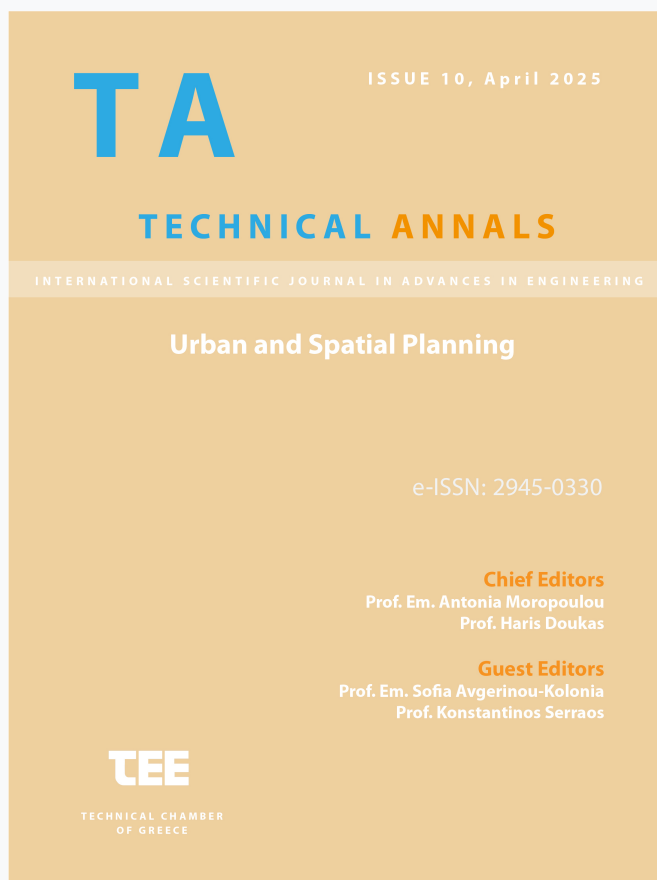


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# Evaluation of healthy historic centers: The case of Chania

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**Abstract.** This paper explores the concept of healthy cities, emphasizing the need for urban environments that promote health, well-being, and sustainability. It highlights the challenges posed by rapid urbanization, environmental degradation, and social inequalities. The World Health Organization's definition of a healthy city is outlined, emphasizing the integration of physical and social environments to enhance quality of life. The paper reviews existing evaluation frameworks and certifications and proposes a toolkit for assessing the health of historic urban centers, incorporating factors like cultural heritage preservation, tourism, and social equity. The historic center of Chania which is used for the application of the proposed evaluation framework is characterized by moderate preservation, with signs of deterioration in some buildings and limited adaptive reuse. Environmental quality is relatively good, but noise pollution and low green space coverage are concerns. Accessibility for people with disabilities and public transportation services are inadequate, while cycling infrastructure is poorly developed. Climate resilience is weak, and sustainable tourism efforts are insufficient, leading to overcrowding and strain on infrastructure. Proposals for improvement include enhancing heritage preservation, expanding sustainable transport, increasing green spaces, and strengthening climate resilience. These measures aim to improve accessibility, livability, and sustainability for both residents and visitors.

**Keywords:** Healthy cities, evaluation frameworks, historic center, Chania

## 1 Introduction: The concept of healthy cities

Urbanization has accelerated rapidly over the last few decades, fundamentally transforming lifestyles and living environments in cities. Particularly in megacities, rapid population growth has intensified a host of urban challenges including deteriorating air and water quality, overcrowded housing, rising social inequalities, insufficient public spaces, the proliferation of informal settlements, traffic congestion, and inadequate waste management systems. These challenges were further magnified during the COVID-19 pandemic, which exposed the fragility of urban systems and redefined the essential requirements for urban development by emphasizing the need for equitable access to health, safety, and basic services. In response to these challenges, the concept of “Healthy Cities” has gained renewed relevance. The World Health Organization (WHO), in collaboration with Health Canada, formally introduced the Healthy Cities initiative in 1986 through the Ottawa Charter for Health Promotion, which stated:

“Health is created and lived by people within the settings of their everyday life; where they learn, work, play, and love” [1].

This was further refined in WHO Europe’s definition: “A Healthy City is one that is continually creating and improving those physical and social environments and expanding those community resources which enable people to mutually support each other in performing all the functions of life and in developing to their maximum potential” [2]. Over time, this concept has evolved. For instance, Barton et al. (2015) emphasized the integration of planning and health in achieving sustainable urban development [3], while Amri (2022) argued for the alignment of Healthy Cities with broader governance frameworks such as Health in All Policies [4]. These developments show a shift from a purely public health perspective to a multidisciplinary and policy-oriented approach involving urban planning, equity, and sustainability.

Table 1 presents a comparative overview of key definitions of Healthy Cities, highlighting similarities, differences, and their evolution over time.

**Table 1.** Comparative Overview of Key Definitions of Healthy Cities

Source	Core Focus	Key Concepts	Evolutionary Features	Multidisciplinarity
WHO & Health Canada (1986)	Health in everyday settings	Health is created in daily life settings: where people live, learn, work, play, and love	Initial framing of health beyond healthcare; foundation of Healthy Cities idea	Primarily public health focus
WHO Europe (1990s–2000s)	Physical, social, and community environments	Continual improvement of environments and community resources to support full human potential	Broadens focus to urban environments and mutual community support	Health + urban social environment
Barton et al. (2015)	Urban planning and sustainable development	Integration of health with urban planning for long-term sustainable outcomes	Marks the shift toward urban sustainability and planning integration	Strong urban planning dimension
Amri (2022)	Governance and policy coherence	Alignment with Health in All Policies; intersectoral and governance-driven approaches	Emphasizes policy frameworks and institutional integration	Cross-sectoral governance, equity, sustainability

Developing healthy cities requires strong urban functions and infrastructure to ensure good living conditions. This aligns with 12 sustainable development goals, including: (i) promoting healthy lifestyles, (ii) fostering social cohesion, (iii) ensuring quality housing, (iv) expanding employment access, (v) improving facility accessibility, (vi) supporting local and healthy food, (vii) enhancing safety, (viii) advancing equity, (ix) creating a clean and pleasant environment, [x] ensuring water quality and sanitation,

(xi) conserving land and resources, and (xii) reducing climate-threatening emissions [5].

Today, the World Health Organization's Healthy Cities strategy places health at the center of the social and political agenda of cities and strives to build a strong movement for public health at the local level [6]. Healthy Cities is a dynamic concept that evolves with time and the accumulation of new evidence and experience, as well as the emergence of new priorities and political developments.

In recent decades, the growing recognition of urban environments' influence on public health and well-being has led to the development of numerous evaluation frameworks and certification systems aimed at evaluating and promoting healthier cities. These frameworks—such as BREEAM, LEED, the Active Design Guidelines, and the WHO Healthy Cities Toolkit—focus on diverse elements ranging from environmental sustainability and infrastructure to social equity and urban mobility. However, while these tools provide valuable insights into how cities can support healthier living, they often reflect divergent priorities and definitions of what constitutes a "healthy" urban environment. Most notably, they are rarely tailored to the unique spatial, cultural, and environmental characteristics of historic urban areas. Historic city centers, which embody cultural heritage and traditional urban forms, face distinct challenges such as tourism pressure, limited green space, aging infrastructure, and social inequalities. Assessing these areas requires a more nuanced, multidimensional approach that integrates heritage preservation with public health, environmental quality, social inclusion, and economic vitality. This paper builds upon an extensive review of existing urban health evaluation frameworks to propose a comprehensive framework specifically designed for historic city centers. Using Chania's historic center in Crete as a case study, the research highlights the need for context-sensitive tools that bridge the gap between sustainability goals and cultural heritage conservation.

## **2 The existing evaluation frameworks systems and certifications for healthy cities**

Since the 1990s, numerous evaluation frameworks, systems, and certification frameworks have emerged to support sustainable development in the built environment. Initially focused on individual buildings, these systems progressively evolved to encompass entire communities and cities [7]. Among the earliest holistic approaches was the Blue Zones initiative (2008–2021), developed by Blue Zones, LLC. This initiative emphasized long-term policy and environmental change, particularly in promoting healthier lifestyles through improvements in public spaces, enhancing walkability, and encouraging social connections. Central to this framework was the concept of the "Life Radius," which targeted the improvement of daily living conditions within a five-mile radius of residents' homes. This involved municipal policies aimed at improving road safety, green infrastructure, and restricting the promotion of unhealthy behaviors, such as junk food marketing and smoking [8].

The BREEAM Communities International Technical Standard represented another key certification system for large-scale urban development. It assessed urban

performance across several categories, namely governance, social and economic well-being, resource and energy efficiency, land use and ecology, and transport and movement. Its holistic approach aims to ensure both environmental sustainability and social inclusiveness in new developments [9]. The LEED v4.1 Cities and Communities certification expanded upon prior versions by providing a comprehensive framework for evaluating sustainability and quality of life in urban areas [10]. This program evaluated performance using nine thematic categories: integrative process, natural systems and ecology, transportation and land use, water efficiency, energy and greenhouse gas emissions, materials and resources, quality of life, innovation, and regional priority. Its strength lies in its broad applicability and standardized metrics for tracking improvements over time. The Active Design Guidelines, introduced in 2010 by the New York Department of Design and Construction, emphasized urban design strategies that promote physical activity and healthy living. The guidelines identified five foundational dimensions—density, diversity, design, destination accessibility, and distance to transit—while recommending design interventions such as land-use mix, improved street connectivity, recreational spaces, and bicycle infrastructure [11].

In 2015, the Urban Land Institute introduced the “Building Healthy Places Toolkit,” which identified ten principles for creating health-promoting urban environments. These included prioritizing people in planning, enhancing access to green and recreational spaces, encouraging mixed land uses, improving air quality, and supporting infrastructure for walking and cycling [12]. Simultaneously, the World Health Organization (WHO) Western Pacific Region published the “Healthy Cities Toolkit,” which offered a series of actionable strategies for local governments to develop health-enabling environments. These included enhancing street-level amenities such as benches, bicycle lanes, public transport networks, smoke-free spaces, and access to healthy foods and community healthcare services [13].

Another influential contribution came from the Gehl Institute’s “Inclusive Healthy Places” framework in 2018, which proposed a participatory and context-sensitive methodology for the design and evaluation of inclusive, health-promoting public spaces. The framework outlined four dimensions: context, process, design and program, and sustainability, with an emphasis on civic participation, inclusivity, and long-term resilience [14]. Similarly, ISGlobal’s “5 Keys to Healthier Cities” report highlighted strategies to improve air quality, reduce noise, enhance access to nature, promote physical activity, and control urban temperatures [15].

In 2020, the Healthy Cities Generator tool provided an integrative framework that emphasized equity, sustainability, active living, social connectivity, safety, access to nutritious food, and environmental health. It supported health integration into urban planning and emphasized community empowerment and policy coordination [16]. The same year, the DGNB System for Districts was developed, offering a detailed certification system organized into five assessment areas: environmental quality, sociocultural and functional quality, technical quality, process quality, and economic quality. Its metrics included pollutant management, infrastructure functionality, governance mechanisms, and participation [17]. Finally, the UN-Habitat and WHO Sourcebook on “Integrating Health in Urban and Territorial Planning” (2020) offered an evidence-based and equity-driven approach aligned with the New Urban Agenda. This

framework focused on four overarching health-oriented planning objectives: avoiding health risks, reducing unhealthy environments, promoting healthier lifestyles, and capturing long-term health benefits through inclusive planning in areas such as housing, transportation, and energy [18].

A comparative review of these tools reveals that although each framework addresses the interface between urban form and public health, they vary significantly in scope and emphasis. While some systems, such as LEED and BREEAM, offer detailed metrics for environmental and energy performance, others, like the Gehl Institute or the WHO toolkits, emphasize participatory planning and social inclusion. Most frameworks incorporate elements of active mobility, access to green spaces, and the integration of health-promoting infrastructure. However, their differing interpretations of core concepts such as “health” and “sustainability” can lead to inconsistencies in assessment outcomes. For instance, some systems privilege environmental criteria—focusing on carbon emissions or energy use—while others stress social determinants like access to healthcare, inclusivity, or food security. This divergence underscores the need for a clear conceptual foundation when developing and applying certification systems. The WHO's definition of a healthy city is instructive in this context. It conceptualizes a healthy city as one that not only mitigates environmental and health risks but also actively fosters well-being through physical and social environments that promote health-oriented behavior. It distinguishes between health protection—minimizing exposure to pollutants, unsafe infrastructure, and disease vectors—and health promotion, which involves creating conditions that enable and encourage healthy choices and lifestyles. Importantly, many certification systems tend to emphasize one of these aspects, either protection or promotion, while failing to integrate both. This gap suggests that for urban development certification systems to fully support the creation of healthy cities, they must align more closely with WHO's holistic perspective. Only then can they contribute meaningfully to urban environments that enhance quality of life, equity, and resilience for all residents.

The data analyzed from the above frameworks indicate that most evaluation frameworks link healthy urban environments primarily with mobility, active design, and transport infrastructures, often guided by different understandings of public health (Table 2). Future efforts should aim to systematize these frameworks under unified evaluation criteria. Such criteria, drawn from conceptual analysis and validated by comparative methods, should address environmental quality, social inclusivity, health infrastructure, mobility, public participation, and governance, ensuring consistency and relevance across diverse urban contexts.

**Table 2.** Comparison of Healthy City Assessment Frameworks

Framework / Tool	Health Focus	Participation	Environmental Quality	Equity & Inclusion	Mobility & Activity	Public Space	Governance
Active Design Guidelines (NYC)	✓	–	✓	–	✓	✓	–
Gehl Inclusive Healthy Places	✓	✓	–	✓	✓	✓	✓
WHO Western Pacific Toolkit	✓	–	✓	✓	✓	✓	✓
ISGlobal 5 Keys	✓	–	✓	–	✓	–	–
Healthy Cities Generator	✓	✓	✓	✓	✓	✓	✓
UN-Habitat & WHO Sourcebook	✓	✓	✓	✓	✓	✓	✓
LEED v4.1 Cities and Communities	Partial	✓	✓	Partial	✓	✓	✓
BREEAM Communities	Partial	✓	✓	Partial	✓	✓	✓
DGNB Districts Criteria Set	Partial	✓	✓	✓	✓	✓	✓

### 3 Methodology: Defining a tool for the evaluation framework for healthy historic centers

As historic urban areas are defined the groups of buildings, structures and open spaces including archaeological and paleontological sites, constituting human settlements in an urban or rural environment, the cohesion and value of which, from the archaeological, architectural, prehistoric, historic, aesthetic, or sociocultural point of view are recognized. Historic urban areas, large and small, include cities, towns and historic centers or quarters, together with their natural and man-made environments. Beyond their role as historical documents, these areas embody the values of traditional urban cultures.

The Historic Urban Landscape (HUL) is defined by UNESCO (2011) as:

*“The urban area understood as the result of a historic layering of cultural and natural values and attributes, extending beyond the notion of ‘historic centre’ or ‘ensemble’ to include the broader urban context and its geographical setting” [19].*

This approach goes beyond preserving individual monuments or buildings and emphasizes the integration of cultural heritage conservation with the goals of sustainable urban development. HUL includes a combination of elements such as the physical form and design of the urban environment (buildings, open spaces, infrastructure), social and cultural practices and values, the economic processes and spatial organization of the

city, and the natural environment (topography, hydrology, vegetation). The HUL approach advocates for a dynamic and integrated approach to managing change in historic cities, ensuring that urban development respects and sustains their historical significance, identity, and community values while addressing contemporary needs such as housing, mobility, and climate resilience. [19].

Evaluating the health of historic urban areas requires a comprehensive framework that balances cultural heritage preservation with public health promotion. To develop a robust evaluation framework, this research analyzed existing frameworks—such as the WHO’s Urban Health Index, UNESCO’s Historic Urban Landscape (HUL) approach, and sustainable development metrics—and identified key criteria pertinent to historic centers. The following selected groups of criteria are based on their relevance to urban health, environmental sustainability, and socio-spatial equity in historic areas.

1. **Cultural Heritage Preservation:** Cultural heritage forms the backbone of historic urban identities and supports social cohesion, economic development, and place-making [20]. Assessing the conservation status of historic buildings and the extent of adaptive reuse ensures the integration of heritage into modern urban life while preventing decay or inappropriate development [20]. Adaptive reuse contributes to sustainability by extending building life cycles and reducing resource consumption [21].
2. **Environmental Quality:** Assesses factors such as air quality, noise pollution, and green space coverage which are determinant of physical and mental health, especially in dense historic environments [22]. These areas often face increased exposure due to traffic congestion and tourism intensity [23]. Green infrastructure, even in limited forms such as pocket parks, contributes to climate regulation and psychological well-being [24].
3. **Public Health and Well-being:** Access to healthcare services and community spaces is essential for promoting health equity in urban areas. In historic centers, infrastructure constraints may limit access to primary care or inclusive public spaces, affecting vulnerable groups such as older adults or lower-income residents [25]. Community spaces also play a critical role in reducing loneliness and fostering social inclusion [26].
4. **Mobility and Accessibility:** Mobility within historic urban centers affects access to services, social participation, and economic opportunities. Evaluating walkability, bike infrastructure, and inclusive design is crucial to ensure accessibility for all users, particularly people with disabilities and the elderly [27]. Public transport accessibility also reduces reliance on cars, contributing to environmental and health benefits [28].
5. **Climate Resilience and Sustainability:** Historic urban areas are increasingly vulnerable to climate-related hazards, including heatwaves, floods, and sea-level rise. Integrating criteria such as energy efficiency, disaster preparedness, and renewable energy helps evaluate resilience while respecting heritage constraints [29]. Retrofitting historic buildings for energy efficiency is particularly critical in reducing emissions and improving thermal comfort [30].
6. **Economic and Social Vitality:** Historic centers thrive when they support both residents and visitors in a balanced, sustainable manner. Monitoring the ratio of



residents to tourists, particularly in peak seasons, helps identify overtourism risks and community displacement [31]. The health of local businesses is also vital for socio-economic resilience and cultural continuity [32].

7. **Governance:** Effective and participatory governance is a cornerstone of equitable urban development. Assessing the inclusiveness of decision-making processes and the availability of reliable data ensures accountability and fosters trust between authorities and citizens [33]. In the context of heritage management, participatory governance supports long-term stewardship and adaptive strategies [34].

These criteria collectively reflect the complex and interrelated challenges that historic urban centers face today. Their integration into a health-oriented evaluation framework allows for a nuanced, place-sensitive approach that safeguards heritage while promoting urban resilience, inclusivity, and sustainability.

Each indicator is supported by quantitative and qualitative data sources, including air pollution levels, noise readings, public transportation availability, and resident surveys. A five-level scale (Very Poor-Low, Poor-Low, Moderate, High, Very High) is employed to assess the attainment of each indicator, providing a nuanced understanding of urban health conditions. This type of ordinal scaling allows for a more refined classification of performance, enabling decision-makers to identify priority areas and tailor interventions accordingly. Multi-level evaluation frameworks are widely used in urban health and sustainability evaluations, as they facilitate the translation of complex, multidimensional data into actionable insights [35]. Moreover, graded scales help capture gradations in health-related determinants, supporting comparative analyses across spatial and temporal contexts [36].

The criteria and the indicators used for the current research are shown in Table 3.

**Table 3.** The proposed evaluation framework for historic centers as healthy areas

<b>1. Cultural Heritage Preservation</b>		
<b>Conservation Status of well-preserved historic buildings and sites [37]</b>	<b>Very Poor</b>	Buildings or sites are at risk of collapse or have collapsed. Historical value is significantly diminished due to neglect or inappropriate interventions. No evident efforts to preserve or maintain the site
	<b>Poor</b>	Major changes compromise the historical authenticity. Original materials are largely lost or severely damaged. Neglect leads to accelerated deterioration
	<b>Moderate</b>	Alterations are evident and may affect the historical character. Significant portions of materials have been replaced or are deteriorated. Occasional Maintenance occurs but may not be comprehensive
	<b>Good</b>	Some modifications exist but do not detract from the historical value. Most original materials are preserved, with minor replacements. Consistent upkeep addresses minor issues promptly
	<b>Very good</b>	Buildings and sites maintain their original structural components without significant alterations. Original materials are intact and have been meticulously conserved. Regular and proactive maintenance ensures the longevity of the structure

<b>Adaptive Reuse</b> [38]	<b>Very Low Adaptive Reuse</b>	Minimal Repurposing of Historic Buildings. Few historic buildings have been adapted for contemporary use. Many structures remain unused or continue their original functions without modernization
	<b>Low Adaptive Reuse:</b>	Some historic buildings have been converted for modern purposes, but such cases are infrequent. A considerable portion of historic structures are either vacant or underutilized
	<b>Moderate Adaptive Reuse</b>	A mix of well-preserved historic buildings and those adapted for modern use exist. Adaptive reuse projects are undertaken based on specific criteria, such as location or architectural significance
	<b>High Adaptive Reuse:</b>	Many historic buildings have been thoughtfully adapted for contemporary functions. Adaptive reuse is a key component of urban development strategies, balancing preservation with modernization
	<b>Very High Adaptive Reuse</b>	Adaptive reuse is the norm, with most historic buildings serving modern purposes. Historic structures are seamlessly incorporated into the modern urban fabric, reflecting a strong commitment to sustainability and cultural preservation
<b>2. Environmental Quality</b>		
<b>Air Quality index</b> [39]	<b>Very poor</b>	>150 AQI
	<b>Poor</b>	101–150 AQI
	<b>Moderate</b>	51–100 AQI
	<b>Good</b>	21–50AQI
	<b>Very good</b>	0–19 AQI
<b>Noise Pollution dB levels</b> [40]	<b>Very low</b>	>85dB-Very high decibel levels that are dangerous to health.
	<b>Low</b>	75–85 dB -High decibel levels which affect
	<b>Moderate</b>	60–70 dB- Moderate decibel levels which have some effect on health.
	<b>High</b>	50–60 dB -Low decibel levels that affect health for sensitive groups.
	<b>Very high</b>	40 – 50 dB-Low decibel levels that have little effect on health.
<b>Green Space Coverage</b> (%Percentage of green space compared to the total built-up urban area)	<b>Very low</b>	less than 5%
	<b>Low</b>	6–10%
	<b>Moderate</b>	10–15%
	<b>High</b>	16–20%
	<b>Very high</b>	More than 20%

<b>3. Public Health and Well-being</b>		
<b>Distance from healthcare services</b>	<b>Very low</b>	>10 km
	<b>Low</b>	5000–9.900 m
	<b>Moderate</b>	1.000–4.999 m
	<b>High</b>	250–999 m
	<b>Very high</b>	0–250 m
<b>Existence of community spaces [41]</b>	<b>Very Low</b>	No designated public or community spaces. Encroachments or privatization of former public spaces. No accessible green or open areas for gathering
	<b>Low</b>	Few public spaces exist, but they are poorly maintained. Lack of inclusive design, making them inaccessible to certain groups
	<b>Moderate–</b>	Presence of some community spaces, such as plazas, parks, or halls. Issues of accessibility, maintenance, or adaptive reuse. Conflicting interests between tourism, conservation, and local needs
	<b>High</b>	Multiple community spaces exist and serve various groups. Adaptive reuse of historic buildings for social or cultural activities. Spaces are maintained but may face pressure from urbanization
	<b>Very High</b>	A well-distributed network of community spaces supporting social life. Historic areas actively foster engagement through public spaces. Strong policies ensure preservation, accessibility, and multifunctionality
<b>4. Mobility and Accessibility</b>		
<b>Walkability [42]</b>	<b>Very Low Coverage</b>	Absence or Scarcity of Sidewalks. No dedicated pedestrian pathways. Pedestrians share space with vehicular traffic, leading to safety concerns. Frequent interruptions in pedestrian paths, making navigation challenging
	<b>Low Coverage</b>	Sidewalks are present in certain areas but missing in others. Sidewalks are too narrow for comfortable use. Obstructions like poles or signage impede pedestrian movement
	<b>Moderate Coverage</b>	Sidewalks are available but vary in width and condition. Some areas are well-connected, while others lack continuous pathways
	<b>High Coverage</b>	Sidewalks are present on most streets with adequate width. Well-maintained surfaces with minimal obstructions. Designed to accommodate all users, including those with disabilities. Features like seating, lighting, and landscaping enhance the pedestrian experience
	<b>Very High Coverage</b>	Continuous, wide sidewalks on all streets, ensuring uninterrupted pedestrian flow. Features such as seating, adequate lighting, landscaping, and accessibility of accommodation enhance the pedestrian experience

<b>Cycling Infrastructure Conditions of bike-friendly routes in historic zones [43]</b>	<b>Very Low Coverage</b>	Historic zones lack designated cycling paths, compelling cyclists to share narrow streets with motor vehicles and pedestrians, leading to safety concerns. There is a lack of cycling-specific signage, bike racks, or support facilities, discouraging cycling within these areas
	<b>Low Coverage</b>	Presence of a few short, non-continuous bike lanes that do not form a coherent network, making navigation challenging for cyclists. Cyclists must share roads with significant vehicular traffic, with minimal traffic calming measures in place
	<b>Moderate Coverage</b>	Several bike-friendly routes exist but lack full connectivity, leading to gaps that require cyclists to merge distributed across the historic zone. Basic Signage and Facilities: Some cycling signage and facilities are available, but they are limited and not uniformly
	<b>High Coverage</b>	A well-connected network of bike lanes and paths covers most of the historic zone, providing safe and direct routes for cyclists. Clear signage, ample bike parking, and support facilities enhance cycling experience
	<b>Very High Coverage</b>	Cycling routes are fully integrated into the historic zone, respecting and complementing the area's cultural and architectural heritage. High-Quality Infrastructure and Services: High-quality, well-maintained cycling infrastructure, along with comprehensive services such as bike-sharing stations and repair facilities, encourage widespread cycling
<b>Public Transport Availability [44]</b>	<b>Very Low Availability</b>	Limited public transport routes, with large areas lacking access. Long intervals between vehicles, leading to inconvenience
	<b>Low Availability</b>	Some routes exist but fail to cover significant portions of the district. Services operate at intervals that may not meet residents' and visitors' needs
	<b>Moderate Availability</b>	Public transport covers most key areas but may miss fewer central locations. Services run at acceptable intervals, though improvements could enhance convenience
	<b>High Availability</b>	Coverage with Frequent Services. Public transport reaches nearly all parts of the historic district. Short intervals between vehicles, catering well to user needs
	<b>Very High Availability</b>	All areas, including peripheral ones, are well-served by public transport. Services operate at very short intervals, ensuring minimal waiting times

<b>Accessibility for People with Disabilities</b> [45]	<b>Very Low Accessibility</b>	Few heritage sites have been modified to accommodate visitors with disabilities. Many sites lack essential features like ramps, elevators, or accessible restrooms
	<b>Low Accessibility</b>	Some sites have incorporated accessible features, but these are not widespread. Visitors with disabilities may encounter difficulties navigating between sites or within site premises
	<b>Moderate Accessibility</b>	Certain high-traffic or prominent heritage sites offer accessible features, while others do not. The quality and extent of accessibility features differ among sites, leading to inconsistent experiences for visitors with disabilities
	<b>High Accessibility</b>	A significant majority of heritage sites have incorporated accessible features, including ramps, lifts, and designated rest areas. Visitors with disabilities can expect a consistent and accommodating experience across most sites
	<b>Very High Accessibility</b>	All heritage sites are designed or retrofitted to be fully accessible, adhering to universal design principles. Features such as tactile guides, audio descriptions, and specialized signage are standard, ensuring an inclusive experience for all visitors
<b>5. Climate Resilience and Sustainability</b>		
<b>Energy Efficiency of Historic Buildings- Retrofit Level</b> [46]	<b>Very Low:</b>	Historic buildings remain largely unmodified, with few or no energy-efficient features integrated. These buildings often exhibit poor thermal performance, leading to elevated energy demands for heating and cooling
	<b>Low</b>	Some buildings have undergone basic retrofitting measures, such as adding internal thermal insulation or upgrading windows
	<b>Moderate</b>	A range of retrofitting strategies, including enhanced insulation, energy-efficient heating systems, and renewable energy installations, are implemented
	<b>High</b>	Urban districts and clusters of historic buildings are retrofitted using standardized methods that harmonize energy efficiency with conservation goals
	<b>Very High</b>	State-of-the-art technologies and materials are employed to achieve near-zero energy consumption while fully preserving the building's historical and cultural significance. These retrofitted buildings serve as benchmarks, demonstrating best practices and influencing policies and standards in historic preservation and energy efficiency

<b>Flood and Disaster Preparedness. Integration of Climate Resilience</b>	<b>Very Low Adaptation</b>	Few historic sites have incorporated climate adaptation strategies, leaving them vulnerable to flooding and other climate-related disasters. There is a lack of comprehensive planning addressing the unique challenges of preserving historic structures while mitigating disaster risks
	<b>Low Adaptation</b>	Some historic buildings have undergone basic adaptations, such as installing barriers or reinforcing foundations, but these efforts are not widespread. Adaptation strategies are implemented on a case-by-case basis without a cohesive framework, leading to inconsistent protection levels
	<b>Moderate Adaptation</b>	Balanced Integration with Ongoing Improvements. A range of adaptation strategies, including flood-resistant materials and landscape modifications, are applied to historic sites
	<b>High Adaptation</b>	Historic areas benefit from integrated adaptation strategies, such as advanced flood defenses and adaptive reuse of spaces for flood management. Well-developed plans address the complexities of protecting cultural heritage while enhancing disaster resilience, with clear roles and resources allocated
	<b>Very High Adaptation</b>	Historic sites feature state-of-the-art adaptations, including nature-based solutions like green roofs and floodable parks, seamlessly blending preservation with resilience. Comprehensive strategies holistically address disaster risks and heritage conservation, serving as models for other regions
<b>Renewable energy integration in historic districts.</b> [47]	<b>Minimal</b>	Historic districts exhibit negligible implementation of renewable energy technologies. Preservation concerns dominate, leading to resistance against energy projects
	<b>Limited</b>	Selective implementation of renewable energy solutions, such as discreet solar panels or biomass heating, in a limited number of buildings. Pilot projects initiated to assess feasibility within heritage contexts
	<b>Moderate</b>	A significant portion of buildings incorporate renewable technologies, such as solar thermal systems or geothermal energy, with careful consideration of aesthetic and structural integrity. Collaborative efforts between preservationists and energy experts lead to tailored solutions
	<b>Extensive</b>	Comprehensive strategies result in widespread adoption of renewable energy across the district, including community-wide initiatives like district heating powered by renewables. Policies and incentives actively encourage residents and businesses to participate in sustainability programs
	<b>Full</b>	Historic district achieves a net-positive energy status, producing more renewable energy than it consumes annually. Innovative technologies are seamlessly integrated, serving both functional and educational

<b>6. Economic and social vitality and sustainable tourism</b>		
<b>Sustainable Tourism Impact [48]</b>	<b>Very low</b>	Tourism development is largely unsustainable, with high environmental degradation and social disruption. Overtourism leads to pressure on local infrastructure, cultural heritage, and ecosystems. Minimal community involvement or benefits from tourism; the local economy is highly dependent on external investors. Lack of sustainability policies or regulations; weak enforcement of existing laws
	<b>Low</b>	Some sustainable practices exist, but they are limited in scope and implementation. Partial environmental policies are in place but not strictly enforced. Tourism development is largely market-driven rather than community-led. Some initiatives promote local cultural heritage, but risks of commercialization and loss of authenticity remain. Awareness of sustainability is growing, but businesses and tourists are not fully engaged
	<b>Moderate</b>	Sustainability is recognized as important, and moderate efforts are made to balance tourism with environmental protection. Local businesses are beginning to integrate sustainable practices. The local community benefits from tourism revenue, but there is still some economic leakage. Visitor management is improving, with initial steps to address over-tourism and seasonality issues
	<b>High</b>	Sustainability is an integral part of tourism policies and planning; eco-friendly infrastructure is widely implemented. Strong governance ensures environmental, social, and economic sustainability. Well-managed carrying capacities prevent over-tourism; local stakeholders are actively involved in decision-making. A significant proportion of tourism businesses are eco-certified or follow circular economic principles. Visitor awareness campaigns successfully promote responsible behavior
	<b>Very high</b>	Fully integrated circular economy model: zero waste, renewable energy, carbon neutrality goals. Tourism contributes positively to biodiversity conservation and cultural heritage protection. High levels of community participation; economic benefits are equitably distributed. Smart technology enhances sustainability efforts
<b>Ratio of residents to tourists in peak seasons [49]</b>	<b>Extreme Tourism Pressure</b>	Severe over-tourism: Tourists outnumber residents 5:1 or more in peak seasons. Heavy strain on local infrastructure, housing, public services, and environment. Rising real estate and living costs due to short-term rentals. High social tension between tourists and locals is due to overcrowding and cultural erosion. Governance struggles to regulate tourism's negative impacts
	<b>High Tourism Pressure</b>	Tourists outnumber residents 2:1 or more in peak seasons. Noticeable congestion in public spaces, transport, and local services. Seasonal economic reliance on tourism, with some diversification efforts. Increasing pressure on housing and rental markets. Some regulation efforts exist, but they are not always enforced effectively
	<b>Moderate Tourism Pressure</b>	Tourists and residents are nearly equal in number during peak seasons. Tourism is well-integrated into the local economy, but risks of over-tourism exist. Some seasonal overcrowding, but mitigation

		measures) help manage flows. Housing and local services remain accessible, though some seasonal pressures persist. Tourism revenue benefits the community, but further regulation may be needed
	<b>Balanced Tourism</b>	Tourism is well distributed across seasons, avoiding extreme peaks. The local economy is diversified, reducing dependence on tourism. Infrastructure and services are designed to accommodate visitors without disrupting residents' daily lives. Sustainable tourism policies effectively prevent overcrowding and maintain quality of life. Strong community involvement in tourism decision-making
	<b>Sustainable &amp; Community-Led Tourism</b>	Tourists never exceed 20% of the local population, even in peak seasons. Strong focus on slow tourism, eco-tourism, and cultural tourism. Residents actively participate in shaping tourism policies. Tourism complements the local way of life without disrupting housing, transport, or public services. Year-round tourism strategies help maintain balance
<b>Local Business Sustainability [49]</b>	<b>Low Local Business Sustainability</b>	Dominance of international chains, franchises, and corporate-owned businesses. Severe loss of local character and cultural authenticity due to commercial gentrification. High rent prices force small businesses to close or relocate. Profits largely leave the local economy, benefiting external corporations rather than local communities. Tourism-dependent economy with little support for local entrepreneurs
	<b>Moderate Local Business Decline</b>	Significant presence of chain stores, international brands, and souvenir shops targeting tourists. Some local businesses survive, but they struggle due to high rent and competition from large retailers. Cultural authenticity is at risk, as local artisan shops and family-owned businesses decline. Some municipal efforts to protect local businesses, but with limited impact. Profits from tourism are partially reinvested in the local economy, but corporate interests dominate
	<b>Balanced Business Landscape</b>	Mix of independent businesses and commercial chains, but local entrepreneurs still have a significant presence. Local businesses benefit from tourism but face challenges in long-term financial sustainability. Some regulations exist to protect historic center businesses, such as rent control policies or commercial zoning laws. Moderate success in preserving cultural identity while accommodating tourism-driven businesses. Community-led initiatives promote buying locally, but economic pressures persist
	<b>Strong Local Business Sustainability</b>	Majority of businesses in historic centers are locally owned and operated. Strong governmental and municipal policies actively protect small businesses from displacement. Local economic benefits are significant, as profits largely stay within the community. Tourism is integrated into the local economy without overwhelming small businesses. Independent businesses are supported through grants, tax incentives, and cultural heritage initiatives
	<b>Exemplary Local Business Sustainability</b>	Historic centers are almost entirely composed of independent, locally owned businesses. Strong municipal efforts and community-driven initiatives ensure that local entrepreneurs thrive. High public awareness and preference for local businesses over commercial chains. Strict regulations prevent commercial gentrification and protect



		historic business identity. Tourism directly supports local businesses, rather than disrupting them
<b>7. Governance</b>		
<b>Levels of participation</b>	<b>Very low</b>	Non-participation
	<b>Low</b>	Local government, in limited partnership with the health sector, provides information about public services
	<b>Moderate</b>	Local government, in partnership with the health sector, provides information
	<b>High</b>	Local government and the health sector work directly with citizens throughout the process to ensure that public concerns are consistently understood and considered
	<b>Very high</b>	Citizens are involved in the decision-making process by partnering with the public or other private entities from different fields
<b>Open Data and Information</b>	<b>Very Low</b>	Non-existing or Existing with legal barrier
	<b>Low</b>	Low -Partially Accessible
	<b>Moderate</b>	Moderate Accessibility – Valid – No variety
	<b>High</b>	Highly Accessible – Valid – limited variety
	<b>Very high</b>	Very highly Accessible – Valid -wide variety

#### **4 Results of the criteria and indicators application in Chania's historic center**

The city of Chania is a historic city (see Fig. 1) located on the northwest coast of Crete, Greece, serving as the capital of the Chania regional unit, which as of the 2021 census, has a population of 111,375 inhabitants [50]. Today, the historic center remains a vital part of Chania, which continues to expand beyond its original boundaries, with tourism driving its economy. Some of its degraded areas are home to low-income immigrants, while well-preserved sections attract affluent tourists. In recent years, the rising number of tourists—driven by lower travel costs and digital communication platforms—has led to growing discontent among residents, who are increasingly affected by uncontrolled tourism. This frustration has been exacerbated by platforms such as Airbnb, which contribute to the decline in residents' quality of life and intensify conflicts over public space usage between locals and visitors.



**Fig. 1.** The city of Chania, *Source: Google Earth*

Tourism in Chania is largely concentrated along the coastal zone, generating noise and traffic congestion during the summer. However, in the winter, the area becomes inactive as most tourist-oriented businesses close. Meanwhile, residential areas are concentrated in more degraded sections, forming segregated zones for low-income inhabitants. The few remaining residents in the western part of the historic center lack essential services, while the western and eastern moats act as barriers, limiting connectivity with the rest of the city due to inadequate infrastructure.

The evaluation of the historic center of Chania is based on data from the Municipality's GIS webpage, the Greek Census for population and buildings of 2021 for the area of the historic center [50], the "Evaluation of environmental noise in the context of the implementation of directive 2002/49/EC for urban areas urban complexes of Heraklion – Chania final report – phase B" technical report [51], the Weather Channel Site [52], the Sustainable Urban Mobility plan [53], the Sustainable Urban Development Strategy of Chania [55], Tourism study on the visitor experience in Chania 2024 [56] and on-site building, land uses, mobility conditions, survey conducted by the author in March 2025 [57].

The methodology integrates diverse data sources including municipal GIS data, the 2021 Greek Census, environmental noise reports, tourism studies, sustainable mobility and urban development plans, and an on-site survey conducted by the author. It assesses key indicators across multiple urban dimensions such as cultural heritage preservation, environmental quality, public health, mobility and accessibility, climate resilience, economic vitality, and governance. Quantitative data like air quality indices, noise levels, green space coverage, and tourism statistics are combined with qualitative evaluations based on field observations and stakeholder inputs. Each indicator is rated to reflect

current conditions, highlighting areas of moderate to high concern or strength. Spatial and statistical analyses are used to identify patterns, interactions, and impacts within the historic center's urban fabric.

The evaluation framework of the historic center is presented in Table 4.

**Table 4.** The application of the proposed evaluation framework in the historic center of Chania

<b>Cultural Heritage Preservation</b>		
<b>Conservation Status of well-preserved historic buildings and sites</b>	<b>Moderate</b>	Many buildings in Chania's historic center show visible alterations that threaten its authenticity. Original materials are often replaced or degraded, compromising heritage value. Maintenance is sporadic, lacking a cohesive preservation plan, which accelerates the area's decline [57]
<b>Adaptive Re-use</b>	<b>Moderate Adaptive Reuse</b>	Chania's historic center features a mix of preserved heritage buildings and others adapted for modern uses. Many retain original forms reflecting Venetian, Ottoman, and Neoclassical influences. Others have been repurposed—mainly in tourist areas—into hotels, cafes, or homes. Adaptive reuse depends on location and architectural value, aiming to balance function with heritage conservation [57]
<b>Environmental Quality</b>		
<b>Air Quality index</b>	<b>Good</b>	21-50 AQI [52] Chania's sea breezes improve air quality by dispersing pollutants. Despite seasonal traffic peaks, low vehicle density keeps NO <sub>2</sub> and O <sub>3</sub> emissions relatively limited
<b>Noise Pollution dB levels</b>	<b>High</b>	50–60 dB Chania's Spring and summer tourism brings constant background noise from cafes, events, and tours. While not loud, it can cause stress and sleep issues for residents near busy areas [51]
<b>Green Space Coverage%</b>	<b>Low</b>	6-10% Limited green space in Chania's dense historic center affects biodiversity, microclimate, and access to recreation. Its compact layout, shaped by Venetian and Ottoman planning, prioritized defense over greenery [57]
<b>Public Health and Well-being</b>		
<b>Distance from healthcare services</b>	<b>Moderate</b>	1.000-4.999 m [57]. In 2020, a new Urban Health Centre opened 2 km from Chania's center, providing primary care, diagnostics, and health promotion services
<b>Existence of community spaces</b>	<b>Moderate</b>	Some culturally important community spaces in Chania's center face poor access and upkeep, as tourist-focused development sidelines local needs [57]

Mobility and Accessibility		
<b>Walkability</b>	<b>High Coverage</b>	A recent project is rebuilding 35,000 m <sup>2</sup> of sidewalks in Chania's center, improving utilities, adding greenery, and enhancing accessibility and urban vitality [57]
<b>Cycling Infrastructure</b>	<b>Low Coverage</b>	Chania is still car-focused, with a limited cycling network and heavy traffic making cycling feel unsafe. This discourages riders and creates challenges due to shared roads and few traffic calming measures. [53]
<b>Public Transport Availability</b>	<b>Very Low Availability</b>	Bus service in Chania is often irregular, especially off-peak and on weekends, causing long waits. Lack of real-time schedule info complicates travel planning for residents and tourists. [53]
<b>Accessibility for People with Disabilities</b>	<b>Very Low Accessibility</b>	A survey of tourists with disabilities in Crete showed Chania has made some accessibility improvements, but much more is needed to make all heritage sites and public spaces fully inclusive [56]
Climate Resilience and Sustainability		
<b>Energy Efficiency of Historic Buildings-Retrofit Level</b>	<b>Low</b>	Few buildings in Chania use internal insulation and double-glazed windows to boost energy efficiency without altering façades. Ongoing retrofitting is vital [57]
<b>Flood and Disaster Preparedness. Integration of Climate Resilience</b>	<b>Very Low Adaptation</b>	Chania's coasts face rising erosion and landslides worsened by heavy rain. By 2050, sea levels may rise 1.5 meters, flooding about 2.83% of the city center. The historic area lacks comprehensive coastal protection, relying on ad hoc mitigation [54]
<b>Renewable energy integration in historic districts</b>	<b>Minimal</b>	Chania's historic center has limited renewable energy use due to preservation priorities. Protecting architectural and historical authenticity often blocks such projects. Although sustainability goals exist, the city's strategy lacks clear plans for renewables in this area. [55]

<b>Economic and social vitality and sustainable tourism</b>		
<b>Sustainable Tourism Impact</b>	<b>Low</b>	The municipality prioritizes collective action and citizen input for sustainable development. While promoting local heritage, challenges like commercialization risk authenticity. Supporting handmade crafts helps preserve culture and lessen environmental impact. [55]
<b>Ratio of residents to tourists in peak seasons</b>	<b>High Tourism Pressure</b>	Short-term rentals in Chania rose sharply—from 2,639 in Dec 2023 to 3,738 in June 2024—making up about 11.8% of housing. This surge drives rents up by as much as 100%, worsening affordability for locals, students, and seasonal workers. [56]
<b>Local Business Sustainability</b>	<b>Balanced Business Landscape</b>	Chania’s seasonal tourism pressures resources and infrastructure. Regulations exist to protect historic businesses but are unevenly enforced. Community initiatives support local buying, yet large commercial forces persist [57]
<b>Governance</b>		
<b>Levels of participation</b>	<b>Moderate</b>	The Municipality of Chania, in collaboration with the health sector, provides comprehensive information and services to residents and visitors, ensuring accessible healthcare and social support [55]
<b>Open Data and Information</b>	<b>Moderate</b>	While Chania has made significant strides in providing open data and information, there are areas for improvement, such as enhancing the variety and accessibility of datasets, particularly those related to tourism and public health [55]

The application of the proposed evaluation framework has revealed that the historic center of Chania demonstrates a moderate level of preservation. While a few buildings remain largely intact, retaining key architectural features reflective of the area's Venetian and Ottoman heritage, a significant portion have undergone visible alterations. These changes—ranging from façade modifications and material replacement to structural interventions—have, in several cases, compromised the historical integrity of the built environment. Observations indicate varying degrees of material degradation, including erosion of stone surfaces, deterioration of wooden elements, and corrosion of metallic features (Fig. 2), underscoring the urgent need for systematic and proactive conservation strategies.



**Fig. 2.** The deteriorated buildings of Neoria in the center of the coastal zone,  
*Source: Google Earth*

Maintenance activities are sporadic and largely reactive rather than preventive. Although some preservation efforts are visible, such as the reinforcement of façades or roof repairs, these tend to occur in isolated instances and do not follow a district-wide maintenance strategy. The absence of a coordinated and consistent conservation plan has resulted in gradual yet steady deterioration of urban fabric. To safeguard the architectural authenticity and ensure the long-term survival of heritage structures, a more structured and regularly implemented maintenance framework is essential.

In terms of adaptive reuse, the transformation of historic buildings for contemporary functions is present but remains at a moderate level. This process has introduced a mix of well-preserved buildings functioning as museums, boutique accommodations, and cultural venues, alongside others converted into commercial spaces or private residences. However, these interventions are unevenly distributed and are typically guided by selective criteria such as proximity to major tourist corridors, commercial potential, or the architectural prominence of the building. While some adaptive reuse projects successfully balance preservation and modernization, others risk undermining the district's historical authenticity by prioritizing economic gain over cultural value.

Environmental quality in the district is generally satisfactory. The air quality index, measured at approximately 30, remains within acceptable health standards and does not currently pose a threat to public well-being. Nevertheless, noise pollution continues to be a significant issue. Noise levels fluctuate between 50 and 60 decibels, exceeding the

thresholds recommended for residential comfort, and particularly affecting sensitive groups such as children, the elderly, and individuals with health vulnerabilities.

The availability of green spaces within the historic center is notably limited, with green coverage estimated at only 6–10%. This scarcity restricts the district's capacity to provide recreational, aesthetic, and ecological functions—factors that are crucial to urban livability and climate mitigation. Moreover, access to healthcare services is classified as moderate. Most medical facilities are located at distances ranging between 1,000 and 4,999 meters from the historic core, potentially impeding timely access for residents, especially those with limited mobility or urgent healthcare needs.

Mobility infrastructure within the district shows mixed results. Pedestrian conditions are favorable, with most sidewalks and footpaths being well-paved and integrated into the urban layout, thereby supporting high walkability. However, infrastructure for non-motorized transport, particularly cycling, is underdeveloped. Bike lanes are sparse, poorly connected, and often intersect with vehicular traffic without adequate safety measures. This undermines the viability of cycling as a safe and sustainable transport option. Public transportation availability is also critically low. The limited number of routes, infrequent service, and extended waiting times make it difficult for residents and visitors alike to navigate the district efficiently, increasing dependence on private vehicles and contributing to traffic congestion.

Accessibility remains a pressing concern. Many heritage sites and public spaces in the district lack essential features for people with disabilities, such as ramps, elevators, tactile paving, or accessible public toilets. This deficiency restricts access for individuals with mobility impairments and poses a barrier to inclusive tourism, civic engagement, and equal participation in public life.

In terms of climate resilience, the historic center shows considerable weaknesses. Most heritage buildings have low energy performance due to outdated construction methods, poor insulation, and limited ventilation systems. Additionally, the district exhibits minimal preparedness for climate-related hazards such as heatwaves or extreme weather events. The integration of renewable energy sources, such as solar panels or energy-efficient lighting, remains minimal due to regulatory constraints and preservation concerns, which often prioritize aesthetic and material authenticity over sustainability.

Efforts toward sustainable tourism management are currently inadequate. The district experiences a high concentration of tourists, especially during peak travel months. At times, the number of visitors can exceed the local population by a ratio of at least 2:1. This seasonal surge results in overcrowding, increased strain on infrastructure, overuse of cultural sites, and heightened environmental pressures, including waste generation and noise. Although local businesses retain a strong presence, with a relatively balanced mix of independent retailers and larger commercial entities, the long-term financial sustainability of smaller enterprises is under threat. Rising operational costs, coupled with shifts in consumer patterns driven by mass tourism, challenge the economic resilience of locally owned shops and services (Fig. 3).



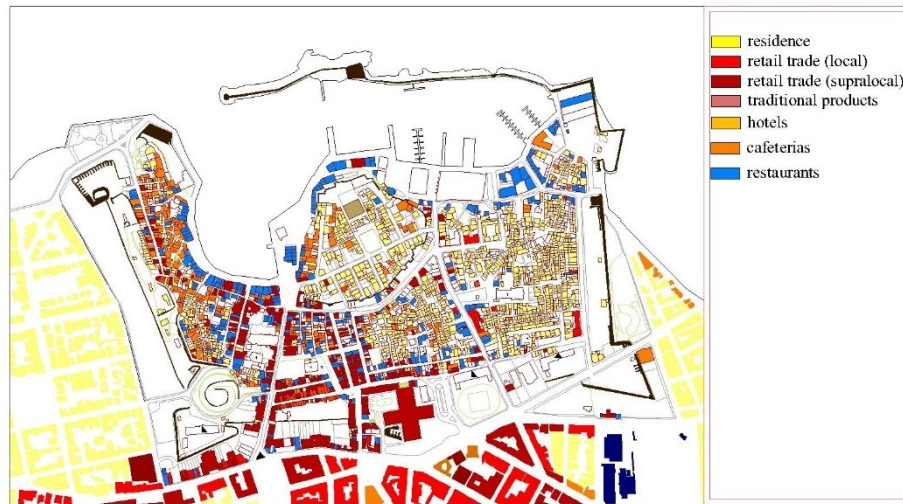


Fig. 3. The spatial distribution of uses related to tourism, *Source: author, based on 2025 data*

Public participation in the planning and governance of the historic district is currently moderate. While some initiatives have been introduced by local authorities to disseminate information and invite feedback—such as public meetings or consultation platforms, these efforts often lack depth, continuity, or transparency. Many residents remain disengaged from formal decision-making processes, leading to a democratic deficit in urban development and heritage management.

In conclusion, the historic center of Chania possesses significant cultural and architectural value, but faces numerous challenges related to preservation, accessibility, environmental sustainability, and inclusive governance. Addressing these issues through integrated, participatory, and context-sensitive strategies is essential for safeguarding the district's heritage while ensuring its long-term resilience and livability.

The comprehensive evaluation of Chania's historic center reveals a moderate level of advancement in key domains such as environmental quality, pedestrian accessibility, and the resilience of local businesses. These areas exhibit a foundational level of development and hold substantial potential for further enhancement through the implementation of targeted urban policies and strategic investments. Environmental criteria, including air quality and walkability, reflect a generally favorable condition conducive to public well-being. Similarly, the presence of a diverse mix of locally owned businesses contributes to the economic vitality of the district, although these enterprises remain vulnerable to tourism-driven market fluctuations.

Despite these positive aspects, the evaluation also identifies several critical deficiencies that demand immediate and coordinated intervention. In particular, the challenges related to urban mobility, accessibility for people with disabilities, climate resilience, and the management of sustainable tourism pose significant risks to the district's livability and long-term preservation. Mobility within the historic center is hindered by a limited and inefficient public transportation network, coupled with inadequate cycling infrastructure. Expanding and modernizing transport services is essential not only for



reducing dependence on private vehicles and alleviating congestion, but also for enhancing the district's connectivity for both residents and tourists.

The lack of accessibility features across many public and heritage sites represents a major barrier to inclusion. Addressing these shortcomings by incorporating universal design principles—such as installing ramps, elevators, accessible pathways, and restrooms—would foster a more inclusive urban environment and align with contemporary standards of equity and human rights. In terms of climate resilience, most historic buildings remain ill-equipped to cope with modern environmental pressures. Integrating renewable energy technologies that are compatible with heritage preservation—such as discreet solar systems or energy-efficient retrofitting—offers a viable path to improving energy performance without compromising architectural authenticity.

Tourism management also requires urgent reform. The seasonal influx of visitors places considerable strain on local infrastructure, exacerbates environmental degradation, and contributes to the displacement of residents through the proliferation of short-term rentals. A more sustainable tourism model should be pursued, including measures to regulate tourist accommodation, promote off-season visitation, diversify tourist activities, and enforce environmental protection regulations. These actions would help achieve a more balanced relationship between economic development and heritage conservation.

In conclusion, while Chania's historic center demonstrates encouraging progress in certain domains, a holistic and inclusive approach to urban planning and heritage management is necessary. Strengthening climate adaptation, promoting accessibility, and aligning tourism with sustainability principles are essential steps toward enhancing the district's resilience, cultural integrity, and overall quality of life for all users.

## 5 Conclusions

The paper advances the understanding of healthy cities by focusing specifically on the underexplored context of historic urban environments. While existing literature on healthy cities predominantly addresses modern urban planning and infrastructure, our study highlights how the unique spatial, morphological, and cultural characteristics of historic centers require adapted tools and approaches. The key contribution of this paper lies in its proposal for a context-sensitive evaluation framework that integrates environmental, spatial, and socio-economic criteria tailored to the constraints and opportunities of heritage urban areas.

The current approach emphasizes the necessity of balancing heritage preservation with contemporary urban health and sustainability goals. By applying the evaluation framework to historic districts, this research fills a critical gap in the healthy cities discourse—bridging the domains of urban heritage management and health-oriented urban evaluation. Furthermore, the paper demonstrates how multidimensional criteria—such as accessibility, green space distribution, building conditions, and urban mobility—can be systematically analyzed to support integrated planning in historic contexts. The findings show that such tools not only provide diagnostic insights but also serve as strategic guides for more inclusive, resilient, and adaptive urban development. It underscores

that historic cities require specialized methodologies that account for their physical and cultural specificity, especially when designing strategies that align with sustainability, livability, and spatial equity. The research contributes to expanding the scope of the healthy city concept by incorporating heritage-sensitive planning into its core principles. It offers practical and conceptual innovations that support cities in navigating the complex intersection between historical continuity and contemporary urban health imperatives. The paper contributes new knowledge to the evolving discourse on healthy cities by expanding its scope to historic urban centers—an area frequently underexplored in urban health literature. By employing an integrated evaluation framework, the study demonstrates how the concept of a healthy city can be meaningfully adapted to the specific spatial, cultural, and regulatory conditions of heritage environments. In doing so, it bridges the gap between public health, environmental sustainability, and cultural preservation, offering a replicable methodology for urban researchers and policy-makers concerned with advancing health and sustainability objectives in historically sensitive contexts.

The historic center of Chania embodies substantial cultural and architectural value, yet it faces persistent challenges related to preservation, accessibility, mobility, climate resilience, and inclusive governance. The application of the proposed multidimensional evaluation framework revealed a moderate level of advancement across several key domains—such as environmental quality, pedestrian infrastructure, and the vitality of locally owned businesses. These areas present a strong foundation for further development through strategic planning and targeted policy interventions. Nevertheless, the study also identified critical deficiencies that demand urgent attention. The lack of accessible infrastructure, insufficient public transport options, underdeveloped cycling networks, and minimal integration of climate-adaptive measures represent significant threats to both the livability and long-term sustainability of the district. Furthermore, the pressure exerted by mass tourism—particularly during peak seasons—exacerbates environmental degradation, strains local infrastructure, and undermines the affordability and inclusivity of urban life. The findings from Chania center address the importance of integrating heritage preservation with principles of sustainability, health equity, and participatory governance. Strengthening universal accessibility through inclusive design, promoting renewable energy retrofitting in alignment with conservation guidelines, and reforming tourism management strategies are essential steps toward building a more resilient and inclusive urban fabric.

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