving heritage values and advancing the sustainable urban design agenda"<sup>31</sup>.

The more than 4 billion tons of Portland cement produced each year account for approximately 8% of global CO<sub>2</sub> emissions. Cement pollutes more than airplanes and commercial ships. A compromise solution would be low-carbon cement produced in Switzerland, which allows a reinvention of buildings built using a sanitized and eco-

<sup>30</sup> Rodwell 2007

<sup>31</sup> Bullen and Love 2011

responsible material. But, in the design of ecological buildings, a holistic approach is needed, considering their entire life cycle. Therefore, the consumption of natural resources should be optimized and, where possible, the use of renewable resources should be resorted to.

When designing building systems, we take inspiration from nature. We integrate energy flow, water flow, and waste disposal into a single interconnected system. Utilizing advanced simulation software, we have near-unlimited flexibility to model and validate the performance of various combinations of energy, water, and waste disposal technologies<sup>32</sup>.

If new constructions new rules can be applied and modern, friendly, and sustainable techniques can be used, in the case of old, historical buildings, energy studies and optimizations of already existing systems are needed to recommend improvements and present cost-benefits, so that the right decisions can be taken.

Further on, if the question arises of restoring an old heritage building, this involves restoring the building to its original state, respecting the logic of the construction. First, it is about interrupting the process of deterioration of the building, while strengthening it to preserve it. Next is bringing it to new standards. After the works are completed, the construction should match the original design and benefit from sustainable improvements.

There are several methods available to bring a construction, regardless of age, either to the desired aspect, or to the original one:

- Renovation - This method involves a process of transforming the old into something new. It can go as far as destruction, total abandonment of the original building, if necessary. Renovation sometimes involves work that affects the structure: reworking the foundations, redoing the floors, demolishing a load-bearing wall, reworking the frame, replacing the roof, etc.
- Eco-renovation - Eco-renovation is a suitable approach for older buildings, for historical buildings by respecting current standards<sup>33</sup>.
- Restoration - If the question arises of restoring an old, historical, heritage building, this involves restoring the building to its original state. The logic of construction shall be considered, and the process of building damage will be stopped<sup>34</sup>. Before preserving it, it needs to be consolidated. A laborious process of bringing to new standards follows. At the completion of the works, the construction should correspond in terms of architecture and equipment to the norms in force and the new standards. The improvements will be in a mandatory and necessary way sustainable.
- Rehabilitation - It means restoring a building, but without destroying any essential element of it. During a rehabilitation operation, the architecture of the buildings is carefully preserved. All types of buildings can be rehabilitated. Rehabilitation consists of refurbishing a building while preserving the exterior aspect and improving the

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<sup>32</sup> Amaral *et al* 2020

<sup>33</sup> Pombo *et al* 2016

<sup>34</sup> Vafaie *et al* 2023

interior comfort. Rehabilitation implies respect for the architectural character of the buildings.

This last procedure is the most suitable for bringing heritage buildings into the 21st century.

The old farmhouses, including those from the Transylvanian area, were fundamentally ecological constructions. Today, traditional techniques and materials can be used to restore the built medieval heritage<sup>35</sup>. A return to traditional materials can provide an advantageous production niche for local artisans. The purpose of this paper is not to review the traditional methods and techniques used in past centuries for the construction of houses, but we would like to draw attention to the current possibilities of a partial return to these ecological and sustainable techniques in the reconstruction and restoration of medieval buildings<sup>36</sup>.

It seems appropriate here to return to the subject of the work, the city of Sighisoara. The effort to identify ecologically sustainable ways to transform a medieval city into a modern city with a sustainable future has been doubled by studying these traditional techniques, which can be successfully rethought for modern times.

Studying Jan Hlsemann's book<sup>37</sup> - "Casa țărănească săsească din Transilvania. Ghid pentru restaurarea caselor vechi" (The Saxon Peasant House from Transylvania. Guide to the restoration of old houses), is a practical way to familiarize ourselves with the anthropogenic landscape of Transylvania. The book is a complete, specialized manual and guide dealing with the rehabilitation methods of the old houses/buildings. Apart from reusing the existing systems, the author also proposes adaptable, feasible and viable traditional solutions.

In the introductory word, architect Eugen VAIDA, president of the MONUMENTUM Association, states that "the present work meets the continuous efforts of the MONUMENTUM Association to preserve the historical buildings in the rural environment and responds to an extremely delicate problem in the process of safeguarding the traditional built stock from Southern Transylvania: restoration of old houses". The book aims and succeeds in being an excellent guide for the restoration of traditional medieval houses.

Safeguarding the built heritage of the rural environment is an urgent issue that must be addressed to preserve the unique cultural values of the Romanian people, which reflect the nation's architectural distinctiveness on a global scale.

### 3.2.3. The medieval city; sustainable city transports

It would be appropriate to go back to the definition given in 1987 by the Bruntland Commission: sustainable development is a form of progress that enables us to meet current needs without jeopardizing the ability of future generations to fulfill their own needs.

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<sup>35</sup> Uprety *et al* 2012

<sup>36</sup> Bardhan and Bhattacharya 2023

<sup>37</sup> Hlsemann 2014

Here is one of the most pressing questions we need to answer: How can we make transport more sustainable? It all starts with understanding the concept of sustainability, understanding the real, long-term value of sustainable transportation, and then creating an adequate urban ecosystem.

The advantages are not to be neglected:

- Reducing the environmental footprint
- Less congestion
- Savings
- Job creation
- Improving the health of the inhabitants.

The main characteristic of the sustainable city is the concern to assess urban development at a global level and to consider it on a very long term. Therefore, urban areas need to prepare citizens for the transition and ensure that there is a clear benefit.

A survey conducted by data supplier Ipsos among 6,000 people from 6 European countries: Belgium, France, Germany, Italy, Portugal and Spain aimed to identify the mobility habits of Europeans<sup>38</sup>. The survey was conducted between November 29 and December 9, 2022. The results showed an obvious change in the mobility habits of the European population. Two-thirds of Europeans (64%) say they have had to revise their mobility habits due to inflation and fuel costs in favour of modes of transport generically referred to as "soft": walking (31% of Europeans declare they walk more often than before the Covid pandemic), bicycles (30% electric bicycle users use it more often, 25% use standard bicycles), but also scooters (stand-scooters) (28% of personal scooter users).

In 2020, the European Commission approved the Sustainable and Intelligent Mobility Strategy, together with an action plan consisting of 82 initiatives, grouped into 10 emblematic areas of action, differentiated on 3 dimensions: sustainability, intelligence, and resilience<sup>39</sup>.

Several projects to make slow streets permanent have expanded to more and more urban areas starting with 2020. These are mainly ways to ensure the safety of pedestrians in residential areas. This initiative eventually became a sustainable solution for bicycles and other non-motorized vehicles to travel safely<sup>40</sup>. And we recall the initiative of Marseille officials to create green streets, mentioned above. Speed limiters are both a green element (clay pots or wood crates with native plants) and a way to ensure a safe traffic area. Here is a very practical and handy solution for old cities with narrow streets and real traffic problems<sup>41</sup>.

Ávila, an ancient medieval city in Spain, has spent several years developing and implementing an extensive plan to gradually transform the city into a green city, coming up

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<sup>38</sup> Chandeze 2023

<sup>39</sup> Santos-Iglesia *et al* 2022

<sup>40</sup> Santos-Iglesia *et al* 2022

<sup>41</sup> Mozos-Blanco *et al* 2018

with sustainable technologies and engaging the citizens in this process. An urban transport fleet rethought as a technology (use of renewable energy sources) and route optimization are constituent elements of a broad plan to solve transport problems for the urban and peri-urban areas, which can be studied and applied in other old cities, including Sighisoara.

## 4. Results and Discussions

### 4.1. Results

Throughout the work there is an effort of limitation as much as possible to urban areas and regions of which direct knowledge was available, relying on adequate documentation. In the current research, the intention was to determine the degree to which decisions associated with a city's historical foundation can transfer to its contemporary functioning and its evolution potential in the context of sustainable development.

The analysis of the strengths, weaknesses, opportunities and threats (SWOT) of managing the medieval city of Sighisoara helps us to comprehend the status quo as well as the challenges implied by the transformation of the city into a sustainable one taking into account the current liveability indicators (Fig. 12). Performing a SWOT analysis for a medieval city helps to develop a strategic plan that maximizes the municipality's strengths, minimizes its weaknesses, takes advantage of opportunities and limits its threats. The ideal strategic urban planning of cities should foster a long-term vision for the future development of urban areas while observing the principles of sustainable growth.



Fig. 12. Primary SWOT analysis.

The important feature is to aim for the improvement and development of the living-environment by increasing awareness and quality of life in space. This should be prepared according to the provision of philosophy governing the local mindset.

#### 4.2. Discussions

The general models of economic development – so called “growth models” – which are planned and exist for each country in the world, do not always meet the requirements of a sustainable development as they are supposed to have a low impact on the environment. The models of economic activity and corresponding models of sustainable development may be regarded as controversial more than once.

There should be alternative scenarios for the development of modern societies along the path of sustainable development. In the case of medieval cities, these scenarios should consider the heritage preservation conditions.

There are cases of almost insurmountable risks on the way to constructing the concept of sustainable development within a medieval city such as:

- Structural damage to the built heritage
- Changing the general inherited image
- Changing the level of tourist attractiveness.

These are elements that bring into discussion limitations that are imposed or that must be imposed. Europe, especially, is facing risky situations of this kind. The International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) published a handbook that represents an ABC method - A risk management approach to the preservation of cultural heritage<sup>42</sup>. This guide comes with examples and provides a scientific model and methodology for risk examination and assessment. Therefore, it is possible to devise intervention plans based on thorough assessment. The methodology adopted in this handbook was developed in compatibility with the specific requirements of cultural heritage management, in Europe and elsewhere.

#### 5. Conclusions

In Europe, around three out of four citizens live in urban areas. Cities are complex systems, where communities and the relationship with the environment are constantly evolving. Cities are social, cultural, and economic centers embedded in a wider territorial structure<sup>43</sup>. Although they have several common aspects, each city preserves its uniqueness. They have been shaped throughout history by geographical, social, historical, economic and demographic factors. Cities represent socio-political systems, and the challenges they face vary significantly. However, European medieval cities have a series of similar characteristics that relate to their age and the impact of the continent's history upon each of them.

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<sup>42</sup> Stefan and Jose 2017

<sup>43</sup> Ostrom 2009

Medieval cities, inhabited until today, have proven over time their ability to adapt to the times, and we can offer a few outstanding examples when it comes to sustainable, healthier urbanization, ready to face the problems of tomorrow. The ecological transition is carried out closely, gradually, in accordance with the life needs of the citizens.

Other assessments and indicators indicate that climate change will impact various regions and cities differently. Our research also reveals that certain communities and demographics, particularly the elderly, within a specific city, are more susceptible to multiple environmental hazards, such as air and noise pollution<sup>44</sup>. The goal might be the same, but the path taken will depend on the characteristics of each city.

The European Environment Agency has developed a common conceptual framework to help local authorities and decision-makers design their own transition policy through six distinct objectives: circular city, sustainable city, low-carbon city, green city, inclusive city, and healthy city.

It is also clear for European urban areas that a long-term vision, coherent and supported by competent and relevant governance structures, based on knowledge and hard data, can really transform a city in a few decades.

When climate change forces us to adapt to the new conditions to survive, it changes the way we live and work, it changes the way we design buildings. The future means sustainable cities, rethought buildings, increasingly fluid and flexible systems.

If medieval urban infrastructures are to survive in the modern world, they and the organizational systems that supported them over time require reconfiguration and restructuring.

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<sup>44</sup> Yi and Chan 2014

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