

Article

Integrating Health and Smartness—New Sustainable Paradigms for the Urban Environment: A Case Study in Lianshi Town (China)

Caterina Pietra  and Elisabetta Maria Venco 

Department of Civil Engineering and Architecture, University of Pavia, 27100 Pavia, Italy; caterina.pietra@unipv.it

* Correspondence: elisabettamaria.venco@unipv.it; Tel.: +39-0382-98-5409

Abstract: The concepts of healthy cities and smart cities are popular in emerging research in the 21st century. This study focuses on the existing interrelations between the two notions in terms of socio-spatial quality, technology, and innovation, particularly regarding industrial sites that no longer have a role and constitute ‘urban voids’ with high volumetric concentrations. The fast expansion of cities and the de-industrialization phenomena have resulted in such void-producing blights that compromise public health; environmental quality; and social, economic, and living conditions. Therefore, the authors intend to emphasize the relevance of citizens’ and communities’ engagement in shaping new healthy and smart urban environments. The present method relies on a literature review to describe the current theoretical and practical dimensions of such topics, identifying synergies and trade-offs. After this, a case study in China is presented to support the discussion. The site, a former granary, is located in Lianshi, a traditional water-edge town in the central area of the Yangtze River Delta. The proposed example enhances solutions that meet healthy and smart requirements, transforming the former industrial area into a social catalyst, acting as an effective motivator for urban development. One such theoretical approach is exemplified by a project that won a national architecture competition in 2018, the ‘Taihu Cultural Heritage Rehabilitation Competition’. The latter is then validated through practical solutions in a real-world context by analyzing the ‘Cuckoo’ project developed in 2021 for the same area. Overall, the integration of healthy and smart elements is proposed by the authors as an effective method to achieve more holistic and sustainable city development from both theoretical and practical points of view.

Keywords: smart cities; healthy cities; environmental sustainability; industrial regeneration; urban renewal



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1. Introduction

Nowadays, contemporary cities serve as the epicenter of human experience, technological advancement, and public health. The rapid pace of urbanization significantly impacts the emergence and progression of health and well-being issues, developing challenges that experts must confront and resolve [1–5]. While certain temporary, immediate, or short-term measures [6] might be identified, these actions are incapable of guaranteeing sustainable and enduring solutions. The latter typically require more profound alterations in the composition and behavior of a system.

Regarding urban issues, the widespread presence of ‘urban voids’ due to the rapid growth of cities and the de-industrialization phenomenon significantly affects citizens’ quality of life and their environmental impact. Indeed, industrial sites commonly present a multifaceted pollution profile involving an array of pollutants dispersed in the air, water, and soil [7].

The widespread economic restructuring and long recession of the 1970s led many industrial cities into an era of de-industrialization, characterized by severe economic decline and the loss of employment in manufacturing industries. Furthermore, suburban

growth caused the decentralization of production, trade, and population away from the central urban areas. Additional reasons that led to such consequences are related to the outsourcing of production in developing economies, the obsolescence of certain public infrastructure, more general modifications of the new economy, many changes in production techniques and processes, and the cessation of activities that were no longer competitive in the local market or no longer met environmental hygiene standards [8–11]. Thus, the highly accessible and intensely infrastructure-industrialized areas have turned into brownfields.

Starting from the 1980s, several definitions have arisen [12,13]. In the United States, the Environmental Protection Agency (US EPA) defines brownfields as abandoned, idling, or underutilized industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived contamination. The definition proposed by Alker et al. [14] is quite broad and widely accepted: “any land or premises which has previously been used or developed and is not currently fully in use, although it may be partially occupied or utilized. It may also be vacant, derelict, or contaminated. Therefore, a brownfield site is not necessarily available for immediate use without intervention”.

In China, the term ‘brownfield’ was first mentioned by Niu [15]. During the first industrialization period, the decline in traditional industries and the relocation of many factories led to a large number of unused and abandoned sites. Officially, in 2010, the World Bank’s Waste Management in China: Problems and Suggestions stated that there were “at least 5000 brownfield sites”; the real estimation is undoubtedly higher [16]. Moreover, at present, there are no specific policies or regulations for brownfield management and redevelopment, but there are numerous national-level documents related to soil pollution control [13].

Europe, where approximately 70% of the population lives in urban or suburban areas [17], is challenged by urban sprawl, scattered development, urban dispersion, soil sealing, and air, soil, and water pollution. Investments in green space and brownfield restoration are seen as new development opportunities [18].

In this context, for over 150 years, an extensive and continually growing body of research has shown that the planning and administration of cities significantly influence the health and well-being of urban residents [5,19]. Urban health is the result of interactions within the environmental, social, and economic domains [20–22]. Consequently, since challenges to urban health emerge as integral components of various cause-and-effect relationships across urban sectors, potential solutions must consider the complexity of the issue [23]. In this sense, urban regeneration constitutes an integrated approach involving vision and action, favoring the overall improvement of disadvantaged places (ranging from buildings, neighborhoods, cities, and regions) to increase their sustainability level [24]. In the 2016 Shanghai Declaration, the World Health Organization (WHO) stated that health acts as a highly significant indicator of a city’s sustainable development [25], reinforcing its position in advocating the necessity to promote ‘healthy cities’ [26].

The urban system derives health benefits if the interconnectivity layer facilitates access to diverse data and resource flows. In particular, the interconnectivity among urban areas must enhance the availability of spaces that can improve health and well-being, contingent on the level of infrastructure development in each sector [5]. The imperative for cities to actively engage in the ongoing ‘data revolution’ implies the need for expanded discussions and debates concerning the utilization of technology, big data, and citizen science for the promotion of smart cities and the advancement of urban planning [27–29]. In this case, the primary implementation tool is represented by technology and innovation. Overall, smart cities positively and actively support strategies exploiting innovation to strengthen the global competitiveness and sustainability of the urban environment [30,31].

Healthy and smart cities notions are both centered on the achievements related to the level of socio-spatial quality, which is derived from applying solutions enhancing the value of virtual and material services and urban infrastructures (the systems providing water, energy, food, shelter, transportation, communication, health, waste management, public areas, etc.).

Additionally, insights drawn from the complexity theory of cities point out the essential need to integrate both scientific and societal elements in actively addressing urban challenges by providing access and enhancing people's capabilities [5,32–34]. Therefore, social infrastructure plays a fundamental role in the approach to urban regeneration, involving science in producing knowledge and supporting a broader collective process that considers multiple spatial scales, sectors, stakeholders, and research disciplines [35]. Particularly, relationships with citizens, living close to the neglected areas, and sharing specific objectives has to be enhanced to build positive cultural networks and support social cohesion for the healthy and smart regeneration process.

The current work presented by the authors supports the urban regeneration process towards the creation of healthier and smarter cities. Indeed, it demonstrates the potential of brownfields for redevelopment and interdisciplinary experimentation to enhance community health and innovation. More specifically, attention is placed on a former industrial area in Lianshi, a traditional water-edge town located in the central area of the Yangtze River Delta. The case study emphasizes urban strategies that can facilitate the area's positive, sustainable transformation. Moreover, the authors stress the importance of citizen engagement in shaping new urban environments. The case study is verified through both a theoretical and practical framework, converging into a holistic approach linking healthy and smart elements.

2. Healthy and Smart Cities: A Comparison

The concept of healthy cities emerged in the 1980s as part of a World Health Organization (WHO) initiative driven by the goal of promoting health on a global scale through local actions [36]. The concept of smart cities, on the other hand, emerged more recently and originates from technology companies in the private sector, evolving with scientific methods and computational analysis in urban planning. Smart cities refer to the utilization of innovations and technological resources in urban infrastructure and services. The European Commission defines a smart city as a place where digital and telecommunication technologies enhance traditional networks and services for the benefit of inhabitants and businesses [37,38].

Consequently, healthy cities emphasizes enhancing individuals' environmental, economic, and living conditions to promote overall health [39]. In smart cities, the focus shifts towards fostering the concentration of human capital, attracting businesses, and catalyzing activities that transform cities into hubs of global competitiveness [40].

A healthy city is defined as follows: "it is one that is continually creating and improving those physical and social environments and strengthening those community resources which enable people to mutually support each other in performing all the functions of life and achieving their maximum potential" [41]. In particular, the fostering of healthy cities includes notions deriving from:

1. Primary health care: implementing the WHO Health for All [42] strategy to prioritize essential healthcare services accessible to all community members;
2. Health promotion: encouraging proactive measures to improve health and prevent illnesses;
3. Ottawa Charter (1986): embracing the idea of health as a continuous process and recognizing the need for new skills, processes, styles, and governance structures;
4. Health beyond the absence of disease: viewing health holistically, considering physical, mental, and social dimensions;
5. Agenda 21: aligning with the principles of sustainable development and addressing environmental and social factors affecting health.

The health policies implemented over time were founded on robust partnerships, health determinants, community development, and monitoring initiatives [43]. Efforts were directed towards clarifying the community's responsibility throughout and beyond the process, encompassing both the initial framing of the problem and the final evaluation concerning work outcomes.

The healthy cities (HCs) movement underscores the significance of the procedural aspect, dividing it into three primary components. The first component mandates that the involved cities establish a substantial political commitment connected to a shared vision at the local level. The second component addresses the engagement of a diverse range of stakeholders, including local communities [5]. This action determines a shift from an exclusively expert-led health agenda to one that emphasizes the role of the community, fostering empowerment and participation [44–46]. The last part necessitates the implementation of the strategy within the local government, requiring a city health plan derived from intersectoral partnerships and stakeholder engagement.

When evaluating city transformations, the healthy cities concept presupposes that people possess knowledge about the territory, which enables them to act in their favor. Consequently, strategies are expected to arise from the community, playing a pivotal role in shaping public policies with governments, emphasizing the bottom-up approach in this concept. When considering the development of a smart city, both bottom-up approaches from citizens and top-down approaches from planners and managers are taken into account. In this context, Dameri [47] put in evidence a top-down approach involving the application of government rules and policies, as well as a bottom-up approach grounded in applying technology to urban challenges. This approach recognizes that integrating technology into urban activities can broaden citizens' potential access to the city, with citizens contributing data to collaboratively address shared issues.

In terms of achieving outcomes, the requirements for being labeled as 'smart' or 'healthy' and the directions for action also vary. In the field of smart cities, particularly when considering the perspective of private initiatives, interventions are often geared towards yielding returns within short-term horizons [5]. In contrast, within the context of healthy cities, the focus is on an ongoing improvement process and long-term perspectives to overcome the risk of 'projectism' [48] and to promote sustainability and non-exclusivity.

Political commitment denotes a crucial objective linked to the correct utilization of resources aimed at mitigating inequalities. Securing engagement and dedication from the political sphere, in conjunction with valuable stakeholder support, form critical prerequisites for implementing enduring change. Additionally, the healthy city vision provides local governments with a leadership role, empowering them to safeguard and enhance citizens' health and well-being [5].

The robustness of the approach is evident when utilizing process indicators, representing a pivotal element in measuring actions and engaging directly with the community. These indicators can also assess the sustainability aspect of healthy city projects [49].

Finally, another aspect where the distinctions between the concepts of a Healthy City and a smart city are noteworthy is in their treatment and understanding of the environment. While both concepts express a commitment to preserving natural resources, there is an implicit difference. In healthy cities, nature is regarded as an essential natural asset for health and quality of life, considered a universal right that should not be monetized. On the other hand, the concept of a smart city emphasizes nature as a natural resource serving the needs of society's reproduction. In this case, the focus is on rationality, efficiency, and occasionally the valorization of specific areas in urban spaces distinguished by environmental amenities, with secondary consideration given to concerns about social relations and overall social and environmental issues.

Overall, a smart city contributes to maintaining a stable ecosystem, a crucial aspect for a healthy city. Consequently, initiatives for a smart city have the potential to contribute to the development of a healthy city, and vice versa. This synergy arises from the understanding that individuals with high levels of health, education, quality of life, etc., are more likely to actively participate in the transformation of cities.

The authors embraced the healthy and smart perspective to allow planners and policymakers to consider a broad range of factors that can contribute to the overall urban quality of life. It also helps uncover potential trade-offs that may arise between different urban development goals. Moreover, understanding the overlaps and differences between

healthy and smart city initiatives enables more informed decision-making processes that consider multiple dimensions of urban well-being. Lastly, comparing smart and healthy cities provides insights into how these challenges can be addressed through integrated approaches that leverage technological innovation, public health strategies, and community engagement, plus ensuring long-term environmental, social, and economic sustainability. Figure 1 effectively summarizes the main components characterizing both concepts and highlights common elements to be taken into consideration and implemented in the proposed case study.

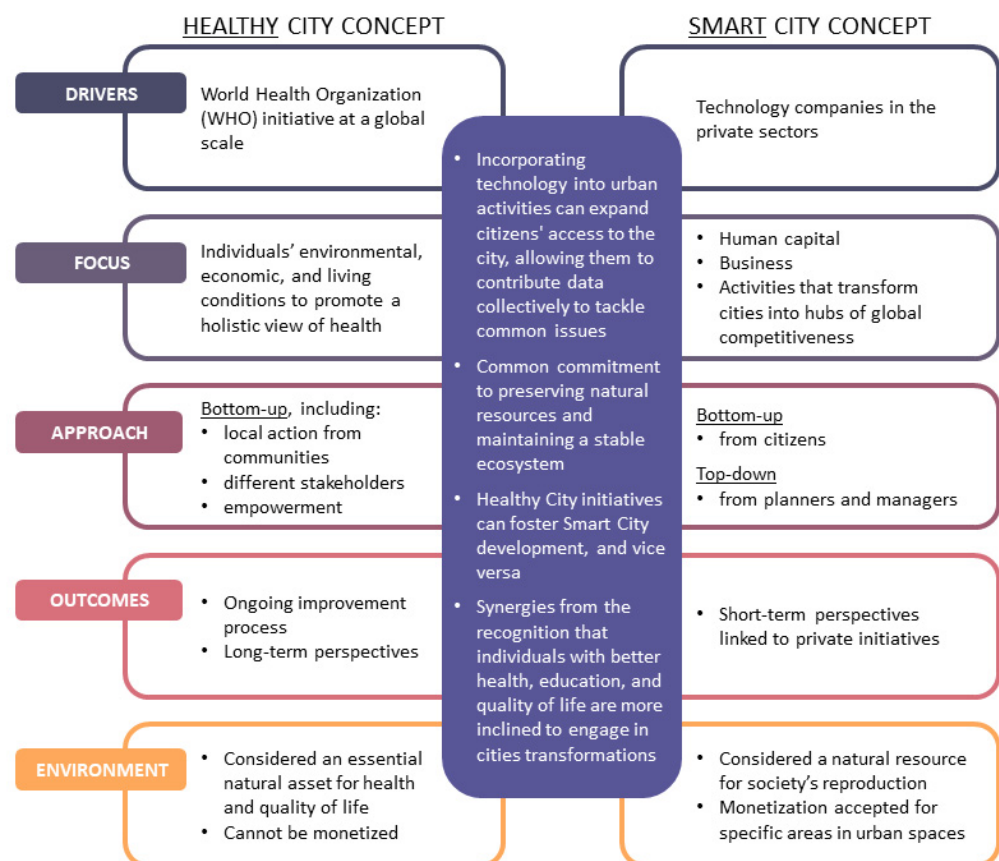


Figure 1. Main components of healthy and smart city concepts.

3. Materials and Methods

The work presented by the authors analyses the case study of a former granary, which is part of Lianshi Town's built heritage, by taking into consideration healthy and smart elements to demonstrate both theoretical and practical urban regeneration approaches.

In particular, the materials and methods encompass a multidisciplinary approach, including three main steps. The process started in 2018, when the site was selected to participate in the 'Taihu Cultural Heritage Rehabilitation Competition'. The goal was to investigate the preservation and rehabilitation of this built heritage within the framework of the on-going transformation of urban development models. Indeed, the architectural contest was part of a bigger event held on 27 November 2018, in the Nanxun Ancient Town titled 'Nanxun Summit Forum on Cultural Heritage Around Taihu Lake'. The latter was co-sponsored by the College of Architecture and Urban Planning (CAUP) of Tongji University, the Huzhou Municipal Bureau of Culture, the Nanxun District People's Government, and the Huzhou Municipal Planning Bureau.

The 'Community Condenser' is one of the ten projects that participated in the competition. One of the authors developed the proposal in collaboration with other three team members from different international institutions and won the third prize.

In the context of national development and urban planning, architectural competitions emerge as effective catalysts for innovation and excellence [50–53]. Moreover, they can reflect the nation’s identity and values: through the design process, architects often draw inspiration from a country’s history, culture, and heritage. This opportunity facilitated the development of a cohesive vision tackling the key challenges and opportunities for the selected area and the urban context in which it is located. The selected designs, therefore, go beyond mere structures, representing symbols of national pride and cultural expression. By investing in the selection of remarkable designs, governments send a strong message regarding their dedication to create aesthetically pleasing, functional, smart, and sustainable spaces that contribute to the overall well-being of their citizens.

The Lianshi Town case study is a valuable example of how these principles can be applied and validated in a real-world context. Indeed, the second phase of the process refers to what occurred in 2021, when the project was concretely implemented by the Office Canopy of Architecture in collaboration with Xiangban Cultural Tourism to renovate the granary station area in Lianshi Town, translating the conceptual designs and programs into tangible urban interventions. The Office Canopy of Architecture represents an architectural firm in Hangzhou that proactively intervenes to implement a new local identity to the site, named ‘Cuckoo’, emphasizing sustainable development and urban renewal.

The third and last step of the methodology consists of the effective synthesis and discussion of the healthy city (HC) and smart city (SM) solutions that have been integrated in both projects, demonstrating how the competition results enabled the actual urban development in Lianshi Town. Figure 2 displays a diagram explaining the components of the methodology.

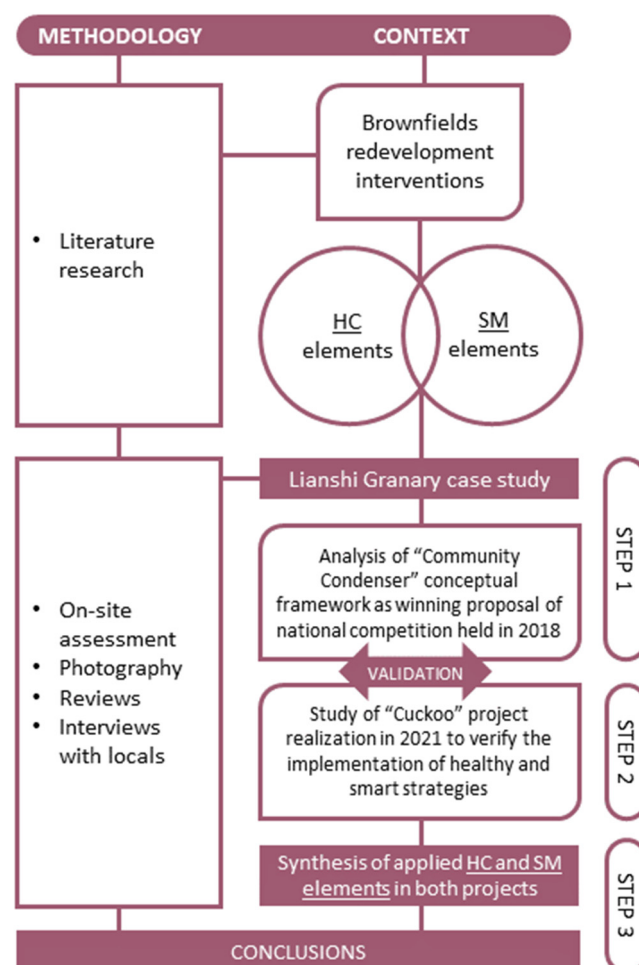


Figure 2. Methodological diagram of the study.

3.1. Lianshi Case Study

Lianshi Town, included in Nanxun District of Huzhou City, Zhejiang Province, is situated at the geographical center of the Hangjiahu Plain, the most extensive plain of the province [54]. Moreover, Lianshi is located in the southern part of Lake Tai, China's third-largest freshwater lake, in the central region of the Yangtze River Delta, approximately 3 h away from Shanghai (Figure 3). The Beijing–Hangzhou Grand Canal traverses the entire Lianshi territory from south to north.

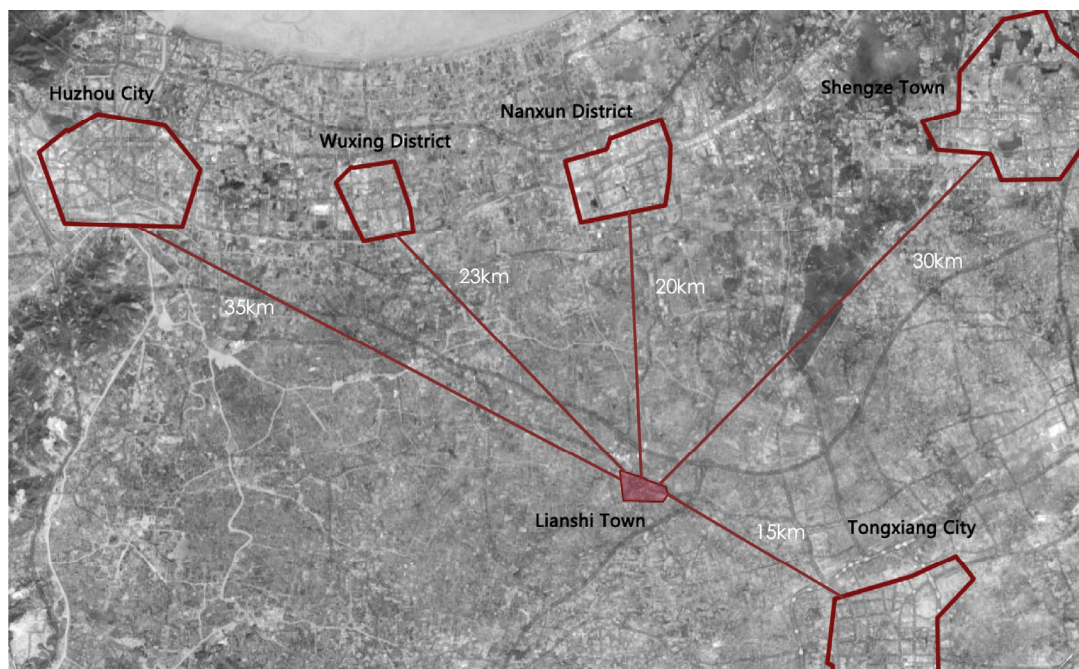


Figure 3. Lianshi Town localization.

A traditional water-edge town setting and a rich natural environment surround Lianshi Town, making this area among the most developed in Chinese history. Additionally, it is renowned as the primary grain and silk production hub in the Yangtze River Delta. Therefore, the region is pivotal in contributing to the agricultural and textile industries.

Notably, the focus is placed on the regeneration project developed for the former granary in the southern Lianshi area. The site, occupying an area of 15,000 sq.m, is recognized as an integral part of the built heritage. Originating around the 1950s as a granary for rice collection and trade, the complex was strategically constructed along one of the canals branching off the Beijing–Hangzhou Grand Canal. Its development was subsequently influenced by the various events that marked China's history, particularly following the establishment of the People's Republic of China. Indeed, the granary was abandoned in the 2000s, evolving into an integral architectural element linked to the cultural heritage of that era. Therefore, standing as a symbol of traditional local culture, it underscores the necessity for preservation and rehabilitation.

3.2. Brief Historical Background

For over a thousand years, Lianshi has stood as a riverside market town along the Jiangnan Canal, witnessing the passage of numerous travelers moving between the North and South. The Jiangnan Canal is one of the six sections into which the Beijing–Hangzhou Grand Canal is divided. Indeed, before the 1980s, Lianshi functioned as a typical agricultural town catering to the needs of the surrounding villages and serving as a hub for the distribution of agricultural products, including silk and rice [55].

As the 21st century unfolded, together with the decline in traditional waterway transportation, the town underwent an accelerated pace of urban industrialization, with Lianshi establishing itself as a stronghold in key industries such as equipment manufacturing, new metal materials, and textile apparel. Therefore, Lianshi achieved its status as an industrial strength in Huzhou City through diligent and pragmatic efforts by the government. Today, nearly half of the town's area is now dedicated to planned industrial land (Figure 4).

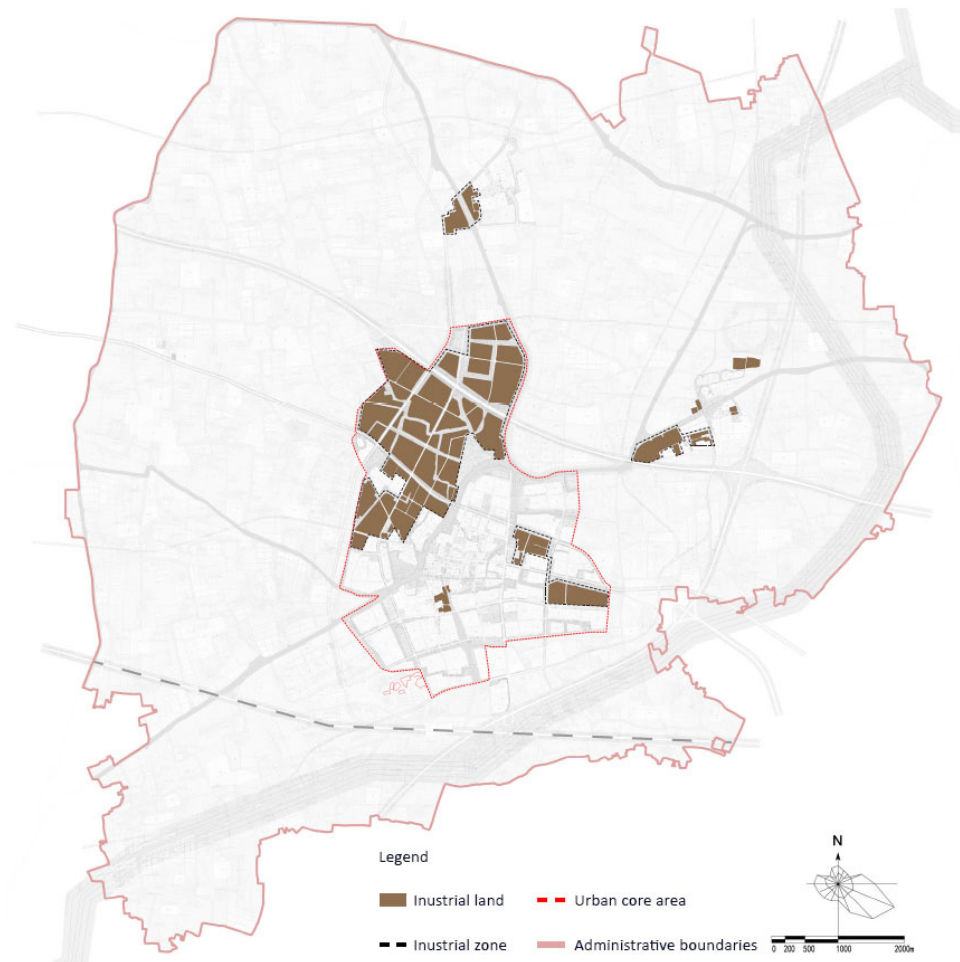


Figure 4. Industrial land distribution in Lianshi Town (picture: © Office Canopy of Architecture).

In this specific urban context, the abandoned granary, situated at the heart of the town, represents a significant testimony of the initial Lianshi industrialization and the evolving times. Established in the 1950s, the grain depot includes a large open-air granary with a 15 m diameter, ten conical silos arranged in a single row, and over ten rectangular factory buildings (Figure 5). The overall industrial complex is well-preserved and stands as the area's most architecturally valuable vernacular site. Moreover, it has been listed among the municipal-level cultural heritage buildings in Huzhou City [55].

In 1956, several private rice businesses in Lianshi transitioned to public-private partnerships, and the building was subsequently renamed as the state-owned Lianshi Rice Factory. It marked the earliest industrial enterprise in the history of Lianshi and emerged as the sole state-owned enterprise at that time. In 1969, the first export of Chinese grain originated from this production plant. In November 1970, subsequently merging with the Grain Management Office, the factory changed its name to Lianshi People's Grain Station [55]. In the 1980s, a period of reforms occurred, during which the construction of a new road was approved, i.e., Zhongji Road, with the granary cluster located on its east and west sides. The latter was later enlarged in the 2000s through the demolishing of some

industrial buildings that were part of the cluster. After various additional transformations, it ultimately ceased production and went out of business in the second half of 2009.



Figure 5. Bird's-eye view of the old granary station (picture: © Office Canopy of Architecture).

3.3. The Optimal Strategy for Regeneration: Health and Smartness Combined

Currently, Lianshi Town has a stable population of around 106,000 inhabitants, comprising roughly 85,000 residents and approximately 21,000 migrant residents [54]. As evident from previous descriptions, the actual numbers derive from the area's historical evolution, which is strictly linked to its industrial history. Indeed, statistical reports from different years show that the global industrial output value of Lianshi Town was CNY 2.1 billion in 2000, further reaching CNY 26 billion in 2022, marking a remarkable tenfold increase over a span of more than 20 years. This growth highly affected the population rate, shifting from 18.6% in 2000 to 78.9% in 2020 [55].

Data demonstrate that a significant portion of the local population has migrated to major cities over the past two decades. Nevertheless, at the same time, the rural and immigrant populations have adapted to the urbanization and industrial development occurring in Lianshi from the beginning of the 21st century, thus filling the void left by the outflow.

A careful survey conducted by Tang and Jiang [54] subdivided Lianshi into three main demographic categories: elderly, middle-aged individuals, and teenagers. Notably, a considerable segment of the population comprises the elderly and teenagers, constituting one fundamental element of the overall regeneration strategy. As previously discussed, healthy and smart paradigms recognize the pivotal role of citizens and emphasize the importance of social participation. Additionally, the synergy between technological innovation, citizen engagement, and a focus on well-being contributes to smartness and promotes the residents' health and quality of life. Anttiroiko et al. and Hollands [56,57] assert that placing the citizen at the core of urban innovations is essential, given that the primary challenges in urban areas derive from sociological rather than technological foundations.

Therefore, integrating healthy and smart elements within the specific urban context of the disused granary leads to some considerations since industrial area requalification may represent an extremely complicated process requiring the significant mobilization

of resources. However, current urban policies strongly support preserving and reusing these residual buildings, open unbuilt areas, and urban public spaces to develop more high-quality, mixed-use, and high-density spaces [11,58–61].

The initial phase of the competition proposal started considering the possible evolution of such neglected industrial areas, and the opportunities included [62]:

- Reactivation by renovating the existing facilities (like maintaining the initial on-site activity with possible technological upgrades towards the so-called green economy);
- Abandonment, with or without protection measures;
- Structural reconversion (keeping an industrial profile with a rearrangement of the buildings);
- Functional and/or structural reconversion (change in function, with or without physical and historic preservation, and reuse linked to typically urban functions but providing urban systems with a high incidence of public services and equipment to significantly improve urban quality).

To this end, the engagement with residents has been decisive in defining the correct functional program: through a direct survey, it was possible to collect some key points. Over 50 interviews were conducted by the authors among residents ranging in age from 13 to 91 years old. The interviewed people recalled the site not just as an industrial space but also as a gathering spot for enjoyment, reminiscing about meeting friends, and playing games like chasing each other around the granaries. In fact, a significant number of them expressed the desire to witness the transformation and enhancement of the area into a new big public space, accounting for 33% of all the answers. Others expressed the desire for new spaces for cultural activities (14%), commercial functions (14%), or new housing (5%). A good number of people expressed the will to preserve the site (24%), while others preferred not to express an opinion (10%) [63]. Most residents envisioned it as a place where people of all ages, including those from neighboring communities, could interact and participate in various activities catering to diverse needs.

Therefore, ‘Community Condenser’ proposes an overall intervention, enhancing healthy and smart solutions based on the existing social, economic, and environmental context characterizing the granary cluster. Qualitative techniques such as case studies, exploration, observation, and description contribute to a comprehensive comprehension of the evolving trends that characterize both smart and healthy cities. Most of the local requests were in line with the healthy guidelines promoted by WHO. Indeed, the new grain station masterplan integrates:

- Green and leisure spaces: ample parks and recreational areas promoting physical activity and mental well-being;
- Clean environment: effective waste management, air quality control, and pollution reduction measures;
- Safe infrastructure: secure public spaces, well-lit streets, and efficient emergency services;
- Healthy lifestyle promotion: community programs promoting healthy habits, nutrition, and fitness;
- Social inclusion: places and facilities to ensure the well-being of diverse populations;
- Active transportation: infrastructure network supporting walking, cycling, and other forms of eco-friendly transportation.

It is worth noting that from the healthy city point of view, the focus is on ongoing improvement processes and long-term perspectives that must be evaluated through performance indicators, which contribute to planning and management [64]. On the other hand, concerning smart cities, private initiatives are much more involved, generating interventions geared towards achieving short-term returns. Thus, the emphasis lies on leveraging technology to optimize urban operations and resource management. Concerning smart features, the following principles were selected and implemented:

- Integrated mobility: intelligent transportation systems for traffic management and improved public transit;

- Sustainable energy: integration of renewable energy sources and smart energy management;
- Connected infrastructure: interconnected devices and systems for efficient resource utilization;
- Smart buildings: intelligent construction and management systems for energy efficiency and occupant comfort;
- Digital inclusion: ensuring access to technology and digital services for all residents;
- Innovation ecosystem: support for technology-driven innovation and entrepreneurship.

Globally, as emphasized by Anthopoulos [65], smart cities comprise different cases in urban spaces where technology is applied for different purposes, from virtualizing cities to attracting business relocations. In the case of the renovation of the granary cluster, the main goal is to create urban spaces that are not exclusively technologically advanced but mostly adaptable, responsive, and capable of fostering economic growth and a high quality of life for the residents of Lianshi Town.

The final project output, which has been submitted to the competition, can be synthesized into three main actions that have been implemented in the design of the new masterplan, encapsulating healthy and smart conditions. The latter are preservation, connectivity, and activation, which are able to function simultaneously. These elements defined the comprehensive revitalization of the industrial site and incorporated this specific project into a broader plan that addresses and connects various parts of the city [66].

Therefore, the entire settlement's infrastructure system is preserved and converted in-to a novel public pedestrian system. The vacant spaces between the massive buildings are transformed into various public recreation areas to bolster community connections. Activities and features along internal paths encourage social aggregation and evoke collective memories.

The 'Community Condenser' has been designed to shape social behavior and serve as a social catalyst for Lianshi, providing the historical granary with the opportunity to serve as a focal point and act as a cultural motivator for the area's urban development. Operating at a neighborhood scale, the project aims to demonstrate how heritage can be revitalized in contemporary cities while preserving the unique characteristics of communities, ultimately creating a vibrant and smart urban environment.

More specifically, regarding the action of preservation, the approach involves transforming the entire urban area along the canal, where the granary was built from the beginning, into a historic district, highlighting the distinctive features of the existing structures. This includes creating new public spaces along the canal to reinstate social relations and stimulate economic growth through incentives aimed at renewing the architecture in the area.

Regarding connectivity, the plan entails developing new pathways through surrounding neighborhoods to connect residents to the granary and historic district along the canal. Improved circulation is promoted through specific signage and open green spaces.

Finally, the activation element focuses on designing open and landscaped areas for community gatherings, establishing ICT hubs in the granaries aiming for efficiency and improved services, converting the south and west areas of the granary into a modern residential block, and developing commercial spaces around the southeast area of the site. The proposed intervention is well expressed through the detailed design of the new site (Figure 6), which represents both a healthy and smart approach to the redevelopment of an urban area. Overall, putting effort into addressing healthy dimensions can contribute to establishing a smart dimension and vice versa.

In conclusion, the proposed intervention harmoniously combines healthy and intelligent aspects, creating an urban environment that promotes the physical and mental well-being of the community while innovatively leveraging history and technology for sustainable urban development.

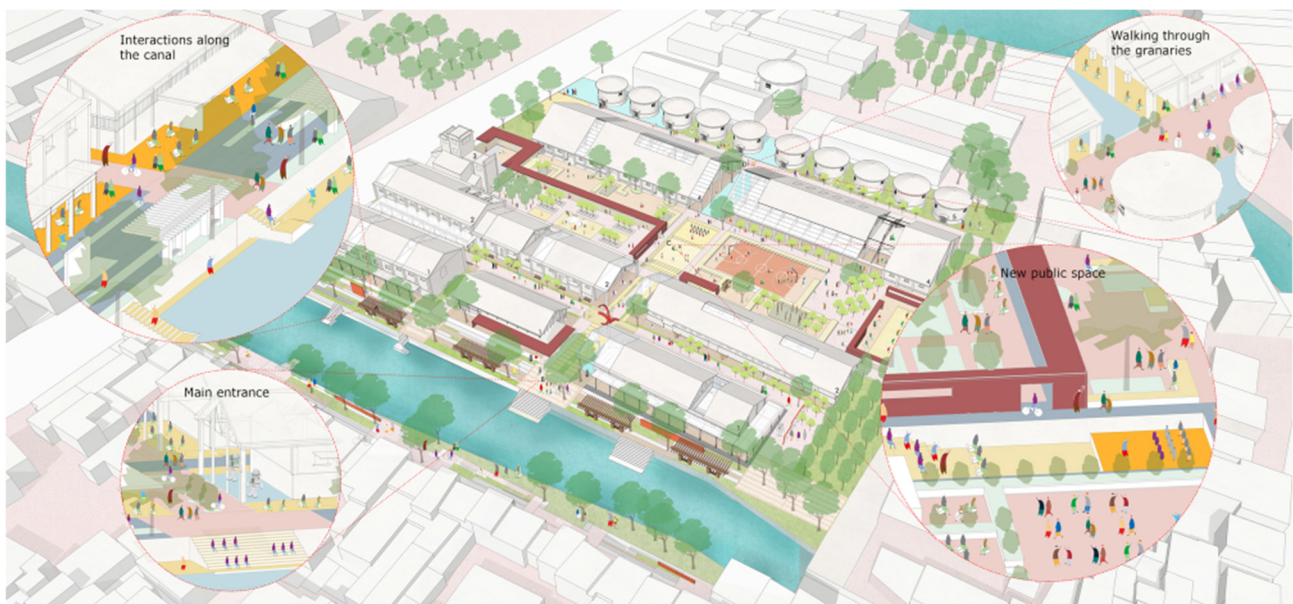


Figure 6. New granary station masterplan submitted to the competition [62].

3.4. From Architectural Competition to Execution: Enhancing Lianshi's Regeneration

The national competition opportunity to redesign the granary cluster of Lianshi represented more than just a design contest; it is recognized as a transformative exercise that will shape the stakeholders' physical, cultural, and social landscape. Governments' attention to these competitions demonstrates a commitment to fostering innovation, celebrating cultural identity, and building healthy environments. In the presented case study, the competition became a driving force for progressive and forward thinking regarding urban development in Lianshi Town.

The social urban context previously outlined was also the same after the participation in the competition, as confirmed by Tang and Jiang [54]. Indeed, they obtained interesting insights from 120 questionnaires that were randomly distributed within each of the three age groups mentioned before (elderly individuals, middle-aged individuals, and teenagers). Of the total number of questionnaires distributed, 112 were successfully retrieved, corresponding to a response rate of 93.3%, including 89 locals, 18 migrants, and 5 tourists, with a relatively balanced gender ratio.

Even in this case, the residents, especially elderly individuals, expressed an urgent need for large-area spaces suitable for physical exercise activities such as fitness, dancing, badminton, etc. Additionally, they desired leisure areas for napping, soaking up the sun, and conversing. Adults were interested in outdoor spaces for dining and socializing during their spare time. Meanwhile, teenagers' preferences revolved around recreational activities and more entertainment venues.

Indeed, in 2021, the Office Canopy of Architecture, an architectural firm based in Hangzhou City, Zhejiang Province, collaborated with Xiangban Cultural Tourism to provide a renovation masterplan (Figure 7) for the granary station area in Lianshi Town [55].

Also, in this case study, efforts were made to open walls, activate street corners, and readjust the scale of the empty squares among the abandoned buildings. As previously discussed, similar interventions allow citizens to engage with and utilize cultural relics effectively.

Moreover, the design studio promoted the concept of 'creating local future scenarios'. This approach involves addressing the needs of specific customer groups and developing innovative, community-oriented solutions through non-standard commercial projects centered around the concept of 'locality'.

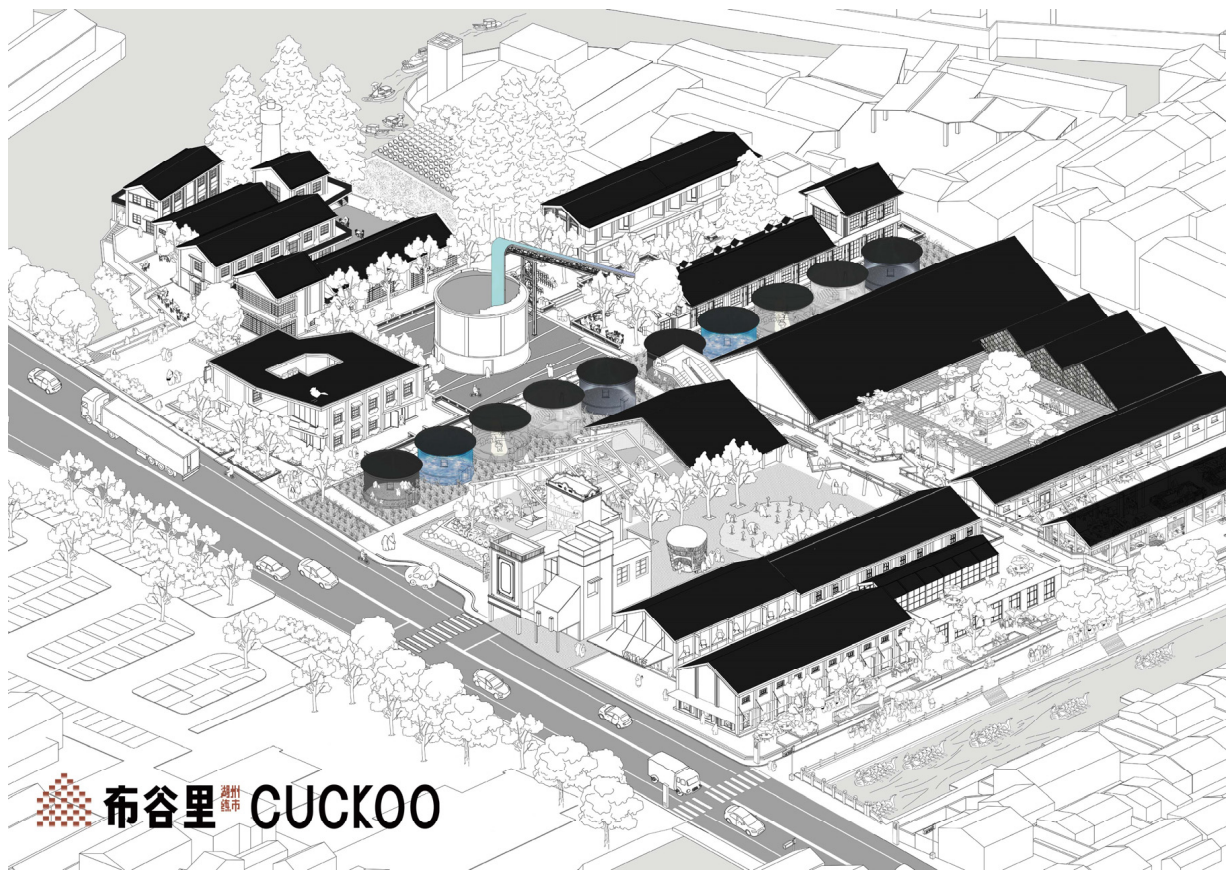


Figure 7. New granary station masterplan designed by Office Canopy of Architecture (picture: © Office Canopy of Architecture).

Considering Lianshi's recent substantial transformation into the most populous industrial town in the Nanxun district, the area must face challenges competing with renowned ancient towns. Therefore, the focus shifted to meeting daily residents' needs.

The planning phase proposed 'community commerce' as the main function to be implemented, aiming to attract residents during holidays and position Lianshi as a sought-after destination.

'Cuckoo', the name of the new urban space, strengthens its architectural and landscape design by maintaining the granary styles and principal features. Through a strategic combination of demolition, restoration, and renovation, the goal is to eliminate congestion and scattered elements, creating a continuous space flowing from the riverbank to the south. Accordingly, the preservation action is enhanced to give value to structures with historical significance (such as the 15 m diameter open-air granary and the ten conical silos) [55]. Consequently, the site's inherent identity or character is either maintained or altered to meet the new demands. This approach enhances sustainability's significance, which is crucial for innovation-driven urban development and heritage conservation (Figure 8).

Overall, the proposal adheres to the 'proximity principle', which, in this case, relies on local merchants' understanding of residents' needs. In this sense, cities should actively pursue local knowledge and gain a comprehensive understanding of solution configurations at the local level to address smartness [55].

To conclude, 'Lianshi Cuckoo' (Figure 9) was conceived as a cultural and commercial district targeting local customers in small towns, aiming to create a local identity aligned while incorporating creativity and maintaining a healthy atmosphere.



Figure 8. The renovation process (picture: © Office Canopy of Architecture).



Figure 9. Bird's-eye view of the realized project (picture: © Office Canopy of Architecture).

4. Results and Discussion

One of the central aims of the concept of a smart city as well as of a healthy city is to improve the quality of life and the well-being of its citizens. As well-displayed by numerous international examples, many cities have decided to use the key features of both the healthy and smart city concepts to reach the targets identified by the SDGs

goals (in particular, Goal 3 ‘Good Health and Well-being’ and Goal 11 ‘Sustainable Cities and Communities’).

In order to contribute to planning and management choices and to define sustainable strategies for city regeneration and further development, it is vital to set performance indicators able to evaluate the flexible and dynamic condition of cities and citizens, addressing both the two dimensions of health and smart in an urbanized context, considering bottom-up and top-down approaches and initiatives, and monitoring the results and the implementation process. As highlighted by many scholars [67,68], the most important indicators (quantitative and qualitative, linked to individual perception) are related to ecosystems (in the urban environment), health promotion, sustainable mobility, consumption of natural resources, green areas, energy production and consumption, public services and facilities, social relationship enhancement, cultural heritage (material and immaterial), community engagement, and so on.

Moreover, the main evident difficulties in the regeneration processes, in particular for former industrial areas, are mainly due to high base costs (decontamination and demolition) and limited financial resources; incapacity to manage the complex and lengthy process of transformation (from the planning phase to the construction and management phase); rigidity of public administration and its slowness in decision-making; fixed regulatory frameworks; planning abilities in all the phase of the process; and a lack of coordination among public bodies, stakeholders, and professionals.

In Lianshi, the primary focus is on aligning with the activities and consumption preferences of the local residents. Regardless of the project’s return on investment or future urbanization development, prioritizing the incubation of local business and cultural communities is deemed the most cost-effective and optimal choice. This approach is then leveraged to expand the overflow customer base and integrate diverse cultural and entertainment activities, effectively catalyzing the vitality and development of urban public spaces.

Below, the authors underline the most relevant characteristics that define the Lianshi case study as a healthy and smart city, both in the proposal competition version and in the actual project version:

Case 1: The Competition Proposal

Healthy Aspects:

- **Public recreation areas:** Transforming vacant spaces between buildings into various public recreation areas that promote an active lifestyle and encourage social interaction. These recreation areas can contribute to the physical and mental well-being of the community, providing open spaces for outdoor activities.
- **Social aggregation:** Designed elements along internal paths that encourage social aggregation are crucial for promoting mental health and a sense of community. Evoking collective memories through these features strengthens bonds among residents and create a more cohesive social fabric.
- **Green spaces and connectivity:** Creating new pathways and open green spaces enhances connectivity and promotes a healthy lifestyle. These elements can encourage walking and physical activity, contributing to a more active and sustainable community.

Smart Aspects:

- **Community Condenser:** The ‘Community Condenser’ concept as a social catalyst is a smart element. Using local history and existing structures as a cultural motivator demonstrates a smart approach to urban planning, leveraging heritage to drive sustainable urban development.
- **Heritage Revitalization:** The approach of transforming the entire area along the canal into a historic district while preserving distinctive features reflects a savvy integration of the past into the present. This demonstrates how history can be key in creating modern and dynamic urban environments.
- **Connectivity and ICT hubs:** The development of new pathways and the presence of ICT hubs indicate a smart approach to connectivity and technology. Improving

circulation through specific signage and open spaces suggests a smart infrastructure that facilitates movement and access to digital resources.

In conclusion, the proposed intervention harmoniously combines healthy and intelligent aspects, creating an urban environment that promotes the physical and mental well-being of the community while innovatively leveraging history and technology for sustainable urban development.

Case 2: The Project in Real Life

Healthy City Elements:

- Emphasis on fostering innovation and building healthy environments.
- Focus on addressing residents' daily needs and proposing 'community commerce' as a primary function.
- Strategic combination of demolition, restoration, and renovation to eliminate congestion and create continuous, accessible spaces.
- Preservation action to give value to structures with historical significance, contributing to heritage conservation.
- Consideration of the significance of sustainability for both innovation-driven urban development and heritage conservation.

Smart City Elements:

- Utilization of local knowledge and understanding of residents' needs as part of the 'proximity principle'.
- Implementation of a renovation masterplan that involves activating street corners and readjusting the scale of empty squares, contributing to a smarter urban layout.
- Promotion of the concept of 'creating local future scenarios' through innovative, community-oriented solutions.
- Integration of non-standard commercial projects centered around the concept of 'locality' aligns with the smart city approach.

5. Conclusions

The main purpose of this contribution is to emphasize the significance of urban health in the context of modern cities, where issues such as urban sprawl, pollution, and the transformation of brownfield areas pose challenges. This paper discusses the challenges arising from intense urbanization, de-industrialization, and the presence of 'urban voids' impacting citizens' quality of life. It highlights the importance of redeveloping these areas for community health and overall well-being. Additionally, this paper emphasizes the interconnectedness of urban health with socio-spatial quality, technology, and innovation, advocating for the development of healthy and smart cities. The complexity of urban problems is acknowledged, and the importance of integrating scientific and societal aspects and engaging citizens in the regeneration process is underscored. Ultimately, this research argues for a holistic and flexible approach to urban regeneration, considering various factors and scales. The specific case study in Lianshi, a former industrial area, exemplifies the holistic approach towards sustainable transformation, considering healthy and smart elements.

The project, operating at the neighborhood scale, demonstrates how the strategy of valuing the existing built environment is one of the most crucial actions to be implemented to satisfy the community's necessities and help decision-makers reach healthy, smart, and sustainable goals. This is due to the anthropological and social value of the site and its strong relationships with the context and the community. Additionally, the project clearly defines and implements the need to encourage social interaction and accommodate new economic, social, and cultural uses. Overall, the project aims to balance physical and perceptual heritage elements and create new, smart urban spaces where people can live, work, move, and socialize.

Citizens have a significant role and responsibility in the regeneration process of urban settlements: their active engagement holds significance in the realm of urban planning

and city and territorial management, as well as in the formulation and execution of public policies. It is at the district, neighborhood, and block scales (the smallest scales in the urban planning field) where knowledge, awareness, and inhabitants' specific actions can substantially contribute to achieving these goals. However, this process needs to be integrated into the framework of various local intersectoral public policies and the diverse scales of the materialization of public policies must be taken into account. Following this path, the qualitative transformation of urban settlements mirrors the following social conditions: healthy and/or smart citizens contribute to the regeneration of healthy and smart cities.

In conclusion, while smart cities and healthy cities have distinct objectives, the integration of smart and healthy elements into urban planning can lead to more holistic and sustainable city development. The Lianshi Town case study is a valuable example of how these principles can be applied in a real-world context.

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