

Exploring sustainable ecosystems in the “15-minute” urban living circle — take Shanghai Urban Space Season 2021 as an example

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Abstract

As a new urban model, the 15-minute city has gradually become a touchstone to measure the future sustainability of cities. With the time-limited planning of urban living circle, urban residents can be allowed to access basic daily needs such as food, health and education while walking or cycling, thus reducing motor traffic and carbon dioxide emissions and contributing to the improvement of people's well-being and the environmental climate. The proposition of building the 15-minute Community-life Circle has been put forward in Shanghai Master Plan 2035. Since 2016, such working standards as Shanghai Planning Guidance of 15-Minute Community-Life Circle, Spatial Planning Guidance Community Life Unit have been continuously released and updated for gradually conducting progressive and incremental circle practices and exploring a path of low-cost, low-emission and low-pollution urban sustainable development. In September 2021, with the theme of 15-minute Community-Life Circle – People's City, SUSAS2021 carried out a two-month urban space art season in 16 communities and 1 theme exhibition area, demonstrating the construction practice of low-carbon life suitable for living, working, traveling, learning and raising in Shanghai.

With SUSAS2021 as a specific case, this paper is aimed at exploring a system design method of sustainability concept in the construction of urban life circle with a time limit of 15 minutes. By applying the method of interdisciplinary research, this paper makes a systematic analysis and impact evaluation on its climate adaptability from four aspects: urban renewal, shared community, low carbon living and smart network platform. With the practice results as the research evidence, this paper summarizes the experience of sustainable ecological construction in urban life circle, introspects and discusses the practical problems and comprehensive feedback during the practice, and then puts forward a sustainable system design framework for 15-minute urban construction and a feasible adaptation scheme for studying this method. Under the ever-changing climate environment, the new zero-carbon city model will be an extensively, profoundly systematic change in economic and social development.

Author keywords

15-minute city, Urban Ecosystem, Sustainability, Community-Life Circle, SUSAS2021

Introduction

The concept of the “15-minute City” was proposed by Professor Carlos Moreno and widely used by the mass media in 2016. It was then adopted by policy makers in Paris and sparked discussion in other cities around the world. The concept supports the demand for indicators based on proximity to better serve urban areas (Moreno et al., 2021). It also points out that the quality of life in cities is inversely proportional to commuting time, especially in the use of cars. Excessive car use on city streets can significantly increase greenhouse gas emissions and energy consumption, resulting in poor urban air quality and lasting negative impacts on biodiversity and quality of life. In addition to psychological and social losses, the negative consequences of traffic congestion are also translated into time, economic and ecological losses (Gössling, 2020). So, the re-thinking of cities to facilitate walkability and cycling would, in turn, inspires the creation of parks, squares and public places within neighborhoods (Gehl & Rogers, 2013) and helps realize the vision of urban sustainability and resilience and build a sustainable climate adaptation framework for urban ecosystems.

At present, Paris, Melbourne, Ottawa and other cities have started the practice of chrono-urbanism planning to actively deal with urban problems. In 2017, Shanghai put forward the idea of creating a “15-minute community life circle (CLC)” in its 2017-2035 development blueprint, and formulated unified action guidance. Since then, Shanghai has progressively put the concept into practice. Shanghai Urban Space Season 2021 (SUSAS2021), which will be studied in this paper, is a concentrated demonstration of the practical achievements of the “15-minute CLC” in Shanghai. This paper adopts the research method of case analysis. Firstly, the paper combs the key theories and relevant research literature, then summarizes a feasible sustainable system design method based on the case of Shanghai Urban Art Season, and finally discusses and reflects on the adaptability of sustainable system design in the



15-minute city based on the actual case feedback. The study of the ecological characteristics and convenience of urban renewal based on the theory of chrono-urbanism. The purpose is to explore a sustainable system design scheme based on the 15-minute urban concept to address many challenges brought by future urban problems and climate change.

Literature Review

15-minute CLC

At present, urban development is facing multiple challenges caused by climate change and social ecology. In this context, reconsidering the sustainable urban development model and transformation has been regarded as the future direction and inevitable choice of global urban development (Jabareen, 2013). As early as the 1950s and 1960s, Japan put forward the concept of "life circle" in a broad sense for the first time in response to urban problems such as resource concentration, regional differences and environmental pollution (Zuopeng et al., 2014). The concept defines the space scope of work, shopping, leisure, education and medical care required for daily life based on the residence of residents, and defines this scope as the basic space unit of the life circle. Subsequently, South Korea and Taiwan(China) in Asia have also carried out research and practice on the concept of life circle. At the Paris Climate Summit in 2016, Carlos Moreno first put forward the concept of a 15-minute city based on " chrono-urbanism" (Mulříček et al., 2014). This concept emphasizes the proximity of all basic services to solve the dependence on cars, thus promoting ecological sustainability, social interaction and public participation. In the same year, Shanghai formulated the planning guidelines for the construction of the "15-minute CLC", and proposed the community as the platform for urban basic life. The goal is to build Shanghai into a sustainable, safe, friendly and comfortable smart city. Residents can meet the needs of education, culture, medical care, elderly care, sports, commerce and other public service facilities within the 15-minute walking range. From the perspective of radiation scope, they all radiate outward from the center, emphasizing the accessibility of space within the time limit, whether it is the concept of life circle proposed by Japan in the early years, the 15-minute city proposed by Carlos Moreno, or the 15-minute CLC plan implemented in Shanghai. However, there are still obvious weaknesses in the current urban environment. The city vision of a 15-minute city (or 15-minute CLC) has not been achieved, and more research and practice need to be invested in the future.

Sustainable System Design

Design for Sustainability, derived from the concept of sustainable development, is a design practice that seeks innovative solutions to cope with environmental, social and economic factors. Systematic thinking is a holistic view of people's view of the world. In the 17th century, French philosopher, mathematician René Descartes (Capra, 1997) created the method of analytical thinking, which promoted the emergence of modern science (Capra & Luisi, 2014), but is not a clear theory. Since the 1920s, system science has experienced a hundred years of development from its infancy to its maturity. At present, as an emerging interdisciplinary discipline, it is at the forefront of international scientific research (Liu & Vrenna, 2021). However, system design is the process of design-

ing a new system that can meet the target requirements to the maximum extent by using the theories and methods of system science. Sustainable system design and sustainable design are interrelated and inclusive, but in the face of various complex and changeable problems in the real world, the overall systematic thinking will help to develop sustainable solutions, and promote the realization of sustainable development goals with the purpose of harmonious coexistence between people, people and nature, people and society.

Case study: Shanghai Urban Space Season 2021

Shanghai's biennial Urban Space Season has been held since 2015 under the theme of "Urban Renewal", "Connection", "Waterfront Space" and "15-Minute CLC" respectively. It aims to combine the display of space art with the practice of urban organic renewal, change the traditional static display into the dynamic interaction in public spaces, so as to explore more connotation and value of urban space. The most recent edition, the 2021 Urban Space Art Season, focused on the building of 15-minute CLC. Compared with the previous seasons, this one lay more stress on people's life, community building and urban ecology.

As an international city, Shanghai occupies a major position in China in terms of economy, culture and society. However, in recent years, due to the impact of urban development and expansion, traffic congestion, housing shortage, environmental pollution and the unacceptably far distance between homes and workplaces have become common urban problems. Cities with complex functions, livable environment, open and sharing surroundings, and local cultural characteristics will become people's vision of future cities. The highest measure of building a people's city is the sense of gain brought by the community life circle. It's imperative to build diversity and richness based on the unique culture and resources of the community and create a differentiated low-carbon and healthy proximate community lifestyle according to local conditions, so as to achieve convenient and shared space quality and open and intensive urban space pattern (Neuhaus, 2015). It is not difficult to see that this is consistent with the temporal urban guidelines of "Proximity, Mixity, Density, Ubiquity" proposed by Professor Carlos Moreno.

Systematic 15-minute CLC planning



Figure 1. 15-minute community life circle planning.

SUSAS2021 showcased the results of organizing living space with the time limit of 15 minutes in Shanghai in the past four

years, emphasizing the connection between the law of life and low-carbon behavior. Focusing on the concept of "livable, workable, travelable, education-friendly and health-friendly", it aimed to improve the quality of space and optimize sustainable ecosystems. The specific measures are as follows: Livable: Built affordable and sustainable community housing supply systems, ensure that people from all walks of life could settle down in Shanghai, and supported shelters, livable ecology, whole-age care, smart living and resilient security; Increased public space, maintained and updated public facilities, so that citizens could enjoy high quality of life within a 15-minute radius.

Workable: Created more employment opportunities for community life circles within the time limit, reduced the threshold and cost of innovation and entrepreneurship, and provided employment opportunities and services; Effectively alleviated traffic congestion and work-family imbalance caused by long-distance commuting, reduced greenhouse gas emissions caused by traffic, and strove for energy saving and carbon reduction.

Travelable: Created colorful and ubiquitous community leisure space so that people could get close to nature; cultivated green and healthy travel and lifestyle; built distinctive community transportation networks that were slow-paced, friendly, and convenient to travel.

Education-friendly: Provided diverse learning systems, aesthetic classes and community education activities; Encouraged a green, low-carbon and sustainable lifestyle, and created a good learning atmosphere and promoted a lifelong learning philosophy.

Health-friendly: Provided a full life cycle of care within a 15-minute space, including hospitals, rescue stations, nursing homes, public living facilities and care gardens, reduced travel risks and helped reduce carbon emissions.

spiritual, starting from public life. Systematic community life circle planning is not a simple addition of all elements. There is overlap and interaction between livable, workable, travelable, education-friendly and health-friendly. For example, the promotion of low carbon life to health, the attraction of public space for the healthy landscape, and so on. Unlike linear relations, systematic planning can promote the interaction between various elements to enhance the ability of self-organization and self-repair, and make it more adaptive.

Sustainable System Design



Figure 3. Community Meta-Box in the theme deduction area of SUSAS2021.

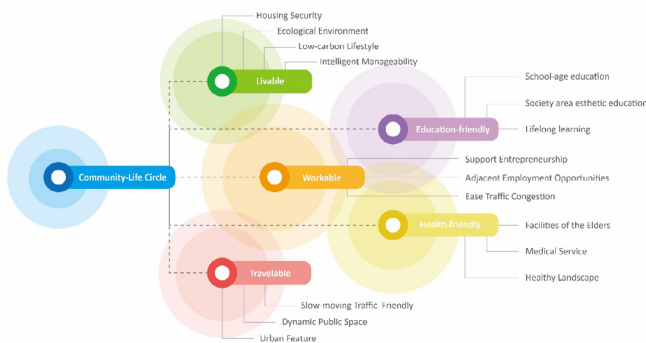


Figure 2. Key elements of the 15-minute community life circle planning in Shanghai.

The planning of community life circle is to meet people's basic daily needs within the range of walking distance, so as to reduce the number of people's long-distance trips and achieve the goal of reducing carbon emissions. From the perspective of service objects, the planning measures for the whole age group increase the inclusiveness of the project and contribute to social equity. In addition, systematic thinking plays an important role in the 15-minute CLC planning. The emphasis in the project is no longer a single transportation facility or community service planning, but a systematic consideration of the specific needs of people of all ages, both physical and



Figure 4. An ecological rain garden in Xinhua Community.

The sustainable system design centered on the 15-minute CLC consists of the key elements of energy, materials, water, ecology, society/economy and culture. The complete plan is to achieve the energy cycle, material cycle, water cycle, ecological cycle, social/economic cycle and cultural cycle, and the six key elements are related, thus forming a complete system. Among them, low-carbon travel, waste material regeneration, rainwater garden, solar power generation, and other measures are all committed to the principle of zero emissions in the community, transforming output (waste) into input (resources) to form a self-generating system. The



Figure 5. Cloud: The public art facilities in the theme deduction area of SUSAS2021.



Figure 3. Spatial typologies: Formal learning space; Individual area; Group area; Webinar / 3600; Arcade / e-learning; Encounter area (Developed by B. Elizondo & D. Gamboa)

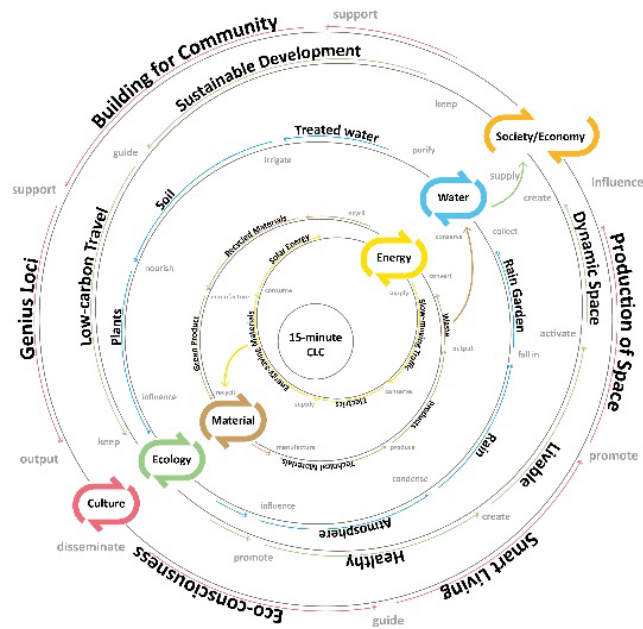


Figure 6. Eco-cycle system model about 15-minute community life circle.

main area of the system design is the local production and consumption system. In addition to the material resources involved, the social, economic and cultural aspects are realized by the participants in the local socio-economic activities. Therefore, the collaborative cooperation of community residents or other stakeholders can help promote the positive interaction between key elements and create new opportunities. Public participation is a key step in the sustainable system design of the 15-minute community life circle, and also an important factor in improving the cohesion and well-being of the community.

It has gradually become the international consensus in the post-epidemic era to regard community as the basic unit of a city and respond to urban problems as communities. To respond to global climate change and fulfill the commitment of the United Nations Climate Conference on net zero emissions, various countries and cities are actively exploring the road of climate adaptation for future urban development. This paper attempts to evaluate the climate adaptability and sustainable ecological effects of Shanghai based on specific urban prac-

tices from four dimensions of its urban renewal, shared community, low-carbon life and smart network platform, evaluating the key factors influencing climate change in practice and specific measures for net-zero emissions.

Urban renewal: In the process of building community life circle, the “acupuncture-like” renewal method of minimal design adjustment, actions and implementation cost is proposed; With a focus on the improvement of environmental quality, the existing community gray space was transformed

into ecological garden featuring carbon sequestration, abandoned factories were preserved and renovated into cultural industrial parks, preserving the cultural characteristics of the city and meanwhile allowing residents to enjoy a high-quality space environment in the adjacent space. Compared with traditional means of demolition and reconstruction, urban renewal with minimal intervention can ensure the goal of improving spatial quality, but at a lower cost. Also, it helps save resources and reduce wastage and carbon emissions. From environmental, economic and cultural perspectives, urban renewal with minimal intervention is more sustainable.

Shared community: Shared community is mainly reflected in sharing governance achievements, tapping into community needs, creating governance mechanisms and building community homes. In the practice of building diverse and shared communities, Shanghai encouraged community planners, social organizations, social workers, volunteers and local enterprises to participate in the joint construction of communities, with emphasis on the planning, construction and management of life circles to ensure localized and sustainable shared communities. At present, more than 180 community projects have been completed in Shanghai. The governance model of shared communities helps multiple stakeholders work together to build low-carbon communities, and share climate responsibility and governance outcomes.

Low-carbon life: low energy, low consumption, low cost lifestyle can start with saving electricity and gas, as well as recycling. On the one hand, as mentioned above, the theme interpretation area of SUSAS2021 is represented by Community Meta-Box, and the materials used are recycled plastic and recycled wood. Clean solar energy was used to power the pavilion, providing a green and low-carbon living place and a new perspective on the sustainable development of the space for the surrounding residents. During the art seasons, sustainable circle experience activities were organized to guide the public to participate in community ecological experience and ecological education in the form of game invitations. Public participation played the most persuasive role in low-carbon environmental protection. On the other hand, proximity to basic services helps to save time wasted on transport, reduce energy

and carbon emissions, and thus promote sustainable transport. The construction of “livable, workable, travelable, education-friendly and health-friendly” 15-minute CLC is conducive to the formation of sustainable ecological effect.

Intelligent network platform: The world is experiencing the fourth industrial revolution featuring ubiquitous information and communication technology (ICT). The proposal of the 15-minute city is considered timely (Allam, 2019). Shanghai explored smart application scenarios on the basis of a 15-minute CLC and took into consideration the community-built interactive scenarios from design, management and governance, ensuring the accessibility of basic amenities and sustainable development of urban space by means of technical support.

Discussion

Community is the basic unit of urban development and the “last kilometer” of multi-stakeholder participation. Life circle planning with a 15-minute radius emphasizes the connection between production, living space and behavior habits, effectively allocate public resources, improve service efficiency, inspire a new low-carbon lifestyle in the post-epidemic era, and enhance the climate adaptability of urban development and public life (Pozoukidou & Chatziyiannaki, 2021).

So far, the practice of “15-minute” CLC in Shanghai has made good progress. The development framework established by SUSAS2021 and the development model of multiple collaboration have begun to bear fruit, and the results of SUSAS2021 have been widely supported and recognized by the public. This practice verified the feasibility of building a sustainable ecosystem of 15-minute CLC, laying a good foundation for the future sustainable urban renewal and climate change adaptation. However, in terms of building sustainable urban system in the future, the current practice of Shanghai is still in the early stage. It is not difficult to find that there is no obvious evaluation standard for the quantification of practical achievements at present, and the development of public space and community construction lacks clear policy incentives. In the future, in the design and transformation of the overall functional zoning of the city, more emphasis should be placed on multiple and composite structural design on the basis of preserving the spatial characteristics, so that the construction of proximate and accessible life circle network can be truly realized, and a

sustainable low-carbon urban development environment can be created.

In this study, the exploration of urban sustainable living circle is still in its early stage, but the development framework and practical results proposed are worthy of being applauded. As a relatively successful case of urban transformation, Shanghai’s micro-renewal has received widespread attention and recognition from other cities. After SUSAS2021, a total of 52 cities jointly signed the document “15-minute community life circle” Shanghai initiative. It can be expected that in the future, more cities will join in low-carbon and sustainable urban construction and provide climate adaptation solutions for urban development in response to global climate change.

Conclusions

This paper mainly studies the promotion effect of “15-minute CLC” on the construction of sustainable urban ecosystem based on the proximity urban design scheme. Taking SUSAS2021 as an example, this paper studies its climate adaptability and sustainable ecological effects through specific renewal schemes, and points out the positive role of community planning to make it livable and resilient, so as to promote sustainability and reduce carbon emissions.

As the “15-minute CLC” has gained attention and been put into practice in many cities around the world, further research is necessary to demonstrate the differentiated solutions of different cities. In the face of the growing challenges posed by climate change, both rural and urban communities should contribute to future climate adaptation programs. How to establish a sustainable urban ecosystem to support the sustainable development of cities in the critical period of global urban development and transformation is a priority for researchers and urban decision-makers, and also the direction of human efforts to respond to climate change. Obviously, the planning practice of “15-minute CLC” is a solution that helps alleviate urban contradictions and enhance urban climate adaptability.

Research into proximate urban design or the 15-minute CLC will continue, and the concept will be enriched and improved as more cities and stakeholders join in. Let us work together to build sustainable urban ecosystems that are low-carbon, resilient, diverse, inclusive and equitable.

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