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Chapter 13

Energy-Efficient Architecture and Sustainable Urban Tourism: Context, Challenges and Solution

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Additional information is available at the end of the chapter

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Abstract

Urban tourism, as well as tourism in general, offers great economic opportunities, while at the same time, it increases the destination's vulnerability to overcrowding and uncontrolled growth. Tourism can and should support sustainable urban development. Sustainable urban tourism and energy efficient architecture are interdependent. Increased stakeholder participation, regional cooperation, sustainable urban mobility, supporting environmental and social innovation, preventing negative social issues, resource efficiency and environmentally acceptable waste management, followed by sustainable hospitality industry architecture, are key drivers for sustainable urban tourism success. Energy-efficient architecture in sustainable urban tourism requires application of energy-efficient concepts, elements and systems. Although considerable effort has been put into raising awareness about the necessity of sustainable urban tourism development, numerous examples of "greenwashing" effect have been detected.

Keywords: sustainability, urban tourism, city tourism, sustainable urban tourism, energy-efficiency, architecture, urban architecture, energy-efficient architecture, green building

1. Introduction

Negative effects of human activities to the environment are visible almost on the entire planet.

The tourism sector accounts for an increasingly large share of the global economy. Growth of tourism makes the destination, as the basic resource, more vulnerable. The share of tourism sector's energy consumption is growing significantly on a daily basis. The analyses of global tourism growth indicate increasing growth of urban tourism.

A massive influx of tourists into the cities poses considerable challenges, including the preservation of cultural resources and the built environment, the sustainability of social interaction between local citizens and tourists, waste management, increased energy consumption and other.

2. Urban tourism and sustainability

Sustainable development is a 'sine qua non' for building a sustainable future. Preservation and protection of natural, cultural and social resources are an unconditional necessity to us and future generations. Unfortunately, despite all the strategies, scientific and research activities, the increasingly frequent statements made by experts and quite homogeneous position of profession (economists, sociologists, architects and urban planners), we are still witnessing tourism development mainly going in the wrong direction towards the unsustainable mass tourism. Mass tourism strongly affects the recourses it is dependent on, ruining its own existence like cutting off the branch one is standing on.

European Travel Commission (ETC) authors of Global Development Tourism Analysis [1] point out that urban tourism is a constantly growing segment. Urban centres have become tourist destinations. In that respect, it is crucial to understand the specificity of the city in relation to other tourist destinations.

2.1. Urbanisation and urban tourism

Urbanisation has had important consequences for many aspects of social, political and economic life [2].

Urbanisation and, consequently, greater concentration of citizens as well as people in general (travellers, traders, residents of nearby places, etc.) enabled exchange of ideas, goods and objects, focusing on products of human creativity such as the literature and poetry, philosophy, architecture, art, craftsmanship, trade, law, administration and other achievements.

Since the archaeological evidence is fragmentary, we still cannot define the exact moment when the process of urbanisation started. Furthermore, there are different definitions of urban structures identified as cities. In the study of the ancient world, the city is generally defined as a large populated urban centre of commerce and administration with sanitation and sewerage system [3].

Bearing in mind the complexity of defining the term city, we can conclude that in this process the following factors should be considered: population (number and density), spatial structure and organisation, buildings (number, height, function and complexity), sewer and sanitation system and defence system (walls and/or fortifications).

Settlements preceded the development of cities and their establishment coincided with mankind's abandonment of nomadic living and beginning of organised dwelling in specific locations. Cities had most commonly developed at the intersection of ancient trade routes.

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The origin of urbanisation can be traced to Sumer and Mesopotamia. The first Sumerian city was Eridu (present day Abu Shahrein, Iraq), founded in 5400 BCE. Uruk was the earliest city in Mesopotamia region dated around 4500 BCE and then Ur around 3800 BCE. Both Uruk and Ur were situated in proximity to the banks of the Euphrates River. After Sumer and Mesopotamia, urbanisation spread to Egypt. Some cities in ancient Egypt grew out of the agricultural developments and other settlements as a result of the state's need to organise its unifying political centres. While two most powerful city-states in ancient Greece were Athens and Sparta, other influential city-states were Corinth, Thebes, Argos, Delphi and Rhodos. The largest cities during the Roman Empire were Rome, Alexandria, Antioch, Carthage, Ephesus, Constantinople, Smyrna, Pergamon, Jerusalem and Leptis Magna.

For several millennia, cities appeared in more and more regions across the world, but the size of the largest cities did not substantially exceed 10,000 inhabitants.

This changed only from 1500 BC onwards when Thebes in Egypt might have exceeded 100,000 inhabitants and Babylon reached 200,000 inhabitants in 600 BC [4].

During the eighth and ninth century AD many cities in Europe, Asia and Middle East, such as Bagdad, reached population of several hundred thousand inhabitants. Water supply, waste management and sanitation were most important limiting factors for further development. Furthermore, the urbanisation level, also, depended on the quantity of food production and resources coming from peripheral areas, as well as the possibility of delivery to the city region.

After the decline of the Roman Empire, cities spread further across the world, but no region reached comparable urbanisation levels until the eighteenth century [5].

The proximity of trade routes, food sources and other vital resources has significantly contributed to the speed of urbanisation and city development, but they pale in comparison to the effect of the Industrial Revolution beginning in the second half of the eighteenth century in Great Britain.

Great Britain was the global leader of urbanisation happening all over the world at that time.

Industrial revolution has led to increased labour demand at particular location, and that was the primary driver of the fast-paced urbanisation. As a larger population could be sustained from farming the same amount of land, the number of people that could live in cities increased strongly [6].

London population continued to grow, and at the beginning of the nineteenth century, it reached 3 million inhabitants. In 1863, the first underground railway line was opened. Initially, it was operated on steam and then electrified from 1890 onwards. The underground lines with the horse-drawn omnibus were the first comprehensive urban mass transport system in the world. This resulted in further growth of the city and the number of inhabitants, which increased to 6.5 million in 1900.

By the turn of the twentieth century, steel frame construction structures were one of the most important technological innovations that contributed significantly to the transformation of city and city views. At that time, and for most of the past millennium, churches were always

the peaks of city skylines. Their construction had a little weight and provided with none or small usable space. At the same time, the tallest office or residential buildings reached heights of only a few dozen metres. Steel-framed construction and reinforced concrete increased heights for residential and office buildings tenfold and exceeded 300 m. This building structure technological innovation contributed to increased population density.

In the first half of the twentieth century, labour-saving innovation slowed down the growth of employment in manufacturing. Jobs were created in the service sector and in knowledge-intensive professions. Although expected, the shift away from manufacturing did not entail de-urbanisation trends. The urbanisation continued and reasons for that can be found in the amenities that cities offer, such as various types of entertainment places (pub concert rooms, cinemas, theatres, restaurants and concert halls), better healthcare, education facilities and specialised shopping opportunities. Agglomeration effects ensured advantage for businesses located in cities.

New technological innovation played a crucial role in shaping post-industrial urbanisation: electric trolley line (1888, Richmond, Virginia), automobile (1890s European and North American cities) and construction of freeways or highways (1950s onward).

From the 1920s onwards, automobiles became more common due to lower prices made possible by Henry Ford's revolutionary assembly-line production techniques. The affordable automobile price, city trolley line network and high-quality sub-urban and inter-urban roads allowed the increase of distance between working and place of residence for the majority of the population.

It is important to emphasise that in 1800 only 3% of the world's population lived in cities. For example, the three largest cities in population size were Boston (18,230 citizens), Philadelphia (28,522 citizens) and New York (33,131 citizens) [7].

Since the 1800s, the process of urbanisation has moved rapidly in the entire world. In 1950, about two-third of the population worldwide lived in rural settlements and one-third in urban settlements [8].

Today, more than half of the world's population lives in urban areas, and the number of cities over 1 million stands at more than 400. By 2030, almost two-thirds of the world's population is projected to live in urban areas. The number of megacities (cities with populations over 10 million) rose from 3 in 1975 to 16 in 2000 and is expected to reach 27 by 2025 [9].

According to the Sustainable Urbanisation Policy Brief, urban centres currently occupy less than 5% of the world's landmass. Nevertheless, they account for around 70% of both global energy consumption and greenhouse gas emission [10].

2.2. Urban areas and environmental impact

According to Demographia World Urban Areas 13th Annual Edition 2017, a slight majority (51.4%) of the large urban area population lives in built-up urban areas between 4000 and 10,000 persons per square kilometre. Approximately one-quarter (0.9%: 40,000 and over; 4.8%: 20,000–40,000; 18.3%: 10,000–20,000) lives at higher densities and one-quarter (15.2%: 2000–4000; 9.4% under 2000) lives at lower urban area densities.

There are 37 megacities in the world (urban areas over 10 million population). A total of 84 urban areas are indicated with 5,000,000 or more population [11].

Urban population accounted for 34% in 1960 will continue to grow approximately 1.84% per year between 2015 and 2020, 1.63% per year between 2020 and 2025, and 1.44% per year between 2025 and 2030 [12].

The World Cities Report 2016, Urbanization and Development: Emerging Futures, projects that by 2030, the urban population of developing countries will double, while the area covered by cites could triple [13].

Such concentration of people and their activity creates increased demands on the environment. In order to reduce the effects of the urban areas to an ecologically acceptable level, planning and design processes should take into consideration the assessment of the ecological footprint and ecological deficit, urban heat islands, construction activities' impact, urban aerodynamic influence, the land use, traffic, **w**aste management, urban dust and air quality and clear water demand.

Ecological footprint is the sustainability indicator that measures the impact of the population on the planet. An urban "ecological footprint" is the total amount of the earth's surface needed to support a given city's level of resource consumption and absorption of its waste products [14].

The surface area that makes up a footprint is a sum of all land required to supply resources and absorb wastes, wherever that land may be on earth. Throughout history, areas with rich agricultural hinterlands have enabled the growth of cities. Nowadays, cities may draw on resources travelling great distances from where they are located. When urban areas use resources above their regeneration boundaries, an ecological deficit occurs. This situation can be improved with importing bio-capacity through trade or liquidating regional ecological assets.

Today, among first 20 built-up urban areas, with 500,000 and over population and with occupied land area from 11,875 to 3212 square kilometres, 11 cities are from the United States, 3 from Japan, 3 from China, 1 from Russia, 1 from Indonesia and 1 from Argentina. When we increase the number analysing the top 50 urban areas with occupied land from 11,875 to 1917 square miles, we have again United States on the 1st place with 22 cities, followed by China with 5 cities, Japan and Australia sharing the 3rd place with 3 cities and all other countries with 1 city. Those countries are Russia, Indonesia, Argentina, Brazil, Thailand, France, South Korea, Germany, South Africa, Mexico, Canada, US Puerto Rico, India, Malaysia, Nigeria and Egypt [15].

Above-mentioned data underline that the wealthier the cities are, the greater the ecological footprint they create.

Urban heat islands are built-up areas of higher temperature than those in the natural environment caused by increased sunlight absorption of materials with higher thermal capacity, such as asphalt and concrete, air pollution, air flow reduction, air humidity increase, etc. The density of population in cities is proportional to the intensity of the influence of thermal

islands. High temperatures in urban areas during the warmer months of the year increase the need for electricity needed for cooling and air conditioning, which results in increased carbon dioxide production and other pollutants. Urban heat island effect raises the temperature by 1–3°C [16].

Construction activities, in course of the development life cycle, create impact during initial on-site work, throughout the construction and operational period up to final demolition. Potential impacts of construction activities are noise and vibration generation; atmospheric emissions; impacts to cultural resources; transport issues; solid, industrial and hazardous waste generation; potential impacts to workers' and public health and safety like earthmoving, large equipment transportation, the danger of potential accidents and incidents, geological hazard activation (earthquakes and landslides) by excavation, altering natural drainage patterns, etc.; soil alternation and other land use impacts; impact to paleontological resources, such as complete destruction of the resources if present in areas undergoing surface or excavation; water consumption and quality; flow alternation of surface and groundwater systems; increased energy consumption and dust generation.

Additional impacts include short-term increased transportation density; road and bridge modification due to shipments of heavy, oversized and hazardous loads; new roads or expansion of existing roads and parking area development; limited access to the urban area of significant interest to residents and tourists and potential urban visual identity deterioration.

The complex **aerodynamic** interaction within the built environment will continue to influence sustainable urban development significantly, today and in the future.

In the cities, the wind speeds are generally lower compared to those in the natural environment because of the buildings obstructing the airflow. This urban aerodynamics influences the temperature and evaporation processes and is therefore an important factor at the microclimatic level. High-rise buildings can cause complex streams of airflow, which often result in wind turbulence in some areas or concentric pollution due to impending airflow in other areas. "With the change in urban topology, an individual building immersed in a complex surrounding can experience different flow mechanisms, such as wake effects and channelling. These flow mechanisms depend on the shape, height and location of the surrounding structures, which alter with the city development." [17].

The **land used** for built-up area construction is a scarce, limited resource that is often used improperly and harshly. Urban form, urban development density and characteristics of land use in general, all undoubtedly strongly influence the urban environment. Low-density cities use significantly more energy compared to high-density cities. Changes such as of city shape, layout, size, residential density and location of city attractiveness could yield energy savings up to 150% [18].

The urban land use is interrelated with transport, CO_2 emissions, etc. It could be said that the city is an organism in which population density, transport organisation, both public and individual, air pollution and the health and safety of citizens interact with one another. Therefore, the organisation of life in the city and the possible problem resolution should take this into account.

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Traffic congestion decreases the quality of life in cities, consumes energy and increases environmental degradation. Excessive amount of land used for traffic circulation, inadequately functioning public transportation and lack of walkways and cycle paths, in addition to other poorly functioning solutions, can create pollution, problems with drainage, limited absorption and flooding. Urban concepts and design largely determine traffic solutions.

Waste management of household, industrial or commercial waste produces valuable raw materials, but also a major source of environmental pollution. Waste, resulting from an urban lifestyle and all other activities taking place in the city, should be at the centre of attention of local authorities and urban residents. Waste reduction, separation, recycling and reuse are feasible, low-cost alternatives to open incineration of solid waste commonly used in developing cities. Sustainable urban waste management strategies can result in multiple improvements of both climate and health. Anaerobic bio-solid digestion systems can produce gas composed of up to 70% methane, a fuel for cooking, heating or other power needs, making an added value in the form of alternative energy source.

Human activity, especially in more developed economies, is increasingly leading to endangered **air quality**, ozone depletion, increase of greenhouse gas emissions and reduction of positive effects of sunlight, especially during the colder days, generally changing dynamic processes in the atmosphere. Furthermore, indoor air pollution is of particular concern in developing cities, possibly contributing to respiratory infections and other serious human health conditions.

In addition to all these, there is the so-called **urban dust** phenomenon. The airborne dust particles in the cities are by-products of construction works, exhaust gases from buildings, street traffic, production and other processes. The particles cling to porous surfaces such as stone, brick or concrete.

Air pollution in cities can be reduced and combined solutions should be applied simultaneously. To improve air quality, the city administrations should be working actively on reducing traffic by promoting walking and cycling, eliminating polluting vehicles with limited access zones, issuing permits exclusively to developers and contractors of building planed and design according to the sustainable architecture principles, decreasing unnecessary road building and freeing up city surface capacity, as well as improving air quality and reclaiming space for public parks, pedestrians and cyclists. Additionally, the city administration should introduce incentives to retrofit polluting vehicles and green the city by maintaining and increasing green urban areas that could enhance air quality.

Unsustainable city lifestyle and conventional urban water management create increasing barriers for efficient management, faced by the city's administration and residents, of scarcer and less reliable water resources. To minimise environmental degradation, the sustainable city development plans and design integrate the urban water cycle, including storm water, groundwater and wastewater management and water supply. For example, very often dust, dirt and other solid waste go into drains with rainwater or other unregulated watercourses. By increasing the area of hard, impermeable surfaces in cities, appropriate and more efficient collection and drainage of rainwater are possible.

Sustainable water management develops effective storm water management options, provides effective water supply services for all at minimum impact on water resources and the environment at large, develops effective sanitation and waste management options and integrates urban water systems into ecological and other productive functions of water at city level [19].

2.3. Urban tourism and sustainability

Urban tourism has been present since the beginnings of Mesopotamia and Sumer. Old Romans travelled to Greek cities, especially to Alexandria and Athens. Cities were then the centres of music, art, literature, architecture and places of encounter of different cultures. In the Middle Ages, long trips were recorded when young aristocrats visited several European cities [20].

The most significant tourist trips to cities date back to the end of the nineteenth century. At the end of the 1970s, tourism has become an increasingly important part of the economy of European cities. Trends, statistical indicators of the number of overnight stays, tourist consumption and total tourist traffic in the first decade of the twenty-first century show that the share of urban tourism in the overall European economy is becoming more and more significant [21].

Urban tourism and its definitions are based on the city as a complex social and economic system as well as the city as the destination with many tourist attractions and valuable resources. The national conference on urban tourism (Rennes, 1988) concluded that urban tourism is a set of tourist resources or activities located in towns and cities and offered to visitors from elsewhere [22].

Many researchers attempted to define the term urban tourism, as Ashwoth [23], Law [24], Howie [25].

Considering the definitions of the aforementioned authors, it is possible to state that urban tourism is a multi-layered complex of activities arising as a consequence of many resource attractions in a town or a city.

Urban tourism has been developed especially in cities with open urban spaces, landscaped parks, unique urban and architectural design solutions, attractive material and intangible cultural heritage, efficient traffic solution, well-known universities and scientific research centres, concentration of well-equipped shops and shopping centres, restaurants with quality gastronomic offer and dynamic street life. Furthermore, urban tourism is well developed in cities that are the base of tourists who have recognised the entire region as a worthwhile tour destination. Some authors point out the attraction of the city as a tourist destination [26] or specific elements of urban tourism products, i.e. city tourism resources that determine the city's attractiveness to its visitors [27].

The contents of the attractions are divided into three main groups: **I. ambience attractions** (climate, landscape, culture and hospitality); **II. material attractions** (cultural and historical heritage, architecture, city squares, streets, parks, fairs, exhibitions, business-congress centres,

sanctuaries and sacred objects, etc.); **III. happenings** (permanent attractions, business, sports, religious, political gatherings and events, local festivals; events of special local and regional significance, etc.).

2.3.1. Challenges of urban tourism development

Urban tourism integrates with urban development. Urban development and the city are in constant interaction. The city as a tourist destination is a complex social and economic system. On architectural-urban level, the city is a dynamic structure subject to constant change and development.

Cities, where national cultural institutions, university and science centres, religious architecture, museums, galleries and other valuable buildings are located, are subject to the influence of an increasing number of tourists. This pressure on historic cities results in ever greater challenges for the city, population and city administration.

The main challenges are certainly the preservation of cultural resources; the built environment and social interaction of the local population and visitors.

UN Expert Group meeting on Sustainable Tourism in 2013, New York, emphasised the following challenges for the sustainability of EU tourism: (1) reducing the seasonality of demand; (2) addressing the impact of tourism transport; (3) improving the quality of tourism jobs; (4) maintaining and enhancing the community prosperity and quality of life, in the face of change; (5) minimising resource use and production of waste; (6) conserving and giving value to natural/cultural heritage; (7) making holidays available to all; (8) tourism as a tool in global sustainable development [28].

Additionally, research of urban tourism and sustainability should certainly consider the following challenges: increased energy demand and CO_2 emissions; pollution of air, water and land; noise pollution; potential increase of blight and crime; land value overvaluation and speculations; decreasing or excluding less profitable but still significant business for the local economy; overcrowding the city with increased number of visitors causing the phenomenon of automobile congestion; facilities, services and infrastructure pressure: place saturation; and uncontrolled growth of the tourism industry.

Overall, tourism growth is often faster than adoption of environmental friendly solution.

The lifestyle incoherence of city residents on one side and tourists on the other, in an unquenchable number of cases and examples, ends with sacrificing the needs of city residents.

Furthermore, another significant challenge is globalisation. Although an important development factor that creates opportunities such as access to knowledge, expansion of partnership, cross-fertilisation of cultures etc., globalisation also affects the intangible and tangible cultural heritage eminently.

And the last challenge, but not the least, would be the issue of tourism and urban tourism in many developing countries with no alternative. It might be said that their government and

other shareholders are encouraging uncontrolled and rapid tourism growth as completely legitimate and appropriate way of creating jobs and foreign currency earnings for the rapidly growing unemployed working-age population.

2.3.2. Indicators and principles of sustainable urban tourism

At the beginning of the 1990s, more efforts were made to develop the sustainability indicators of economic and tourist development. Indicative systems for assessing and monitoring sustainability of tourism were created by international organisations, academic institutions and government agencies such as United Nations World Tourism Organisation (UNWTO), European Environment Agency (EEA), Eurostat and Tourism SustainabilityGroup (TSG).

The UNWTO methodology consists of 12 key steps grouped into three levels (initial level, benchmark development and implementation level) with the aim to develop a system of tourism sustainability indicators for a particular destination, which may be applied to a particular tourist location, but also the region or country as a whole.

Special attention was paid to indicators relating to the following issues: tourism volume and value, including seasonality; employment in tourism; the development impact on the environment and communities; the conservation and valorisation of cultural heritage; solid waste management; visitor and resident satisfaction; other indicators (energy use, water use and pollution of air and water) [29].

Eurostat and the European Tourism Sustainability Group (TSG) have published their lists of tourism sustainability indicators in the mid-2000s. To a large extent, both lists rely on the European Environmental Agency's methodology (Drivers-Pressures-State-Impact-Responses).

In the conference on 'Responsible Tourism in Destination' held in 2002, Cape Town, a consensus was reached among most of the 208 representatives of all tourism sectors, coming from 20 countries resulting with a declaration. The main purpose of the declaration was to call upon country representatives, multilateral agencies, destination representatives and enterprises to develop similar practical guidelines and to encourage planning authorities, tourism businesses, tourists and local communities—to take responsibility for achieving sustainable tourism and to create better places for people to live in and for people to visit.

According to the conference participants, responsible tourism has the following characteristics: it minimises negative economic, environmental and social impacts; generates greater economic benefits for local people and enhances the well-being of host communities, improves working conditions and access to the industry; involves local people in decisions that affect their lives and life chances; makes positive contributions to the conservation of natural and cultural heritage and to the maintenance of the world's diversity; provides more enjoyable experiences for tourists through more meaningful connections with local people and a greater understanding of local cultural, social and environmental issues; provides access for physically challenged people; and is culturally sensitive, engenders respect between tourists and hosts, and builds local pride and confidence.

The declaration guiding principles are as decided in three fundamental groups: guiding principles for economic responsibility; guiding principles for social responsibility and guiding principles for environmental responsibility. For detailed description, see [30].

In 2004, UNWTO defined the following baseline sustainable tourism indicators: local satisfaction with tourism; effects of tourism on communities; sustaining tourist satisfaction; tourism seasonality; economic benefits of tourism; energy management; water availability and conservation; drinking water quality; sewage treatment; solid waste management; development control and controlling use intensity [31].

In 2005, UNWTO and UNEP, in the publication 'Making Tourism More Sustainable: A Guide for Policy Makers' [32], presented the study results addressed to the development and the implementation of sustainable tourism policies, strategies and tools. The guide sets 12 aims for sustainable tourism: economic viability; local prosperity; employment quality; social equity; visitor fulfilment; local control; community well-being; cultural richness; physical integrity; biological diversity; resource efficiency and environmental purity.

EU's policies and measures in support of a quality urban environment are continuously evolving; therefore, additional policies and programmes are being developed. In 2010, the publication 'Making Our Cities Attractive and Sustainable' [33] defines the basic principles of sustainable city development as foundation for sustainable urban tourism development.

The above-mentioned principles, their basic groups and subgroups, are as follows: clean and healthy: safe water to drink, clean air to breathe, collection and disposal of solid waste, toxic free; green and pleasant: green urban areas, biodiversity-friendly, quiet places, respect for urban heritage, sustainable land use; efficient and sustainable: resource efficiency, energy efficiency, green mobility, local actions on climate change, technological innovations and green jobs; well-managed and democratic: integrated environmental management systems, green public procurement, participatory urban planning, assessing environmental impacts and tracking progress.

Urban development and urban tourism are in constant interaction. Sustainable development of cities simultaneously provides numerous solutions, but it also presents challenges for all stakeholders in the process, from government representatives to local people. Cities that are attractive tourist destinations unfortunately often get the negative consequences of irresponsible and unsustainable urban tourism. Urban tourism, on the one hand, offers the possibility of economic growth, while on the other hand, it shows the vulnerability of the destination, which is the result of over-excitation and excessive and unplanned growth.

Sustainable cities are those that have transport systems that enable rapid and efficient movement, provide a supply of clean and accessible water, provide quality health care and employment and provide friendly economic environments. In sustainable cities, waste management is solved in a way that protects the environment from pollution. Governing structures of the city and city institutions work predictably in predetermined terms. Sustainable cities have pre-established security measures and protection plans in case of natural disasters and major accidents.

Sustainable urban tourism is responsible tourism. Following the above-mentioned principles and indicators of sustainable urban tourism, it is possible to conclude that sustainable tourism and sustainable city can and should support each other's development.

3. Energy-efficient architecture in sustainable urban tourism

Architecture and spatial planning are important elements of urban tourism. Recognition of the existing architectural heritage and responsible planning and design of architecture and urban space according to the sustainable development principles contribute significantly to the development of sustainable urban tourism, as well as tourism in general.

Tourism is the fastest growing economic sector in the world [34], with urban tourism among the fastest growing segments [35].

Tourists are drawn to the cities attracted by the diversity on offer in cities worldwide. It is unquestionable that their arrivals contribute to the local economy making a strong socio-economic impact. All participants involved in tourism planning and development today should clearly be aware of the necessity to reduce the environmental impact.

This certainly applies to the architecture in tourism, since hospitality industry is among the largest polluters and resource consumers.

Sustainable urban planning and sustainable architecture are prerequisite to sustainable urban tourism development. All relevant stakeholders should consider the environmental, social and economic impacts, highlighting the conscientious use of resources especially the non-renewable energy and water, waste minimisation and application of energy-efficient systems and optimisation of technology solution.

Hotels, directly and indirectly, affect the environment. Energy, water and raw materials are consumed during construction, building use, maintenance, renewal and destruction. In addition, waste is generated and harmful substances are released into the atmosphere during those processes. These facts prompted the creation of standards and certification systems aimed to mitigate environmental impact in accordance to the principles of sustainable development.

In the 1990s, the first so-called green building was certified in the United States by the Building Research Establishment Environmental Assessment Method (BREEAM). In 2000, the US Green Building Council (USGBC) defined the certification criteria to improve energy efficiency and environmental protection and set up a Leadership in Energy and Environmental Design (LEED). Under the influence of BREEAM and LEED systems, other systems have been developed, tailored to national priorities and needs and some of them coming out as the usual framework of building practice and existing legislation, applying the principles of sustainable development and concepts such as building of nearly-zero energy use or passive-solar buildings.

Hotel certification systems were initiated with the aim to manage the hotel's environmental impacts, both globally and locally. Those systems were focused on: reduction of water and

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non-renewable energy consumption; environmentally sound waste management; protection and preservation of natural habitats; sustainable building and operational practices; responsible resource response with zero-waste strategies; effective damage and accident control at the construction site; self-sustainability with the utmost utilisation of renewable energy sources and passive solar systems; sustainability of all phases of the construction process; the use of environment-friendly materials; indoor air quality; promoting the concepts of sustainability among hotel guests, employees, suppliers and business partners with implementation of positive operational procedures; responsible attitude towards cultural heritage and biodiversity; partnerships with non-governmental organisations and the local community; socially responsible behaviour with the inclusion of community members.

Furthermore, the necessity for the high-quality hotel certification systems is the 'Greenwash' prevention. The most widespread and most common form of 'greenwash' is a hidden trade, lack of evidence, inaccuracy, irrelevance, inaccurate data on origin and content of recycled materials, possession of internationally recognised certificates, false labels on materials (such as, 'ecologically' on products containing pesticides and other toxins) and the alike.

In addition to the above-mentioned BREEAM and LEED systems, the following systems should be highlighted: Certified Passive House Building (by International Passive House Association [iPHA]), Deutsche Gesellschaft für Nachhaltiges Bauen (DGNB), Excellence in Design for Greater Efficiencies (EDGE), Energy Star, Green Building Evaluation Label (NR China) and nearly Zero Energy Hotel (neZEH, UK).

In 2016, the web site greenhotelworld.com announced the results of 'Certified Global Green-Hotel Density' research. The research was based on just over 130,000 hotels worldwide certified by a total of 50 hotel certification systems, in accordance with the standards set by the Global Sustainable Travel Council (GSTC). The established standards wanted to objectify green-hotel certification systems globally, as a support and incentive for sustainable tourism development. According to the research results, global density is 6.2%, while densities per continents are North America, 10.1%; South America, 2.7%; Europe, 6.1%; Oceania, 4.8%; Africa, 3.7% and Asia, 0.9%. Data show insufficient density of green hotels, both globally and regionally [36].

3.1. Energy-efficient concepts, elements and systems

In the past, climate adaptability was of fundamental importance to the planning and construction of traditional settlements. The vernacular and urban architecture often contain and still embody the extraordinary knowledge of local climatic and geographic potential for sustainable development. Much before Vitruvius wrote his work 'Ten Books of Architecture', builders were forced to optimise their life environment, organise the land and surroundings and design the interior space and external parts of the building. During the industrial revolution, in the mid-nineteenth century, architecture was less dependent on local energy sources, relying more and more on abundant—as it seemed—fossil fuels. Trends in architecture and urbanism too often continue to ignore environment-friendly and sustainable design principles.

Application of sustainable development strategies and sustainable design principles should enable the fulfilment of maximum human requirements with minimum environmental loads.

Hospitality industry facility architects' and urban planners' continuous task in designing processes is to incorporate the globally important fact that energy and raw material resource are limited, as well as the capacity of the ecosystem to absorb waste.

This important task is best achieved by pollution suppression and by implementation of energy-efficient concepts, elements and systems, and they are as follows:

3.1.1. Sustainable urban design

A sustainable urban design, spatial planning for sustainable tourism development, should promote the diversity of architectural solutions complementary to the activities of potential users, the diversity of green areas and the diversity of renewable energy sources, thus reducing dependence on one non-renewable resource.

Furthermore, building construction should consist of integrated systems, self-sufficient energy production and water supply, sustainable waste management and reduced raw-material use. Planning and design should contribute to the mitigation of climatic extremes and be harmonised with the bio-climatic and ecological principles or the principles of sustainable development.

3.1.2. Evaluation and site selection

Analysis of carrying capacity is crucial for assessing the location, site and land use of energy-efficient architecture and sustainable tourism development. The renovation and reconstruction of existing building will encourage the greatest savings of energy, materials, land and technical and social infrastructure.

3.1.3. Land-use planning

The land-use planning will ensure that users meet their vital needs in a sustainable way by reducing energy consumption and CO_2 emissions, reducing the use of environmentally unacceptable construction materials and more heavily relying on local resources. Pre-planning scheduled development process prevents irreparable damages.

3.1.4. Sustainable architectural design

The best project solution will come as a result of a well-organised design process, a carefully selected design team, a precisely defined end goal, a study of applicable principles and model testing.

3.1.5. Application of the principles of passive solar architecture

Appropriate location, selection of a site with good solar access, proper orientation with building's position towards solar gain during winter and limited western exposure in the summer, compact spatial concept, natural lighting, shading (natural and architectural), thermal mass, preheating, double envelope, well-dimensioned thermal insulation made of environment-friendly

materials, air permeability, natural ventilation, solar chimneys and solar walls and system optimisation are the basic principles of passive solar architecture.

3.1.6. Application of other energy-efficient concepts, elements and systems

This primarily refers to wind generators, biomass plants, photovoltaic solar systems, solar heating and hot water systems, split solar systems, heat pumps, active facades, energy-efficient building elements (structures, materials, building openings, thermal insulation and minimising thermal bridges) and energy-efficient Heating Ventilation and Air Conditioning (HVAC) system.

3.1.7. Sustainable waste management

Waste analysis is the foundation of any zero waste and nearly-zero waste programme. Sustainable design will respect the waste management hierarchy before the final disposal of potential residual waste.

3.1.8. Involvement of residents, guests and users

Responsible occupants' behaviour has a significant impact on the thermal balance and energy-efficiency, water consumption, as well as on waste management of the facility. These facts raise importance of informing and educating the hospitality industry participants, guests, visitors and employees on how technology and occupant behaviour can be integrated into realising the sustainable lifestyle.

The hospitality industry sector is energy intensively demanding. The use of renewable energy sources reduces operational costs, increases competitiveness and strengthens the green-building identity. In addition to reducing energy consumption from non-renewable sources, the application of the principles of energy-efficient architecture in tourism, such as energy-efficient concepts, elements and systems, brings many significant benefits such as reducing CO_2 emissions, improving guest comfort and reducing the possibility of the 'sick building syndrome'.

4. Conclusion

Tourism is the fastest growing economic sector in the world, with urban tourism among its fastest growing segments. It is crucial to understand the specificity of the city in relation to other tourist destinations. Urban tourism, undoubtedly, needs to preserve the resource that allows its existence according to the three pillars of sustainable development. Urban tourism can and should support sustainable urban development.

Urban tourism, on the one hand, offers the possibility of economic growth, while on the other hand, it exposes the vulnerability of the destination, which is the result of over-excitation and excessive and unplanned growth.

Sustainable urban planning and sustainable architecture are prerequisite to the sustainable urban tourism development.

Sustainable urban tourism and energy-efficient architecture are interdependent. All relevant stakeholders should take into account the environmental, social and economic impacts by highlighting the conscientious use of resources especially the non-renewable energy and water, waste minimisation and application of energy-efficient systems and optimisation of technology solution.

Green building certification programs (e.g. USGBC, LEED, BREEAM, etc.) promote costefficient and resource-saving framework as well as integration of sustainable development strategies during construction, use, maintenance, renewal and destruction of architecture in tourism. In addition, waste is generated and harmful substances are released into the atmosphere during those processes. These facts prompted the creation of standards and certification systems aimed to mitigate environmental impact in accordance to the principles of sustainable development.

The hospitality industry sector is energy intensively demanding. The use of renewable energy sources reduces operational costs, increases competitiveness and strengthens the green-building identity. In addition to reducing energy consumption from non-renewable sources, the application of the principles of energy-efficient architecture in tourism brings many significant benefits such as reduction of energy consumption, CO_2 emissions, improvement of guest comfort and reduction of the possibility for the occurrence of the 'sick building syndrome'.

Unfortunately, most hotels all around the world are energy in-efficient and have negative impact on the environment [37].

However, hotel companies' owners are reacting to positive ecological trends. Investing in sustainable architecture in tourism is often perceived as an obstacle to ambiguity about the ultimate goal. As Rincones notes [38], despite the usual assumption that initial investment is considerably higher for a sustainable, energy-efficient hotel, practice shows that if the holistic approach to a project that has integrated all the necessary strategies and principle into the planning stage, the total investment will be slightly increased, or in some examples (for the time being rare), zero-rise and even the reduction of the initial investment has been achieved.

Architecture in urban tourism, with its design and spatial solutions, is playing an important role for the identity and tourism development of a city. Although initially potentially higher, but certainly varying low-risk investments subjected to numerous external and internal factors will, in a relatively short period of time, result in faster revenue returns, lower costs, financial growth and positive cash flow.

Finally, and most importantly, consistent application of energy-efficient principles contributes significantly to the sustainability of urban tourism.

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