Urban Health for Urban Sustainability and Resilience

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Abstract: This paper examines urban health as a strategic enabler of urban sustainability and resilience, focusing on the interconnections between public health, environmental quality, urban functionality, and social well-being. The scope of the study is to explore how health considerations can be systematically integrated into spatial planning, governance structures, and urban strategies in order to enhance cities' adaptivity and capacity building in the face of complex and interrelated challenges. Methodologically, the paper adopts a multidimensional approach. It first clarifies key concepts related to urban health, sustainability, and resilience, and then reviews international, European, and national policy frameworks that incorporate health into urban development agendas. This policy analysis is complemented by selected European case studies and a local case from the Greek city of Chalkida, which illustrate practical pathways for embedding health into urban planning and resilience strategies. Through a comparative and synthetic analysis, the study identifies emerging good practices, persistent implementation gaps, and critical needs, focused on cross-sectoral urban health indicators. The paper concludes by outlining policy directions for health-sensitive, evidence-based, and equitable urban planning.

Key-Words: Urban, health, sustainability, resilience, planning, governance, impact, assessment, cross-sectoral, indicators

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1 Introduction

1.1 The importance of urban sustainability and resilience in a multiple challenging era

In recent decades, cities have increasingly evolved into complex systems confronted with multilayered and interrelated challenges. Climate change, urban growth, the built environment including public spaces, social cohesion, public health, living conditions, effective governance, accessibility of services, economic competition, and rapid technological evolution are among the key determinants influencing urban functionality [1], [2].

These interacting factors within urban ecosystems have highlighted the limitations of traditional, sector-based planning models and emphasized the urgent need for integrated, adaptive, and future-oriented urban strategies. Within this evolving context, urban sustainability and resilience have emerged as a pivotal concept, one that encompasses not only the capacity of cities to withstand and recover from crises, but also their ability to adapt, transform, and thrive amid chronic stresses while safeguarding long-term sustainability [3], [4], [5].

Healthy urban development reflects a broader, systemic approach that incorporates structural, environmental, institutional, economic, and social dimensions, with sustainability considerations woven throughout [6], [7].

European and global frameworks increasingly recognize resilience and sustainability as central to future-proof urban development. The EU Urban Agenda, the European Green Deal, the Mission for Climate-Neutral and Smart Cities, and the New European Bauhaus collectively shape the guiding principles of contemporary urban policy, fully integrated within the broader transition towards more sustainable, inclusive, and adaptable cities [8], [9], [10].

At the global level, the Sustainable Development Goals (SDGs) advocate cities that are not only resilient but also inclusive, sustainable, and health-promoting [1], [11].

1.2 Urban health as a key factor for sustainable and resilient cities

Urban health is increasingly recognized as a critical pillar in the pursuit of sustainable and resilient cities. Beyond its traditional association with healthcare systems, urban health encompasses a wide range of interrelated factors including environmental quality, housing conditions, active mobility, access to green and public spaces, and the promotion of mental as well as physical well-being through health-sensitive urban design [12], [13], [14].

These dimensions are intrinsically linked to both sustainability and resilience objectives, as healthy urban environments directly influence social cohesion, economic vitality, and the adaptive capacity of communities to withstand and recover from crises [6], [15].

2 Problem Formulation

2.1 Scope of the study

2.1.1 Scope

This paper highlights the interconnections between public health, environmental quality, urban functionality, and social well-being and positions urban health as a key enabler of resilience and sustainability within contemporary urban policy frameworks. Furthermore, it examines how urban health considerations can be integrated into spatial planning, governance structures, and urban strategies in order to enhance cities' adaptive capacities to both ongoing and emerging challenges [3], [5], [14].

2.1.2 Main Research Questions

- Which factors most directly link the urban environment with urban health?
- In what ways does urban health contribute to the development of sustainable and resilient cities?
- How can urban health be effectively integrated into existing urban policies and planning frameworks?

2.2 Methodology

This paper adopts a multidimensional approach to exploring the interconnections between urban health, sustainability, and resilience.

It begins by clarifying key definitions that underpin the conceptual foundation of the research, including urban health, sustainability, and resilience [2], [5].

The analysis with a review of international, European, and Greek frameworks that incorporate health considerations into sustainable and resilient urban development [8], [9], [11].

To contextualize the policy review, the study presents a series of case studies from selected European cities,

serving as strong examples of initiatives that integrate health into urban planning strategies [14], [15].

In addition to the European cases, the Greek city of Chalkida provides an illustrative local example of the interlinkages between resilience, sustainability and urban health. [28]

Based on the policy and case study review, the paper identifies the main findings, consisting of emerging good practices and persistent gaps.

Building on these elements, the paper examines the linkages between urban health, the urban environment, sustainability, and resilience.

It analyzes how urban planning can act as a catalyst for public health — and conversely how urban health can strategically contribute to achieving urban sustainability and resilience [4], [6], [13].

The paper concludes with a set of targeted policy recommendations for cities.

Finally, the conclusions synthesize the overarching message of the study.

2.3 Key definitions

● Urban Resilience: The capacity of urban systems to survive, adapt, and thrive in the face of shocks and chronic stresses, while maintaining essential functions and structures [2], [16].

● Urban Sustainability: The ability of cities to maintain environmental integrity, social equity, and economic viability over time, while enhancing the well-being of their populations through inclusive, adaptive, and forward-looking urban governance [3], [5].

● Urban Health: A holistic concept encompassing not only healthcare systems but also the environmental, social, and infrastructural determinants that influence the well-being and quality of life of urban populations [6], [7], [17].

2.4 Framework and Policies short Review

2.4.1 Frameworks

A review of international, European, and national policy frameworks reveals a growing recognition of urban health as a key enabler for achieving sustainable and resilient cities [1], [4], [7]. However, the integration of health considerations into urban strategies remains uneven across policy levels and thematic areas.

At the international level, the importance of urban health as a cornerstone for sustainable and resilient urban development is firmly embedded within several key global strategies and policy frameworks.

The United Nations Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-being) and SDG 11 (Sustainable Cities and Communities), explicitly recognize the interdependence between health, urban sustainability, and resilience [1].

The Sendai Framework for Disaster Risk Reduction (2015–2030) further emphasizes the need to strengthen urban systems' capacities to prevent and mitigate health-related risks, acknowledging health as a critical dimension of resilience planning [18].

Additionally, the WHO Healthy Cities Programme, active since 1986, has played a significant role in mainstreaming health considerations within urban governance structures. It promotes an integrated approach linking urban planning, health equity, environmental quality, and social cohesion, offering a practical framework for cities to align health objectives with broader sustainability and resilience agendas [7].

At the European level, urban health is increasingly recognized as a driver of urban sustainability and resilience through multiple interlinked strategies and initiatives.

The EU Urban Agenda explicitly addresses the intersections between health, urban mobility, environmental quality, and social inclusion through dedicated partnerships on sustainable urban mobility, urban regeneration, and air quality.

The European Green Deal further strengthens this agenda by advocating for greener, healthier, and more sustainable urban environments as part of Europe's climate neutrality ambitions, through decarbonization, nature-based solutions, and clean mobility [4].

The Mission for Climate-Neutral and Smart Cities supports cities in adopting holistic strategies where health outcomes are directly linked to sustainable mobility, clean energy, and green infrastructure [6].

In parallel, the New Leipzig Charter and the New European Bauhaus reinforce the qualitative dimensions of urban development - including well-being, inclusion, and aesthetic value - highlighting health and quality of life as fundamental components of resilient and sustainable urban futures [9].

Moreover, initiatives such as URBACT, Horizon Europe, and Covenant of Mayors encourage cross-sectoral collaboration and the integration of health objectives into urban planning and climate strategies across European cities [10], [15].

At the national level (Greece), the integration of urban health into sustainability and resilience policies is gradually evolving through sectoral policies.

The Greek National Recovery and Resilience Plan (Greece 2.0) indirectly addresses urban health through investments in sustainable mobility, energy-efficient buildings, and digital health infrastructure, contributing to the creation of healthier urban environments [8].

The National Health Strategy incorporates social determinants of health [12], though its alignment with urban planning and sustainability policies remains limited and fragmented.

Urban health considerations are also indirectly reflected in national spatial planning frameworks, which increasingly acknowledge the role of public space, mobility, and environmental quality in enhancing both health and resilience. However, further integration is required to bridge existing gaps between health, urban governance, and spatial planning.

However, there is a lack of systematic integration between health, spatial planning, and urban resilience strategies [6], [8], [13].

Despite the growing convergence of international and European agendas, the extent to which these frameworks are translated into concrete operational practice remains uneven.

The European Green Deal has achieved measurable progress in embedding environmental and climate objectives into urban governance; however, its health-related dimensions are still largely implicit, framed as ancillary co-benefits rather than as central policy goals.

In contrast, the WHO Healthy Cities Programme offers a more direct institutional mechanism linking health equity with spatial planning, yet its implementation continues to rely on voluntary municipal participation rather than binding regulatory mandates.

The Sendai Framework has been pivotal in integrating health considerations within disaster risk reduction, though it still needs the urban-specific operational instruments necessary to guide local authorities effectively.

These observations underscore the need to move beyond declarative alignment toward measurable, health-sensitive implementation frameworks capable of bridging global, European, and national scales of governance.

2.4.2 Case Studies

Several European cities provide valuable examples of integrating urban health into sustainability and resilience agendas through concrete policies and projects:

● Paris, France - "15-Minute City" Strategy
Policy Focus: Proximity-based planning, health through active mobility, air quality, and mental well-being [14], [19].
Key Actions: Reorganization of urban space to ensure access to essential services within 15 minutes by walking or cycling. Promotes reduced car dependency, improved air quality, and more livable, health-supportive neighborhoods.
Relation to Urban Health: Directly fosters physical activity, reduces pollution-related health risks, and improves mental health through better access to public space and local services.

● Vienna, Austria - "Urban Heat Islands Strategy Plan"
Policy Focus: Urban climate adaptation and resilience, urban health protection from heat stress, environmental sustainability [15].
Key Actions: Expansion of green infrastructure (cooling islands, pocket parks), use of reflective materials, strategic tree planting, and water features in vulnerable neighborhoods.
Relation to Urban Health: Reduces risks related to heatwaves, enhances mental and physical well-being, contributes to long-term resilience through adaptive public space design.

● Ljubljana, Slovenia - "Vision 2025 & Sustainable Urban Mobility Plan (SUMP)"

Policy Focus: Sustainable mobility, green infrastructure, emphasizing compact city structure and accessible public realm [15].
Key Actions: Expansion of car-free zones and low-traffic areas, creation of ecological corridors and linear parks, investment in cycling infrastructure and urban greening.
Relation to Urban Health: Enhances air quality, reduces noise pollution, promotes active mobility, fosters mental well-being through access to green spaces and safe, equitable public environments.

● Amsterdam, Netherlands - "Amsterdam Healthy Weight Program (AAGG)"
Policy Focus: Child health, nutrition, spatial equity [20].
Key Actions: Regulating urban food environments, promoting walking and cycling near schools.
Relation to Urban Health: Prevents childhood obesity, fosters healthy behaviors, and integrates health into spatial design.

● Stockholm, Sweden - "Vision Zero" for Road Safety
Policy Focus: Road safety as a determinant of urban health and social equity [21].
Key Actions: Infrastructure redesigned to prioritize pedestrian and cyclist safety, reduction of speed limits, creation of safe mobility networks.
Relation to Urban Health: Reduces accidents, promotes active mobility, strengthens the perception of safe and healthy public spaces.

● Copenhagen, Denmark - "Copenhagen Climate Plan 2025"
Policy Focus: Active mobility, climate adaptation, citizen-centered design [6], [22].
Key Actions: Expansion of cycling networks, green corridors, and stormwater management through green infrastructure.
Relation to Urban Health: Promotes physical activity, reduces air pollution, and mitigates flood-related health risks.

● Barcelona, Spain - "Superblocks (Superilles) Programme"
Policy Focus: Urban reconfiguration, environmental quality, walkability [9], [23].
Key Actions: Creation of car-restricted zones, redesign of public spaces, and green interventions to promote active lifestyles.
Relation to Urban Health: Reduces pollution and noise, enhances mental well-being, and encourages social interaction.

● Rotterdam, Netherlands - "Resilient Rotterdam Strategy"
Policy Focus: Climate resilience, integrated urban health planning [15].
Key Actions: Implementation of heat stress and flood protection strategies, supported by data-driven tools.
Relation to Urban Health: Reduces climate-related health risks, promotes social equity, and enhances urban well-being.

Viewed comparatively, the European case studies illustrate distinct yet complementary pathways for integrating health into sustainability and resilience agendas.

Paris and Barcelona, for example, embody two emblematic models: Paris' 15-Minute City advances proximity and spatial justice as key levers of urban well-being, whereas Barcelona's Superblocks initiative places stronger emphasis on environmental equity and the collective reclaiming of public space. Copenhagen, on the other hand, represents a climate–health integration paradigm in which infrastructure investment is explicitly tied to citizen-centered design and participatory governance.

Collectively, these examples reaffirm that there is no universal blueprint for health-sensitive urbanism; rather, success depends on the institutional culture, governance maturity, and civic engagement mechanisms unique to each urban context.

In addition to the European cases, the Greek city of Chalkida illustrates how coastal urban areas experience the combined pressures of climate change, socio-economic stressors and infrastructure vulnerabilities.

These dynamics have direct implications for urban health, including housing quality, accessibility of services and exposure to environmental risks.

A SWOT analysis of Chalkida [28] conducted for the city identified critical challenges and opportunities across the environmental, cultural, economic, and social sectors, pointing to the urgent need for integrated spatial strategies.

The case of Chalkida underlines the importance of localized resilience planning that builds on the specific urban fabric, cultural assets, and socio-economic dynamics of coastal cities, while aligning with broader European and global sustainability frameworks, and with health-sensitive urban planning approaches.

2.5 Main findings, identified gaps

2.5.1 Main Findings

The review of international, European, and national frameworks, alongside selected case studies, confirms that urban health is increasingly recognized as a critical enabler for sustainable and resilient urban development. However, its practical integration into urban policies and planning strategies remains inconsistent and fragmented across different governance levels [3], [7], [13].

Key findings include:

● Interdependence of Health, Sustainability, and Resilience: Health outcomes are intrinsically linked to urban sustainability and resilience objectives through shared determinants such as environmental quality, access to services, mobility patterns, and public space design [2], [5], [17].
Healthy populations are more adaptive to climate shocks and support stronger local economies, as recognized by both empirical research and EU strategic frameworks [17], [21].

● Health as a Cross-Cutting Issue: Urban health intersects with diverse policy areas (e.g., climate adaptation, mobility, social inclusion) but is often addressed in a siloed manner rather than through integrated, cross-sectoral strategies [6], [9].

● Public Space and Governance as Levers: Case studies highlight the pivotal role of public space and local governance in advancing health-supportive environments. Cities that prioritize participatory planning, green infrastructure, and active mobility demonstrate co-benefits for health, resilience, and sustainability [4], [14], [22].

● Emerging Good Practices: European cities increasingly incorporate health considerations into climate resilience strategies, sustainable mobility policies, and urban regeneration projects, aligning with broader EU policy objectives (e.g., Green Deal, Climate-Neutral Cities Mission) [9], [15], [19].

2.5.2 Identified Gaps

Despite growing recognition, several gaps hinder the full integration of urban health into sustainability and resilience frameworks:

● Fragmentation of Policies: Urban health remains insufficiently embedded in spatial planning and resilience policies, often treated as a secondary or indirect outcome rather than a strategic priority [3], [8].

● Lack of Standardized Indicators: There is a clear deficit in standardized, cross-sectoral indicators that link health outcomes with environmental, social, and economic resilience on the urban scale. This limits the ability to measure progress and compare results across cities [12], [20].

● Operational Disconnection: While policy frameworks acknowledge health, practical implementation tools, funding mechanisms, and institutional collaboration often remain fragmented between sectors (urban planning, health, environment) [6], [13].

● Limited Integration in National Frameworks (Greece): In the Greek context, urban health considerations are still underdeveloped within national spatial planning and resilience strategies, with limited alignment between health, environment, and urban policy agendas [8], [12].

● Reactive Rather than Proactive Approaches: Health is often addressed through reactive measures (post-crisis adaptation, public health emergencies) rather than through preventive, proactive planning embedded in urban design and governance [11], [18].

● Equity Considerations: While inclusion is emphasized in EU strategies, local implementation often fails to adequately address health inequalities linked to vulnerable groups, spatial disparities, and access to healthy environments [5], [7], [22].

A key insight emerging from this review is the pressing need to implement Integrated Urban Health Indicators that effectively link the environmental, social, and governance dimensions of urban sustainability, by integrating physical determinants with psychosocial aspects and social cohesion.

3 Problem Solution

3.1 Linkages between Urban Health, Urban Environment, Sustainability and Resilience

Urban health is not only a policy objective. It is a key determinant and catalyst of sustainability and resilience in contemporary cities. The relationship between public health, the built environment, environmental quality, and social cohesion is both multidimensional and dynamic. A holistic, cross-

sectoral, and spatially integrated approach is essential for designing cities that can withstand crises, adapt to uncertainty, and promote long-term well-being for all inhabitants [2], [5], [17].

A growing body of evidence confirms that urban form, infrastructure, mobility patterns, public space design, housing quality, and climate adaptation strategies have direct and indirect impacts on public health outcomes [6], [14], [21].

At the same time, health-sensitive design contributes to broader urban objectives, such as social equity, environmental performance, and economic productivity [13], [16].

Urban health must be embedded across systems thinking, where planning, governance, infrastructure, and services align to support health-positive outcomes. Resilient and sustainable cities are not only environmentally efficient or economically productive, but also socially just and health-promoting by design.

Beyond their physical and environmental dimensions, urban planning interventions must also be understood through a psychosocial lens. Urban environments must support mental well-being through equitable access to nature, safe public spaces, and participatory forms of governance.

This is not only a critical health issue, but also an urban sustainability one, due to its contribution in strengthening urban social function, economy, adaptivity, foresight and readiness. Addressing this issue within planning processes ensures that mental health, equity, and social cohesion are treated not as secondary benefits but as integral determinants of sustainability and resilience.

Recent methodological contributions by Sharifi and Yamagata (2018) [24], Honey-Rosés et al. (2020) [18] and the WHO Europe (2022) [4] highlight that the ability of cities to sustain collective psychological stability in the face of environmental and social stressors is increasingly recognized as a central feature of urban resilience, so composite, multi-dimensional indicators are critical to operationalizing the nexus between health, sustainability, and resilience in evidence-based urban planning.

3.1.1 Urban Planning for Public Health

Urban planning directly influences the environmental and social determinants of health. Key intervention domains include:

● Urban Governance & Digital Transition
Inclusive, multi-level governance frameworks, combined with digital tools such as smart platforms, digital twins, and urban dashboards, improve transparency, enable real-time health monitoring (air quality, mobility, green access), and foster data-informed decision-making.

Digital twins, for instance, are increasingly used to optimize resilience and health-related planning through interactive simulations [18], [23], [24].

E-governance also enables participatory planning and adaptive responses to health and climate challenges [20], [24].

● Public Space, Green Areas & Nature-Based Solutions (NBS)
Green infrastructure and nature-based solutions (e.g. parks, urban forests, rain gardens) mitigate heat, improve air quality, and support both physical activity and mental well-being. Quality public spaces facilitate social interaction and foster a sense of community, particularly in high-density areas [4], [9], [22].

Access to well-designed green spaces enhances mental health - especially in vulnerable groups - and reduces chronic disease risk [14]. Urban greening actions - like park creation, bioswales, and tree planting - mitigate heat islands and filter air pollutants.

● Urban Environment (Noise & Air Quality)
Chronic exposure to air pollution and noise is a major urban health risk, as it is linked to respiratory and cardiovascular diseases. Strategic spatial planning can reduce these exposures by creating low-emission zones, noise buffers, and green corridors, especially near sensitive uses like schools and hospitals [6], [12].

● Urban Transport & Active Mobility
Replacing car-dominated systems with active and clean mobility options improves air quality, reduces accidents and traffic injuries, and promotes daily physical activity. Walkable, bike-friendly cities also support greater social engagement and accessibility for all. These investments support mental well-being and reduce healthcare burdens.

This policy area is strongly supported by initiatives like the European Mobility Week, which promotes sustainable and active transport modes through local

actions and awareness campaigns across European cities [24].

● Affordable and Quality Housing
Access to safe, energy-efficient, and affordable housing mitigates health risks associated with overcrowding, inadequate heating or cooling, and indoor pollution. Housing location also shapes access to services [5], [21].

● Compact, Mixed-Use Urban Design
Compact and mixed-use urban forms shorten travel distances, reduce car dependency, and enable better access to amenities and services [5],[14].

They support healthier routines and strengthen urban vitality. This principle aligns with the 15-minute city concept, which promotes localized access to daily needs within a short walking or cycling distance, enhancing health, sustainability, and urban efficiency [10], [14], [27].
● Energy Neutrality & Climate Adaptation
Energy-neutral buildings and climate-adapted infrastructure (e.g., green roofs, permeable pavements) reduce environmental stressors while protecting residents from climate-induced health risks such as overheating or flooding. This approach is increasingly promoted through Positive Energy Districts (PEDs), which aim to produce more energy than they consume, while integrating renewable sources and improving urban resilience [19], [23].

● Urban Safety
Perceived and actual safety - whether from traffic, crime, or gender-based violence - influences how people use public space. Safe design (lighting, crossings, visibility) is essential for mental well-being, accessibility and inclusivity [6], [13].

● Accessibility of Services and Urban Nodes
Equitable access to healthcare, education, culture, recreation, and mobility is a precondition for public health. Spatial segregation and service deserts reinforce health disparities and social exclusion [5], [22].

● Social Equity, Cohesion & Inclusion
Vulnerable groups (low-income, migrants, children, elderly, persons with disabilities) often face higher exposure to health risks and limited access to supportive infrastructure. Inclusive planning addresses these inequalities and enhances collective resilience [7], [20].

● Well-being & Mental Health
Mental health is increasingly shaped by urban life. Cities that provide opportunities for rest, nature connection, socialization, and recreational activities help counter stress, anxiety, and urban loneliness [14], [17]. Even small green features (pocket parks) can contribute to this.

3.1.2 Urban Health as a Lever for Sustainability and Resilience

Urban health is not only an outcome of urban systems, but also a driver of transformative change. Healthier urban populations enhance the overall adaptive capacity, social cohesion, and productivity of cities.

● Resilience to Climate and Socio-Economic Shocks
Communities with better health are more resilient to disruptions such as heatwaves, pandemics, or economic crises. Integrating health systems within urban resilience frameworks ensures faster, more coordinated crisis response [3], [11], [18].
● Contribution to Sustainable Economic Systems
Health is a foundation for human capital, labor force participation, and economic innovation. By reducing public health costs and enabling active citizenship, urban health supports fair, circular, and future-proof urban economies [21], [23].

3.1.3 Mental Health and Urban Resilience in the Post-COVID and Climate Crisis Era

Integrating psychological resilience into post-COVID and climate-sensitive urban planning.

Urban health must be expanded to systematically include its psychological and psychosocial dimensions, especially within the context of compounding crises faced by contemporary cities.

The COVID-19 pandemic revealed the mental health vulnerabilities of urban populations, with increased levels of stress, isolation, and anxiety - particularly among youth, women, and socially marginalized groups. The accelerating climate crisis is amplifying psychological impacts through phenomena such as climate anxiety, eco-grief, and post-disaster trauma [25],[26].

Mental health is no longer a secondary concern; it is a key determinant of urban resilience. According to WHO Europe (2021), over 25% of urban residents reported worsened mental health symptoms during and after the pandemic. Cities exposed to repeated climate hazards - such as heatwaves, flooding, or wildfires - report increased cases of post-traumatic

stress disorder (PTSD), emotional fatigue, and social withdrawal.

Urban design can act either as a protective factor or a driver of psychological distress. Factors such as lack of access to green space, overcrowding, traffic congestion, and the exclusion of vulnerable groups from the public realm can exacerbate mental health risks.

Conversely, planning interventions that prioritize healing environments, quiet zones, green-blue infrastructure, and inclusive public spaces can mitigate stress, support emotional well-being, and strengthen a sense of belonging and community [14], [17], [22].

In this regard, it is essential to incorporate mental health indicators into urban monitoring systems (e.g., urban dashboards) and urban policy tools such as Health Impact Assessments (HIAs). These indicators may include perceived safety, access to green spaces, prevalence of loneliness or anxiety, proximity to supportive services, and community cohesion scores. Mapping such indicators spatially can help reveal inequities and guide targeted policy responses.

Moreover, the establishment of municipal psychosocial support networks - integrated through local health units, schools, youth services, and neighborhood hubs - is critical in addressing the "invisible trauma" generated by prolonged uncertainty and collective crises [25], [26].

3.1.4 Differentiated Vulnerability and Urban Equity in Resilience Planning

Urban vulnerability is not uniform - it is deeply shaped by social, spatial, demographic, and institutional inequalities. While many urban strategies refer to “vulnerable groups” in general terms, resilient and health-sensitive planning must explicitly recognize and respond to diverse forms of vulnerability, which intersect and evolve over time [7], [12], [20].

Key vulnerable populations in urban contexts include:

- Children and adolescents: sensitive to environmental stressors, limited autonomy of movement, high dependency on service access [12].
- Elderly populations: increased exposure to heat risk, mobility limitations, social isolation [5], [21].
- People with disabilities (PWDs): face multiple barriers in accessing safe, healthy, and inclusive environments [12], [20].
- Low-income residents: concentrated in high-density or substandard housing, exposed to pollution, limited access to health services or green space [2], [14].
- Migrant and refugee populations: often face spatial segregation, legal precarity, and barriers to social inclusion [7], [20].
- Women and gender minorities: exposed to gender-based violence, transport insecurity, or exclusion from participatory processes [6], [12].

Urban resilience policies must go beyond "equality of provision" to embrace equity of outcomes. This requires the following actions:

- Spatial justice: ensuring access to services, mobility, and healthy environments is not concentrated in privileged zones [5], [20].
- Gender-sensitive and age-friendly design: adapting infrastructure, safety measures, and services to diverse needs [6], [12].
- Targeted outreach and participatory mechanisms: involving underrepresented voices in planning and monitoring [23].
- Data disaggregation: collecting and using indicators by age, gender, income, migration status, and ability level [24].

Equity-centered planning recognizes that some groups require different levels and types of support to achieve equivalent outcomes in health and resilience. It is not enough to design resilient cities for the average citizen - we must plan with and for those most at risk [17], [21].

3.2 Policy Recommendations

Building healthy, sustainable, and resilient cities requires a shift from fragmented, sector-specific approaches to integrated, systemic, and equity-oriented policy frameworks.

The following recommendations aim to inform local and national policy agendas, support multilevel governance efforts, and guide the operationalization of urban health within sustainability and resilience strategies [1], [5], [10], [21].

- Strengthening Urban Governance Structures, Promoting Digital Governance and Participatory Urbanism

Urban governance should be reinforced through institutional mechanisms that enable coordination across multiple policy domains. Governance structures play a central role in aligning health outcomes with sustainability and resilience goals.

This includes collaboration between municipal departments, ensuring vertical coordination between local, regional, and national levels, and promoting integrated urban policy-making [2], [3].

Equally important is the promotion of civic participation in decision-making processes. Inclusive governance frameworks that engage citizens - particularly vulnerable and underrepresented groups - enhance legitimacy, foster community ownership, and ensure that health-related strategies reflect real, place-based needs.

Civic engagement mechanisms such as participatory budgeting, local health councils, and neighborhood assemblies should be institutionalized as part of a resilient and health-sensitive urban governance model.

E-governance platforms, urban digital twins, and open data tools can improve transparency, participatory planning, responsiveness to public health needs and improve urban foresight [17], [19].

Participatory approaches such as health observatories, co-design workshops, citizen panels, and community-based planning processes increase legitimacy, address local needs, and foster trust [4], [15].

Cities should prioritize digital inclusion to ensure vulnerable populations are not excluded from these tools. This promotes equity and social trust, essential to resilience and sustainability transitions [12].

Local authorities should be empowered to implement health-sensitive strategies at the neighborhood level.

● Identifying Barriers and Leveraging Opportunities, Aligning Local Strategies with National and EU Funding Instruments

Common barriers to health-oriented urban policy include institutional silos, data fragmentation, insufficient funding, limited technical capacity, and lack of political continuity [5], [6].

Urban health is still often addressed in a reactive rather than preventive manner, and its integration into spatial and resilience planning is frequently ad hoc or symbolic.

However, growing support at the EU and international levels creates new opportunities for cities to accelerate action [18].

Municipalities are increasingly encouraged to engage in strategic initiatives and policy platforms that support integrated urban transformation. These include:

● the WHO Healthy Cities Network, which promotes health equity and cross-sectoral urban governance [7],
● the EU Mission for Climate-Neutral and Smart Cities, which supports innovation-driven climate action with health co-benefits [6],
● the European Mobility Week, which promotes sustainable and active transport systems [20],
● the Driving Urban Transitions (DUT) Partnership, focused on 15-minute cities, circular economies, and energy-positive neighborhoods [9],
● the European Urban Initiative (EUI), offering funding and capacity-building for place-based urban innovation [22].

Participation in such frameworks not only provides access to funding, tools, and peer learning, but also enhances political commitment, institutional capacity and strategic continuity for embedding health, sustainability, and resilience in urban strategies, in the context of health-sensitive urban strategies [6], [10], [23].

To ensure financial feasibility, local governments must align their strategic urban development plans with available funding streams at EU and national level. Instruments such as the Recovery and Resilience Facility (RRF), ERDF, Horizon Europe, and LIFE offer targeted opportunities to support actions at the intersection of health, climate, and urban development.

● Mainstreaming Health-Sensitive Urban Design, Integrating Health Indicators into Planning and Resilience Tools, Supporting Data-Driven Monitoring and Adaptive Management, Advancing Cross-Sectoral Collaboration

Urban health must be institutionalized across the policy cycle, not treated as an externality.

Municipalities should integrate health indicators into spatial planning tools, zoning regulations, and impact assessments to systematically embed well-being into city design [13], [14], [24].

Urban design should systematically address the social and environmental determinants of health.

Recommended actions include:

● Urban design standards promote walkability, green infrastructure, safe mobility, and social inclusion [8], [14].
● Use of tools such as the Healthy Cities Generator and urban health modeling platforms for ex-ante Health Impact Assessments (HIAs) [16], [24].
● Institutionalization of HIA alongside Environmental Impact Assessments (EIAs), ensuring health becomes a mandatory consideration in urban development [13].
● Development of urban health observatories or dashboards that combine health, environmental, and socio-spatial indicators for continuous monitoring and adaptive management [17].
● Cross-sectoral coordination platforms — such as joint urban-health task forces or interdepartmental working groups — can strengthen cooperation across public health, spatial planning, mobility, housing, and environment departments [12], [18].
Municipalities are encouraged to invest in:
● Equitable access to green and blue spaces
● Safe, walkable, and cyclable public spaces
● Accessible public transport and essential services
● Mixed-use and inclusive neighborhoods
● Spaces that promote mental well-being, rest, and social interaction

This integrated approach enhances both individual and collective resilience.

Health-related indicators - such as air quality, access to green space, proximity to services, physical activity levels, and vulnerability to environmental hazards - should be systematically embedded into spatial planning tools, zoning frameworks, and urban resilience assessments.

This integration enables evidence-based decision-making, facilitates cross-sectoral collaboration, and ensures that urban strategies are aligned with well-being objectives.

In this context, the use of Health Impact Assessment (HIA) methodologies becomes increasingly important. A growing number of tools - such as the Healthy Cities Generator and other urban health modelling platforms - are available to support the ex-ante evaluation of how urban projects and policies influence population health. These tools help identify unintended consequences, promote equity-sensitive planning, and align urban development with public health goals [16], [24].

Health Impact Assessment should be institutionalized in a similar way to Environmental Impact Assessment (EIA), becoming a standard requirement for major urban policies, infrastructure investments, and land-use plans [6], [16], [20].

Embedding HIA in the policy cycle - from visioning to implementation - ensures that health is not treated as an afterthought, but as a central criterion of sustainable and resilient urban governance.

Robust data systems are essential for tracking progress, identifying disparities, and adjusting policies. Municipalities should develop and maintain urban observatories or dashboards that monitor urban health indicators alongside environmental and social metrics [18], [23], [24].

This enables adaptive management and promotes accountability in delivering on sustainability and resilience goals.
Urban health is inherently intersectoral. Stronger collaboration is needed between departments of public health, urban planning, environment, housing, mobility, and climate resilience.

Institutional platforms for interdepartmental coordination (e.g., joint working groups, task forces) should be established, supported by shared data systems and common indicators.

Translating international and European frameworks into the Greek policy context requires a shift from sectoral planning to integrated, cross-domain and multilevel governance.

Urban health principles should be systematically embedded within all mainstream public investment programmes to ensure coherence across spatial, environmental, and social objectives.

At present, however, health-related goals are addressed only indirectly, with limited institutional mechanisms linking spatial planning processes to measurable public health outcomes.

● Local insights: The case of Chalkida - participatory planning

Evidence from the Chalkida study reinforces the centrality of participatory governance in advancing urban resilience, sustainability, and health.

The research demonstrated that the effectiveness of spatial and policy interventions is strongly

conditioned by the active involvement of local communities, stakeholders, and civil society in the planning process.

Participatory approaches not only enhance the legitimacy and social acceptance of urban strategies but also unlock local knowledge and capacities that are crucial for addressing complex challenges such as climate adaptation, health equity, and sustainable mobility.

In this sense, participatory planning emerges as a prerequisite for resilient and sustainable urban futures, ensuring that strategies are not only technically sound but also socially and health-wise embedded.

Scaling up this model could help institutionalize health as a measurable pillar of sustainability and resilience across Greek cities.

4 Conclusion

In the face of global challenges — such as climate change, socio-spatial inequalities, public health crises, and rapid urbanization — the intersection between urban health, sustainability, and resilience is no longer optional but imperative [1], [2].

This paper has argued that urban health is not merely a byproduct of good urban planning, but a strategic enabler and performance indicator of a city's capacity to adapt, transform, and thrive [3], [5].

The integration of health considerations into urban governance structures, spatial policies, and infrastructure design holds the potential to generate co-benefits across environmental, social, and economic dimensions.

When urban health is proactively addressed, cities become more inclusive, environmentally sound, and socially cohesive—traits that are essential for long-term resilience [4], [6], [10].

The review of international frameworks highlights a growing convergence around health-centric urban sustainability transitions [6], [7], [9], [23].

Yet, at the implementation level — particularly in national and local contexts — urban health remains fragmented, often treated as a secondary concern or siloed within the health sector.

The analysis also reveals that specific planning interventions — such as active mobility, greening, compact neighborhoods, accessible public services, and inclusive urban governance — have measurable impacts on physical and mental well-being [5], [10], [12].

Moreover, data-driven tools and health impact assessments can support more responsive, anticipatory, and citizen-centered policy design [13], [14].

Despite the progress made, significant gaps remain. These include the lack of standardized urban health indicators, limited integration into resilience frameworks, underdeveloped national strategies (as in the Greek context), and uneven local capacities.

More specifically,

- Urban health is still fragmented across sectors and is often viewed as secondary to other urban goals [6], [11].
- There is a lack of standardized indicators linking health to spatial and resilience planning [17], [24].
- National frameworks (e.g., in Greece) show limited institutional integration between health, environment, and spatial governance [8].
- Approaches are often reactive (e.g., heatwave or pandemic responses) rather than proactive and preventive [13].

Addressing these challenges requires a systemic shift from reactive, sectoral approaches to proactive, crosscutting, and equity-based planning.

To this end, the paper proposes some key policy recommendations aimed at:

- Strengthening governance and civic participation, including digital inclusion and participatory urban health processes [4], [20]
- Institutionalizing health impact assessment, as standard practice in urban projects and policies [16]
- Aligning municipal strategies with EU instruments, enabling implementation and scaling of health-sensitive solutions [6], [9]
- Mainstreaming health-sensitive design in all phases of urban development [12], [13].

Finally, cities must seize the policy and funding opportunities provided by European initiatives which not only support innovation and peer learning but also contribute to embedding health at the core of sustainability and resilience strategies.

Doing so will enhance their institutional capacity, governance maturity, and ability to deliver systemic, inclusive, and equitable transitions [7], [21].

In conclusion, prioritizing urban health within urban development is not a sectoral ambition but a cross-cutting imperative. It is both a moral responsibility and a strategic opportunity - a foundation for healthier societies, stronger communities, and cities better equipped to face the uncertainties [1], [3], [5].

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