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Materials for a debate on the 15-minute city: Public transportation's effect on urban space and time in two Asia-based alternative proposals

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ABSTRACT

This work aims to encourage a debate about Carlos Moreno's "15-minute city" – a recent, popular concept to make contemporary cities more livable by decentralizing the urban environment into self-sufficient, walkable units. After reviewing the principles of Moreno's idea and its current criticism, this paper illustrates two projects, Woven City (Japan) and Gwangmyeong New Town (Korea), that start from the "15-minute city" intentions; nonetheless, arrive at opposite conclusions. These proposals focus on transport – a central element in Moreno's model, paradoxically, due to its absence – as the key issue to realizing a sustainable urban environment while preserving the notion of a city as a vast, complex and centralized organism. Both projects rethink public transportation to address the social problem of the time wasted on transferring, a crucial concern of the 15-minute city. Woven aims at minimizing this time through futuristic infrastructures, while Gwangmyeong makes transportation time "usable," allowing people to carry out activities while transferring. These projects' results are yet to be tested. Nevertheless, by illustrating these proposals, this study shows how alternative options are possible for the realization of a sustainable modern city.

KEYWORDS

15-minute city; transport; centralization; Woven; Gwangmyeong

1. Introduction

The "15-minute city" is a recent proposal for the urban and social redefinition of contemporary towns. The model was first established by the Franco-Colombian scientist, Carlos Moreno (2016).[1] Similar proposals were later developed by Weng et al. (2022),[2] Capasso Da Silva et al. (2020)[3] and Larson (2022).[4] The roots of this concept can be traced back to proposals developed during and after the Industrial Revolution, which aimed to address urban degradation and improve living conditions in contemporary cities.[5] Ebenezer Howard's "Garden City" (Howard 1965)[6] and, later, Clarence Perry's Neighborhood Unit concept (1923),[7] focused on planning neighborhoods as human-scale environments equipped with essential services, can be considered the most meaningful historical precedents.

Even before Moreno's work, the centrality of the neighborhood and its mixed-use nature had been the subject of theoretical studies (such as those by Jacobs 1969)[8] and urban planning theories, including the post-modern approach of the 1980s.[9]

The proposal radically redefines the urban transportation system and the distribution of public functions.[10] According to this model, a traditional

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This article has been corrected with minor changes. These changes do not impact the academic content of the article.

[1](Moreno 2016). "La ville du quart d'heure: pour un nouveau chrono-urbanisme" *La Tribune* 5 October < https://www.latribune.fr/regions/smart-cities/la-tribune-de-carlos-moreno/la-ville-du-quart-d-heure-pour-un-nouveau-chrono-urbanisme-604,358html > [Accessed 1 November 2023].

[2](Weng et al. 2022). "The 15-minute walkable neighborhoods: Measurement, social inequalities and implications for building healthy communities in urban China" *Journal of Transport & Health* 13, 259–273. <https://doi.org/10.1016/j.jth.2019.05.005.>

[3](Capasso Da Silva, King, and Lemar 2020). "Accessibility in Practice: 20-Minute City as a Sustainability Planning Goal" Sustainability 12, no. 1: 129. https://doi.org/10.3390/su12010129

[4](Larson 2022). Online video recording, TED, 2021 "Brilliant designs to fit more people in every city" <https://www.ted.com/talks/kent_larson_brilliant_designs_to_fit_more_people_in_every_city?language=en> [Accessed 1 November 2023].

[5](Khavarian-Garmsir et al. 2023). "From Garden City to 15-Minute City: A Historical Perspective and Critical Assessment" *Land* 12, no. 2: 512. https://doi.org/10.3390/land12020512.

[6](Howard 1965). *Garden Cities of To-Morrow*. London: Routledge.

[7](Perry 1929). "The Neighborhood Unit, a Scheme of Arrangement for the Family-Life Community" *Reg. Surv. N. Y. Its Environ*. 7, 2–140.

[8](Jacobs 1991). The Death and Life of Great American Cities. New York: Vintage.

[9](Khavarian-Garmsir et al. 2023). Op. cit.

[10]After its initial formulation in 2016, the 15-minute city proposal was reworked and updated by Moreno himself in collaboration with other authors (Carlos et al. 2021 . "Introducing the '15-minute city': Sustainability, resilience and place identity in future post-pandemic cities" *Smart Cities* 4, no. 1: 93–111; Allam et al. 2022. "The 15-minute city offers a new framework for sustainability, liveability, and health" *The Lancet Planetary Health* 6, no. 3: 181–183). Simultaneously, several analyses were conducted on the concept and its specific aspects (Bocca, Antonio. 2021. "Public space and 15-minute city" *TeMA-Journal of Land Use, Mobility and Environment* 14, no. 3: 395–410; Balletto et al. 2021. "A methodological approach on disused public properties in the 15-Minute City perspective" *Sustainability* 13, no. 2: 593). This introduction provides a summary of the accomplishments of these studies and directs the reader to a more detailed bibliography in the subsequent sections of the article.

city, divided into the center (of the services) and the periphery (of the residence), is subdivided into smaller areas. Here, the citizens have access to every urban function within 15 minutes, on foot or by bicycle, including work, shops, health facilities, schools, sports facilities, cultural spaces, bars and restaurants, and meeting places. The key concept around which the proposal is developed is the nearly complete abandonment of the car, at least within the city boundaries, which is perceived as an obsolete tool due to its "physical" (pollution) and "social" (time wasted in traffic jams) unsustainability. The role of public transport, too, is significantly reduced.

Given the concept's success among numerous public administrations, the 15-minute city seems destined to be established as a new urban paradigm. In 2020, it was included in the electoral program of the Mayor of Paris, Anne Hidalgo, while several other towns tried to partially apply its principles (Melbourne 2017; Shanghai 2016; Bogota 2021).[11]

The success of Moreno's model was significantly influenced by the COVID-19 pandemic. As highlighted by several studies,[12] the objectives of the 15-minute city align with the reforms that pandemic-affected and post-pandemic cities should implement in response to the health crisis. The Parisian example itself had emerged during the pandemic, and the the adoption of the proximity approach to urban reforms was recommended as a recovery strategy by the Cities Climate Leadership Group (C40).[13]

Although the belief in this model seems universal, it would be incorrect to ignore the opposing opinions about its effectiveness. These arguments point out the uniqueness and, therefore, the irreproducibility of the reference model of Paris, and the possible social consequences of city fragmentation into self-sufficient units.[14] In particular, they highlight how only a vast and varied territory, such as a traditional, centralized city, can provide the plurality of social, cultural, and economic experiences that the constellation of villages envisioned by the 15-minute city cannot offer. However, these criticisms recognize the car's inadequacy. Some accept it, although reluctantly, as the "price to pay" for living in a larger and more stimulating context than a simple pedestrian enclave. Others, instead, believe that the solution may come from technological and urban planning research, which should aim to "evolve," and not "abolish," the traditional means of transport and infrastructures and, therefore, eliminate their aforementioned weaknesses – pollution and time-wastage.[15]

The authors of this study acknowledge the potential value in the critiques directed at Moreno's model, especially those that raise questions about the idea of renouncing large centralized cities and suggest that the substantial size and centralization of the urban environment might be seen as an advantage, rather than a drawback, for citizens.[16] Additionally, the authors tend to agree that *reimagining* current transportation methods, rather than neglecting or minimizing them, could potentially be a key to achieving sustainable urban living. Transportation, it seems, could play a pivotal role in fostering both dynamism and social sustainability within the urban environment.[17]

The paper aims to investigate these ideas through a two-phase approach. The first phase involves a review of the principles of the 15-minute city (Section 3), which includes an examination of their global reception and both positive and negative criticisms. In the second phase, in light of these principles, two projects are analyzed as *alternatives* to the 15-minute city: Woven City in Japan and Gwangmyeong New Town in South Korea (Section 4). These two designs notably contrast with the 15-minute city by advocating for a model of a vast, centralized city that heavily relies on transportation for its functionality (Sections 4.2 and 4.3). The core focus in analyzing these city models is how they use transportation to influence urban *space* and *time* factors. Section 4.4, in

[11](Pisano 2020). "Strategies for Post-COVID Cities: An Insight to Paris En Commun and Milano 2020" *Sustainability* 12, no. 15: 5883; Victoria State Government, "Plan Melbourne 2017–2050", Planning https://www.planning.vic.gov.au/policy-and-strategy/planning-for-melbourne/plan-melbourne> [Accessed 1 November 2023] (Hou and Liu 2017); "Life circle construction in China under the idea of collaborative governance: a comparative study of Beijing, Shanghai and Guangzhou" *Geographical Review of Japan* serie B 90, no. 1: 2–16. https://doi.org/10.4157/geogrevjapanb.90.2 (Guzman et al. 2021).; "COVID-19, activity and mobility patterns in Bogotá. Are we ready for a '15-minute city'?" *Travel Behaviour and Society* 24, 245–256. See also (Campisi, Kh, and Ngomsi 2023). "Beyond COVID-19: Planning the Mobility and Cities Following '15-Minute City' Paradigm" In *The City in an Era of Cascading Risks: New Insights from the Ground*, edited by Liqin Zhang, Elizabeth Kanini Wamuchiru, Claude A. Meutchehe Ngomsi. Singapore: Springer Nature.

[12](Khavarian-Garmsir, Sharifi, and Sadeghi 2023). "The 15-minute city: Urban planning and design efforts toward creating sustainable neighborhoods" *Cities* 132, 104101. https://doi.org/10.1016/j.cities.2022.104101 (Campisi, Kh, and Ngomsi 2023). Op. cit (Tricarico and De Vidovich 2021).; "Proximity and post-COVID-19 urban development: Reflections from Milan, Italy" *Journal of Urban Management* 10, no. 3: 302–310. doi: 10.1016/j.jum.2021.03.005 (Bocca 2021).; Op. cit.

[13](Khavarian-Garmsir, Sharifi, and Sadeghi 2023). Op. cit. See also (Allam et al. 2022).: Op. cit.

[14]See, for example, Daniele, Federica. *La città dei 15 minuti, tra opportunità e sfide* <https://aspeniaonline.it/la-citta-dei-15-minuti-tra-opportunita-e-sfide/> [Accessed 1 November 2023]; The theme of criticism, here just outlined, will be developed in paragraphs 3.4–3.7, with specific references to the literature.

[15](Glaeser 2021). "The 15-minute city is a dead end – cities must be places of opportunity for everyone" *LSE COVID-19 Blog* <https://blogs.lse.ac.uk/covid19/2021/05/28/the-15-minute-city-is-a-dead-end-cities-must-be-places-of-opportunity-for-everyone/> [Accessed 1 November 2023].

[16]In this regard, the authors align with studies that, following Mumford (Mumford 1961. *The City in History: Its Origins, Its Transformations, and Its Prospects*. New York: Harcourt, Brace & World), have highlighted the peculiarities and advantages of complex urban environments; See, for example (Jacobs 1969).: *The Economy of Cities*. New York: Vintage Books (Glaeser 2011).; *Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier*. New York: Penguin Books.

[17](Uteng, Jain Singh, and Helen Hagen 2019). 'Social sustainability and transport: making "smart mobility'socially sustainable." In *Urban Social Sustainability*, edited by M. Shirazi, Ramin Keivani, 59–77. London: Routledge.

particular, examines how variations in the emphasis on these variables define and differentiate the projects' approach to social sustainability, and provides insights on these aspects.

The objective of this study is to highlight the existence of alternatives to the 15-minute city and investigate their value and potential. To achieve this, the authors will employ the "research through case study" and "research through design" approaches. As detailed in Section 2.2, these represent two sides of a single method that has gained popularity in recent studies dealing with architectural and urban phenomena. The authors recognize that this approach, which is primarily qualitative, may have its limitations (Sections 2.2 and 5). Nonetheless, they believe that such a method could potentially offer valuable insights, especially when examining urban proposals that are still evolving and lack the statistical data required for quantitative analysis (Section 2.2).

2. Methodology

Before delving into the topic, it is essential to provide an overview of the methodology used in developing the two main sections of this study: the introduction and discussion of the 15-minute city principles and the analysis of the two selected case studies.

2.1. Identification and outline of the 15-minute city principles

The objective of this section is to provide an overview that will serve as a basis for comparison in the analysis of the urban cases. To achieve this, an extensive online search was conducted through both academic and general sources, resulting in the collection of academic and grey literature. In the subsequent phase, the gathered works were selected or discarded based on the following criteria: A) Inclusion of studies offering an up-to-date review of the literature on the topic.[18] B) Inclusion of works focusing on transportation, which is the primary interest of this study.

2.2. Cases selection and study

As mentioned in the introduction, this research aims to explore projects that provide an alternative to the 15-minute city concept, particularly those that maintain the vision of a complex, centralized, and extensive city. To begin the study, the authors naturally chose the Gwangmyeong project, which they are currently working on, as it reflects their core beliefs. In their search for similar cases, they found that Woven City closely aligns with Gwangmyeong's objectives, despite being smaller in scale. Like Gwangmyeong, Woven City is a design research project aspiring to transcend the confines of its specific context and identify potential prototypes for the contemporary urban environment.

Among the various perspectives to study these projects, the authors have chosen to focus on how transportation characteristics can influence a city's social sustainability by shaping *space* usage and citizens' available free *time* (Sections 4.1-4.4, cf. Section 3.1). With this premise, the analysis emphasizes the designs' infrastructural proposals while directing interested readers to specific bibliography for urban and architectural details (Sections 4.2 and 4.3). Placing urban planning and architecture in the background doesn't seem inappropriate because both case studies propose adaptable models for various urban configurations without strict formal determinism. The varying success of this aspiration in the two projects is examined in Section 4.4.

Woven City and Gwangmyeong are two *case studies*, and two ongoing projects. Furthermore, Gwangmyeong is a *design* created by the authors of this study. However, the paper's purpose extends beyond merely reporting their features. Instead, it aims to use them as research tools following the principles of "research through case studies" (for both projects) and "research through design" (for Gwangmyeong, in particular).[19] In architectural research, these approaches have enjoyed popularity even before their codification,[20] dating back to the pioneers of modern architecture.[21] These methods recognize that architectural research, given its unique nature, often requires a qualitative and inductive perspective, which differs from the quantitative and deductive methods of the "hard sciences." This approach yields insights, plausible solutions, and indications rather than objective, quantifiable results.[22] While it fosters creativity in research, it also comes with inherent limitations, including subjectivity, a lack of generalizability, and difficulties in replication.[23] The authors acknowledge these limitations but consider the approach of research through case

[18] In line with the comprehensive nature of this section, readers are directed to these works and their respective sources for a more in-depth study.
[19] It is not within the scope of the paper to delve into the implications of these methods. For this, refer to the bibliography in the following notes and, in particular (Godin and Mithra 2014).: "Aspects of Research through Design: A Literature Review." In: *Proceedings of Design Research Society DRS2014 International Conference: Design's Big Debates*, edited by Youn-kyung Lim, Kristina Niedderer, Johan Redström, Erik Stolterman, Anna Valtonen, 16–19. Held in Umeå, Sweden: DRS (Frayling 1993).; "Research in art and design." *Royal College of Art Research Papers series* 1, no. 1 (Nnanyere Nnaemeka 2015).; "Case Study as a Tool for Architectural Research."https://www.academia.edu/33816129/CASE_STUDY_AS_A_TOOL_FOR_ARCHITECTURAL_RESEARCH [Accessed: 1 November 2023] (Joost et al. 2016).; *Design as Research. Positions, Arguments, Perspectives*. Basel: Birkhäuser (Priya 2012).; "Case Study Methodology of Qualitative Research: Key Attributes and Navigating the Conundrums in Its Application" *Sociological Bulletin* 70, no. 1: 94–110 (Silberberger 2021).; *Against and for Method Revisiting Architectural Design as Research*. Zurich: gta Verlag.
[20] (Godin and Mithra 2014). Op. cit. (Priya 2012).; Op. cit.
[21] (Corbusier 1966). *Creation is a Patient Search*. New York: Praeger.
[22] (Silberberger 2021). Op. cit.
[23] (Godin and Mithra 2014). Op. cit. (Priya 2012).; Op. cit.

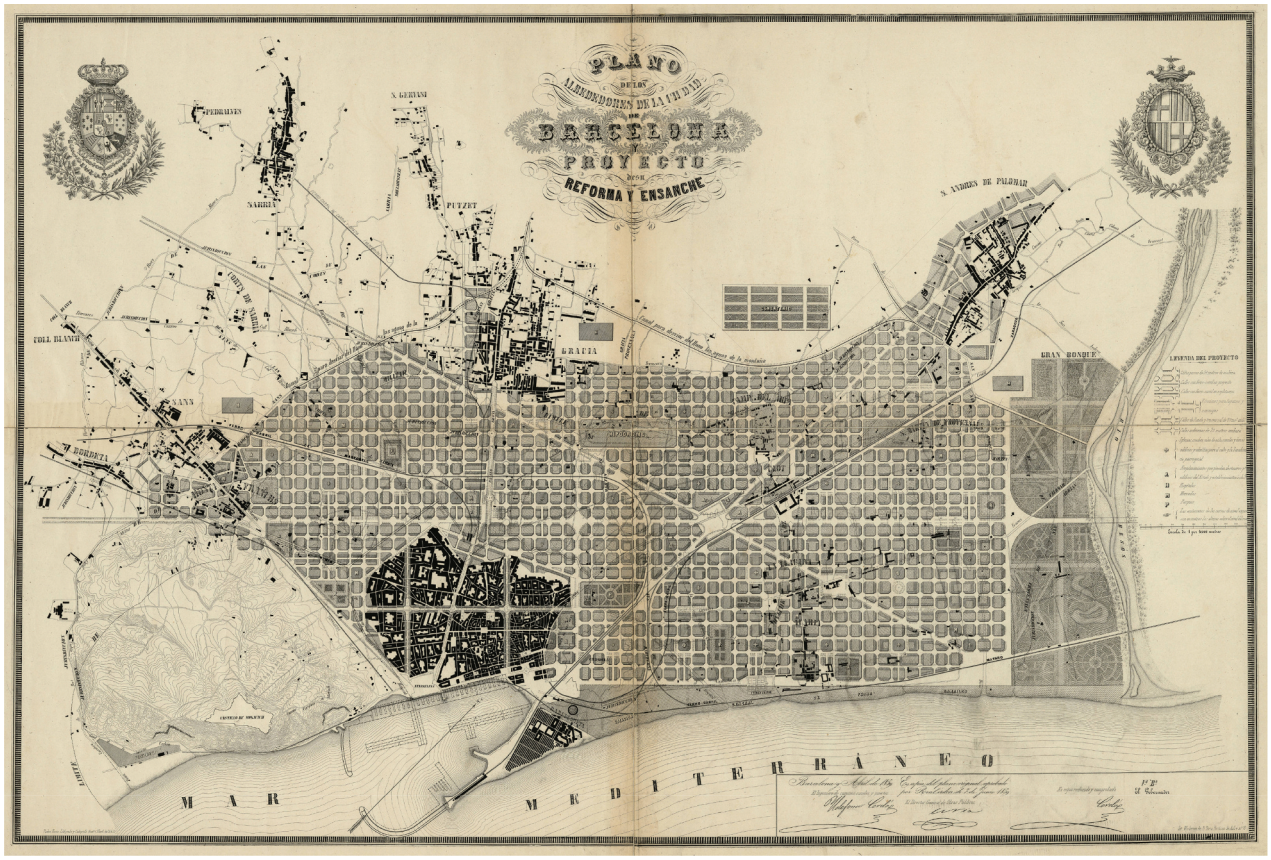

Figure 1. Barcelona, Plan Cerda (1860). (Source: https://commons.wikimedia.org/wiki/File:PlaCerda1859b.jpg)

studies and design suitable for the topics of this study. Firstly, because a purely quantitative method may provide limited insights into multifaceted subjects like proposals for the reform of urban life. Secondly, because the 15-minute city, as well as Woven City and Gwangmyeong, are based on evolving proposals and statements that currently lack statistical or quantitative data to support them.

3. An overview of the 15-minute city concept

3.1. The *time* and *space* variables (*chrono-urbanism)*

Carlos Moreno formulated the idea of the 15-minute city (*la ville du quart d'heure*) in an article published in 2016 in *La Tribune*.[24] Moreno argued that new technologies – that have transformed people's lives and work – have increased the pace of the city. He urged the need to reconcile the irreversible urban developments with the conditions essential for a quality life. This balance could be achieved by guaranteeing the residents the best possible access to their basic needs (life, work, supplies, care, and education), bringing everything within a 15-minute walk or bike ride. The precondition for this proposal is the dismissal of cars, which, in this context, is defined as any petrol vehicle developed using 19th-century technologies, including public transport.

The expression, *nouveau chrono-urbanisme* (new chrono-urbanism), mentioned in Moreno's article, recalls the *chrono-urbanisme* (chrono-urbanism) concept coined at the end of the 20th century by urban planner and sociologist, François Ascher.[25] In this concept, the reciprocal relationship between "time" and "space" is the focal point. Time and space are the two major variables of our world. Accordingly, they rule city design and the features of urban planning tools. In his concept of the 15-minute city, Moreno places a specific *time* frame, precisely 15 minutes, at the core of the idea. The city's *spatial* organization must revolve around this timeframe, requiring urban functions to be located in close proximity to users. This idea stands in contrast to urban planning concepts that emerged during and after the Industrial Revolution, from the nineteenth-century orthogonal grid and linear city (Figures 1 and 2)[26] to the Modernist city of the 1920s and 1930s, as well as proposals by unique and somewhat isolated figures, such as Frank Lloyd Wright.[27]

[24](Moreno 2016). Op. cit. For the notes in this section see also (Carlos et al 2021): Op. cit. (Allam et al 2022); Op. cit. (Bocca 2021); Op. cit. (Balletto et al 2021), Op. cit.
[25](Ascher 1997). "Du vivre en juste à temps au chrono-urbanisme" *Les Annales de la recherche urbaine* 77, 112–122 (Moreno 2021).; "Vivre dans nos métropoles: la evolution de la proximité" *Constructif* 60, 75–78.
[26](Boriani, Rossari, and Rozzi 1992). *La Milano del piano Beruto (1884–1889)*. Milan: Guerini (Soria y Mata 2004).; *Tratados de urbanismo y sociedad*. Madrid: Clan.
[27](Benevolo 1980). *The History of the City*. Cambridge, Massachusetts: MIT Press.

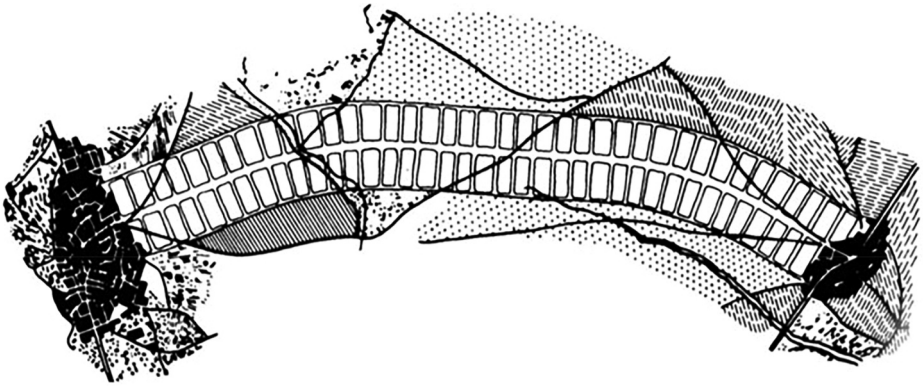

Figure 2. Arturo Soria y Mata, *La Ciudad Lineal* (Soria y Mata 2004).
(Source: http://www.has-architectuur.nl/res/paper%5Bjds12%5D.pdf)

These models, which have significantly shaped our cities, prioritize pre-established *spatial* organization (independent variable), with the *time* required to access functions being subordinate (dependent variable). They centralize key urban functions and are centered on mobility, relying on the efficiency of public and private transportation for accessing urban activities within a reasonable timeframe.[28] The 15-minute city, therefore, suggests a shift in the relative importance of space and time, favoring the latter.[29]

3.2. Other principles

The theme of space and time variables holds primary importance for this study, as it serves as the foundation for the analysis and comparison of the three urban models under examination. However, the 15-minute city is a complex concept comprising several principles interlinked with the chrono-urbanism notion itself, serving as its foundations or outcomes. These principles collectively aim at creating a socially, physically, and economically sustainable environment. Therefore, it's necessary to briefly review them to gain a comprehensive understanding of the concept.

To do this, the authors have chosen to reference the recent study by Khavarian-Garmsir et al., which, through a thorough analysis of the 15-minute city model, identified ten key features.[30]

(a) *Proximity*. As mentioned in the previous section, this principle emphasizes the accessibility to key urban functions on foot or by bicycle within a 15-minute radius. It serves as the foundational pillar supporting the entire concept.
(b) *Density*. High density and compactness are the quality that the urban environment must embody for the successful adoption of a proximity strategy. Urban contexts characterized by low density, fragmentation, and sprawling structures, as found in cities in North America and Australia, heavily dependent on cars, are not suit for the application of the concept.[31] The question of density takes precedence over size. Adapting the 15-minute city model is easier in smaller to medium-sized yet dense cities, like those in Europe, compared to larger but widely dispersed cities, such as those in the United States.[32]
(c) *Diversity*. The city envisioned by Moreno consists of neighborhoods accessible to all, regardless of social and economic class, race, nationality, or other factors. This results in urban contexts characterized by a diverse and inclusive social, cultural, and economic reality.
(d) *Mixed-use*. Each neighborhood should offer a varied mix of functions to enable residents to optimize their daily travels to reach them, resulting in reduced time and transportation needs.
(e) *Modularity*. This principle concerns the subdivision of the city system into independent but interconnected community modules.
(f) *Adaptability*. Contemporary cities, including the 15-minute city, must equip themselves with this essential quality. Recent pandemics and the growing unpredictability of climate change emphasize

[28] Cf (Khavarian-Garmsir et al 2023). Op. cit., 5.
[29] The 15-Minute City is compatible with some urban proposals promoting town dimensions based on proximity of functions and emphasizing walkability and social interactions: see (Alexander 2002). *The Nature of Order: The Process of Creating Life*. Berkeley: The Centre for Environmental Structure (Gehl 2013).; *Cities for People*. Washington DC: Island Press (Whyte 1990).; *City: Rediscovering the Center*. New York: Doubleday (Carlos et al. 2021).; Op.cit.
[30] (Khavarian-Garmsir et al. 2023). Op. cit. The authors direct readers to this article and its references for detailed illustration of the principles, which will only be briefly outlined in this section. See also (Khavarian-Garmsir, Sharifi, and Sadeghi 2023). Op. cit.; Moreno (Carlos et al. 2021)., Op. cit.
[31] (Pozoukidou and Chatziyiannaki 2021). "15-Minute City: Decomposing the New Urban Planning Eutopia" *Sustainability* 13, no. 2: 928 (Mouratidis 2017).; "Is compact city livable? The impact of compact versus sprawled neighbourhoods on neighbourhood satisfaction" *Urban Studies* 55, no. 11: 2408–2430 (Balletto et al 2021).; Op. cit.
[32] (Campisi, Kh, and Ngomsi 2023). Op. cit., 32.

the need for cities to be prepared for possible, even sudden, changes.

(g) *Flexibility*. This feature relates to the adaptability of city and neighborhood buildings for various uses in both the short and long term.

(h) *Human-scale urban design*. The city must be designed on the human scale of pedestrians and cyclists, providing routes and road sections that encourage active mobility.

(i) *Connectivity*. This issue concerns public transport, to which is entrusted the crucial function of connecting the different neighbors in order to avoid isolation and segregation. [33]

(j) *Digitalization*. This feature, which encompasses the integration of smart technologies for the control and regulation of urban functions, was integrated into the principles of the 15-minute city after these technologies proved their effectiveness during the pandemic. Beyond the functional advantages, for example in the transportation field, digitalization facilitates more direct interactions between citizens and institutions, thus promoting increased participation and inclusion.[34]

3.3. The positive reception and implementation

The first systematic attempt to apply the principles of the 15-minute city took place in Paris. In January 2020, Anne Hidalgo based her electoral program for the Mayor of the French capital on this concept. It was intended as an essential condition for the sustainable transformation of the city (Figure 3).[35]

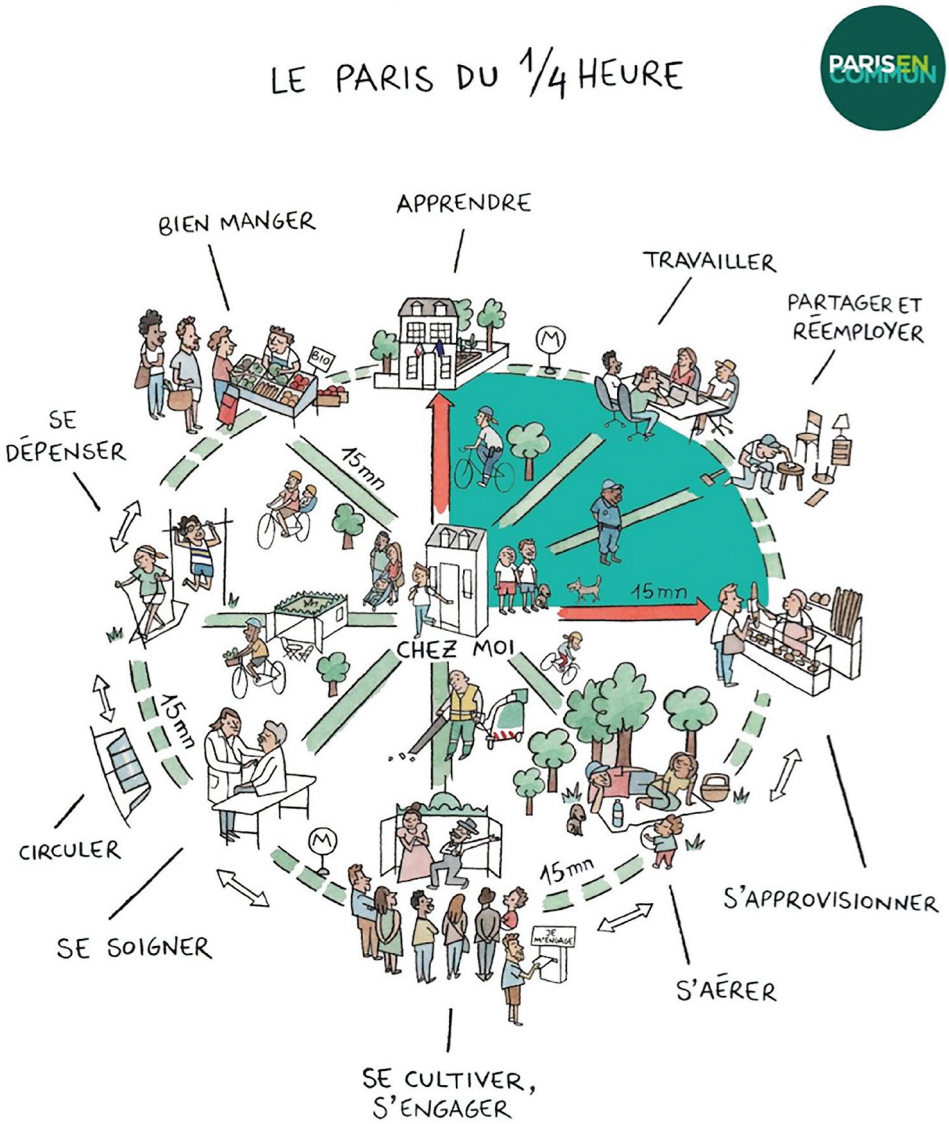

Figure 3. Diagram from *Paris en Commun*, the electoral programme of Anne Hidalgo. (Source: Pisano 2020)

[33](Pozoukidou and Chatziyiannaki 2021). Op. cit.

[34](Sharifi, Reza Khavarian-Garmsir, and Krishna Reddy Kummitha 2021). "Contributions of Smart City Solutions and Technologies to Resilience against the COVID-19 Pandemic: A Literature Review" *Sustainability* 13, no. 14: 8018.

[35]The agenda in: https://www.instagram.com/parisencommun/?hl=en. See also Reid, Carlton, "Anne Hidalgo re-elected as mayor of Paris vowing to remove cars and boost bicycling and walking" *Forbes* <https://www.forbes.com/sites/carltonreid/2020/06/28/anne-hidalgo-reelected-as-mayor-of-paris-vowing-to-remove-cars-and-boost-bicycling-and-walking/?sh=7661f5bc1c85> [Accessed 1 November 2023].

As a result, Paris became a reference model. In the last three years, several other cities followed suit. They elaborated new urban planning tools and modified the existing ones. Stockholm, for instance, developed a program called the "One-minute-City," which took the "15-minute" idea to extremes. Based on the development of a set of special street furniture, the plan transformed all streets and public spaces into places of socialization.[36] Milan adopted and adapted the Parisian model through the declaration of the "Milan 2020 Adaptation Strategy."[37] The document aimed at the creation of a "city of 15 minutes" by increasing the public use of streets and common spaces and enhancing non-polluting transfers, such as walking, cycling, and light mobility. In addition, the urban activity schedules were redefined to distribute the mobility demand over 24 hours.

The application of the Parisian model is generally based on the use of the same spaces for multiple activities by staggering the latter over time, such as carefully planning the use of buildings and infrastructures by time bands for differentiated public and service functions. This can be implemented in both existing and new public spaces, such as schools and their facilities, offices, hospitals, libraries, and stadiums. In certain cases, private areas, such as those in residential buildings, can be opened to the public at specific times. As for workspaces, the 15-minute city model aims to decentralize work activities within neighborhoods or condominium spaces capable of hosting different services and users, such as offices or coworking centers. The latter choice was made convenient by the significant increase in smart working during the COVID-19 pandemic.

3.4. The negative criticism

The consensus on the 15-minute city concept is not unanimous. Recent literature illustrates negative opinions about the concept and its local variations. In the following sections, the primary issues of criticism would be reviewed.

3.5. A (perhaps) non-exportable model and the risk of the social ghetto

The most frequent objection is the non-exportability of the Parisian example, which is modeled on the characteristics of the French capital.[38] Paris is the ideal context for applying the 15-minute city concept. Its neighborhoods are dense (one of the densest in Europe) and rich in diversified services and functions, which are quickly reachable. However, the Parisian/European model is not easily applicable, for instance, to the North American context, where social segregation is a reality in many towns. In such conditions, the formation of mutually independent cohesive areas carries the risk of ghettoization or the exacerbation of existing segregation.[39] The 15-minute city is often criticized for its somehow utopian and abstract nature, which may not fully grasp the complexity of urban phenomena and local economic and social specificities.[40]

3.6. Cultural diversity and central places

The negative observations regarding the 15-minute city highlight that the cities have more social and cultural facets than the proposed decentralized model. A city cannot be reduced to a group of villages. The centralization of certain functions must be considered a strength, instead of a weakness, since crossing city territories to access rare services enriches an individual's experience.[41] Furthermore, certain activities cannot be easily decentralized (e.g., museums, large theatres, etc.) or replaced with local versions. In particular, the work dynamics contribute against decentralization. Studies indicate that individuals prefer a wide range of opportunities, even if they are forced to travel further from their residence.[42] Hence, it is not surprising that several cities persist in policies opposite to decentralization, which strengthens the role of centralized functions. The case of Milan, where the

[36](O'Sullivan 2021a) 'Make Way for the "One-Minute City" *Bloomberg*, January 5 <https://www.bloomberg.com/news/features/2021-01-05/a-tiny-twist-on-street-design-the-one-minute-city?sref=Y5NzbMHF> [Accessed 1 November 2023]. See also (Pinto and Akhavan 2022).: "Scenarios for a post-pandemic city: urban planning strategies and challenges of making 'Milan 15-minutes city'" *Transportation Research Procedia* 60, 370–377.

[37](Municipality of Milan, Milano 2020) *Strategia di adattamento*. <https://www.comune.milano.it/documents/20126/95930101/Milano+2020.++Strategia+di+adattamento.pdf/c96c1297-f8ad-5482-859c-90de1d2b76cb?t=1587723749501> [Accessed 1 November 2023]; Cf (Pisano 2020). Op. cit.

[38]Daniele, Federica. Op. cit.

[39]O'Sullivan, Feargus. "Where the '15-Minute City' Falls Short", *Bloomberg*, March 3 2023 (Whittle, 2021) <https://www.bloomberg.com/news/articles/2021-03-02/the-downsides-of-a-15-minute-city> [Accessed 1 November 2023].

See also (Whittle 2021) .: *The 15 Minute City: Global Change Through Local Living*. Edinburgh: Luath Press. For example, the application of the 15-minute city in Toronto highlighted the neoliberal dimensions and socio-spatial inequality dynamics of this model: Amin, Aaminah. 2021. "The 15-Minute City in Toronto: Insights from Lefebvre and Fanon." Unpublished master's thesis, York University. <https://yorkspace.library.yorku.ca/xmlui/bitstream/handle/10315/38601/MESMP03621_Amin_Aaminah.pdf?sequence=1&isAllowed=y> [Accessed 1 November 2023].

It is interesting to compare the principles of the 15-minutes city with the studies on pathological behaviours in ideal conditions and in closed environments. See (Calhoun 1962). "A behavioral sink." In *Roots of Behavior*, edited by Eugene Bliss, 295–315. New York: Paul Hoeber; See also (Anderson and Eugene 1972). "Some Chinese methods of dealing with crowding" *Urban Anthropology* 1, no.2: 141–150.

[40](Pozoukidou and Chatziyiannaki 2021). Op. cit; Cf (Khavarian-Garmsir et al 2023). Op. cit., 12 (Khavarian-Garmsir, Sharifi, and Sadeghi 2023).; Op. cit.

[41](Di Lieto 2023). "Le città dei 15 minuti: teoria o realtà?" *Senzafiltro*, <https://www.informazionesenzafiltro.it/le-citta-dei-15-minuti-teoria-o-realta/> [Accessed 1 November 2023]; Daniele, Federica. Op. cit.

[42]Di Lieto, Norman. 2021. Op. cit. (Khavarian-Garmsir et al. 2023).; Op. cit.

competition for the "Single City Library" project *Biblioteca Europea di Informazione e Cultura* ("European library of information and culture") – BEIC, has recently resumed, is significant.[43]

3.7. The role of transport

As mentioned in Section 3.2, the principles of the 15-minute city aim to achieve ultimate goals of environmental and social sustainability. The latter includes, among other aspects, minimizing the waste of social time spent on accessing urban functions.[44] While the principle of *connectivity* emphasizes the importance of public transportation, the central principle of *proximity* renders it almost unnecessary, in Moreno's vision, allowing for the complete renunciation of cars or other petrol-driven means of transport.[45] However, several critics believe that the question needs to be approached differently. According to them, sustainability goals should not be achieved by nearly eliminating transportation through the redistribution of urban functions. Instead, both private and public transport require a reevaluation, involving conceptual and technological evolution.[46] These critics essentially advocate for maintaining the traditional model of the industrial-era city: centralized and "mobility-centric".[47] However, the new "center" should consist of a new generation of *green* means of transportation that ensure rapid communication between urban areas. This strategy is seen as the key to achieving environmental and social sustainability while preserving the city as a vast and complex territory filled with opportunities.[48] Throughout this process, careful attention to technological innovation is necessary to prevent issues of inaccessibility and exclusion.[49]

4. Alternative options to the 15-minute city: case studies

4.1. Woven city and gwangmyeong new town: common objectives, differences, and their connection with the 15-minute city

The reflections in Sections 3.4-3.7 could be considered opinions as they do not carry concrete technical proposals. However, this section presents two cases that elaborate on and implement the aforementioned issues on theoretical and operational levels. The projects selected for this study are Woven City (Japan) and the master plan for Gwangmyeong New Town (South Korea). Gwangmyeong will be discussed in detail as the authors of this paper designed a part of the plan, which forms the basis for this study's arguments.

The two projects are not alternative interpretations or applications of the 15-minute city because they have different outcomes. Unlike the 15-minute city, the city proposed by these designs is centralized, vast, and smart. However, these models can be consistently compared with Moreno's concept because they, too, work on the urban variables of "space" and "time" through the theme of transportation. Although interpreted in different ways (minimized in Moreno, fast and super-efficient in Woven, and slow and multifunctional in Gwangmyeong), transportation is entrusted, in all three cases, with the role of mitigating the "social" unsustainability of the contemporary city, that is, the time wasted in traveling from one urban function to another.[50]

As anticipated by Section 2.2, the discussion of the two projects would focus on the infrastructure and transport systems, with just an overview of the urbanistic and architectural specificities. Details on the latter aspects can be found in the bibliography.

4.2. Woven City

At Consumer Electronic Show (CES) 2020, Toyota revealed its plans to build Woven City, a prototype future town with an area of 70 hectares (708,000 m^2), at Susono City, Shizuoka Prefecture, at the base of Mount Fuji. The site was formerly an industrial plant of the Japanese automobile company (Figures 4 and 5).[51]

Currently under construction, Woven City has been envisioned as a "living laboratory" (Figure 6). It will host resident researchers to test and develop technologies, such as autonomous driving, robotics, personal mobility, smart homes, and artificial intelligence in a real environment.[52] Based on the data captured and analyzed, the town will be potentially expandable to a larger smart city (from 350 to 2000

[43](Municipality of Milan 2022). "Pubblicato il concorso internazionale di progettazione per un polo culturale di ultima generazione" <https://www.comune.milano.it/-/beic.-pubblicato-il-concorso-internazionale-di-progettazione-per-un-polo-culturale-di-ultima-generazione> [Accessed 1 November 2023].
[44]Cf (Khavarian-Garmsir et al 2023). Op. cit.
[45](Papas et al. 2023). "Urban mobility evolution and the 15-minute city model: from holistic to bottom-up approach" *Transportation Research Procedia*, 69, 544–551.
[46](Glaeser. 2021). Op. cit.
[47](Khavarian-Garmsir et al. 2023b). Op. cit.
[48](Bertaud 2022). *The Last Utopia: The 15-Min City*. Houston: Urban Reform Institute.
[49]Two increasingly crucial issues in current smart mobility trends are "transport poverty" and "digital inequality." These terms refer to the lack of access among economically disadvantaged or digitally less-educated classes to a wide range of modern smart transportation options. (Durand et al 2022). "Access denied? Digital inequality in transport services" *Transport Reviews* 42, no. 1: 32–57; (Groth 2019). "Multimodal divide: Reproduction of transport poverty in smart mobility trends" *Transportation Research Part A: Policy and Practice* 125, 56–71.
[50]The objective of eliminating the *physical* unsustainability of the urban environment (i.e., pollution) is implicit in all three proposals.
[51]Official website: *Toyota Woven City*. https://www.woven-city.global/ [Accessed 1 November 2023]. The Higashi-Fuji plant closed on December 9, 2020, after 53 years.
[52]Woven Planet, "Woven City Tech Meetup" < https://www.youtube.com/watch?v=Nlo1ittLehM > [Accessed 1 November 2023].

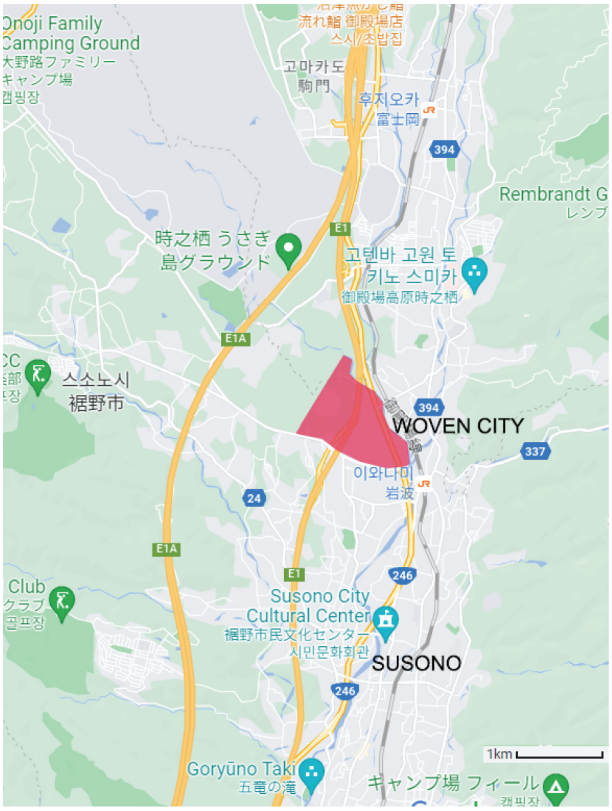

Figure 4. Location and territory of Woven city.
(Source: Google Maps, elaborated by the authors)

people).[53] Designed by the Bjarke Ingels Group (BIG) architecture office, Woven City is an integrated ecosystem powered by hydrogen fuel cells, regulated by a digital operating system for urban infrastructure. Mobility will consist of autonomous, zero-emission vehicles for transportation, deliveries, and touring stores.[54]

The city master plan includes three paths for three types of users (Figure 7).[55] The main street is for fast autonomous vehicles with logistical traffic underneath. The secondary road, curved and within nature, would host lower-speed residential traffic. The third street is exclusively for pedestrians, designed as a linear park walkway. These three roads intertwine to form an orthogonal grid of 3 × 3city blocks where neighborhood parks/courtyards are distributed and the center is occupied by a large central plaza, hosting the main urban functions and services. At another point, the grid expands to accommodate a central park (Figure 8).

Woven City does not renounce the great distance, that is, the territorial vastness of the city. Although initially contained, the Woven City prototype can potentially grow on an unlimited scale. In contrast to the 15-minute city, the Toyota model does not pursue the decentralization of the main functions (except for a reasonable peripheral distribution of services and public greenery). The central plaza is a clear example of this approach since it accommodates the most significant collective activities. Futuristic self-driving transportation converges with it. Once parked, they can be converted into communal service and leisure functions (Figures 9 and 10).[56] The vehicles' autonomous driving system, their technological equipment for the safety of passengers and pedestrians, optimization of routes, and accurate flow control allows citizens to considerably reduce their transfer time. Thus, movement becomes socially sustainable and time is not deducted from individuals' lives.

4.3. *Gwangmyeong new town*

Gwangmyeong New Town, situated in southern Seoul (Figures 11 and 12), is designed to host 237,000 inhabitants. The authors of this study co-participated in the design of the urban layout and were in charge of the design of the mobility system and its infrastructure (Figures 13 and 14). Although the project is currently undergoing a technical study for feasibility, the materials presented here illustrate its design concept phase to extract principles that are adaptable to different situations and contexts.[57]

The urban plan does not entirely neglect the 15-minute city concept. The city's territory is organized into orthogonal blocks and replete with decentralized services (small theatres, shopping centers, and education facilities housed in buildings used for multiple functions) that can be

[53]The city layout is designed for virtually infinite expansion, both physically and demographically. This expansion may not necessarily occur within Woven but can be implemented in contexts where this urban model is adopted: see *Toyota Woven City*, Op. cit.

[54]Burkert, Andreas. 2020. "Japan's Mobile Society 5.0"*ATZ worldwide* 122, no.5. https://www.springerprofessional.de/en/japan-s-mobile-society-5–0/17924902 [Accessed 1 November 2023].

According to Byarke Ingels, "We have a unique opportunity to explore new forms of urbanity with the Woven City that could pave new paths for other cities to explore." See IOT Business News. January 3 2020. "Toyota to Build Smart City Prototype in Japan", <iotbusinessnews.com/2020/01/13/50144-toyota-to-build-smart-city-prototype-in-japan/> [Accessed 1 November 2023].

The city is designed to be completely sustainable, with buildings made primarily of wood to minimize CO_2 emissions, using traditional Japanese carpentry techniques combined with automated manufacturing methods. The roofs will be equipped with photovoltaic panels to generate solar energy in addition to hydrogen fuel cells. The city exteriors feature indigenous and hydroponic vegetation.

[55]Toyota Woven City. Op. cit. At the moment, there are no exhaustive texts that describe or analyze Woven City from an urban planning and transportation perspective (see Bruno et al. 2022. "Smart Trams: A Design Proposal for a City of Interrelation" Sustainability 14, no. 18:11471). Therefore, the official project's website remains the most valuable source of information, from which the material for this section was gathered.

[56]Among them, the autonomous electric Toyota *e-Palette*, which will be used for shared transportation and deliveries, individual transportation -with electronic and digital equipment- and mobile retail. See (Burkert 2020), Op cit.

[57]The term New Town, in South Korea indicates the urban expansion of an existing city: a new district. The plan, commissioned by The Union of Land Owners of Gwangmyeong to be submitted to the City Government for approval, was developed from 2019 to 2021. The design team included international professionals and experts from several fields and was coordinated by ATEC Architects of Seoul (http://m.atec.co.kr/main). The administrative steps of the project are currently on hold, while its technical development is under process. As in the case of Woven City, Gwangmyeong's illustrations, too, focus on infrastructure and transportation design. For the architectural and urbanistic aspects, see the recently published book (in Korean) (광명도시계획연구팀 2022). 특별한 도시 광명-광명·시흥 특별관리지역 도시계획. 서울: 우리북. On the social implications of the project, see also (Bruno, Musante, and Dacarro 2022). Op. cit.

Figure 5. The site of Woven city before starting the construction works.
(Source: Toyota Woven City.https://global.toyota/en/download/14221319/)

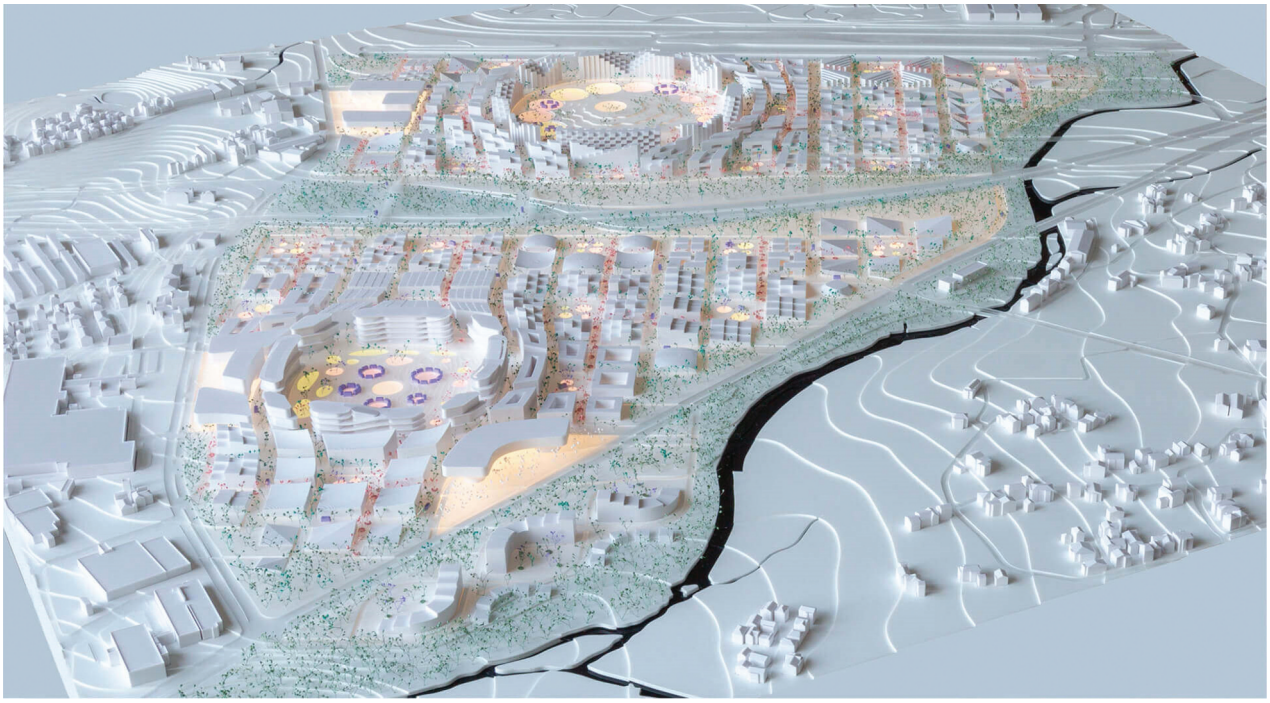

Figure 6. Woven city masterplan model.
(Source: BIG. https://big.dk/#projects. Toyota Woven City. https://www.woven-city.global/)

reached by foot in every neighborhood. However, unlike the 15-minute city, and similar to Woven City, the general philosophy of the project does not reject urban centralization. Significant urban functions, such as shopping malls, cultural and religious facilities, and schools, are located in centralized, strategic locations (Figure 15).

The transport plan elaborated on by the authors reflects this dual approach. The primary public transportation service of the New Town is trams. A feasibility study (Figure 16) suggested the use of old vehicles, purchased abroad and suitably modernized and adapted, to accommodate various functions. In particular, the vehicles would

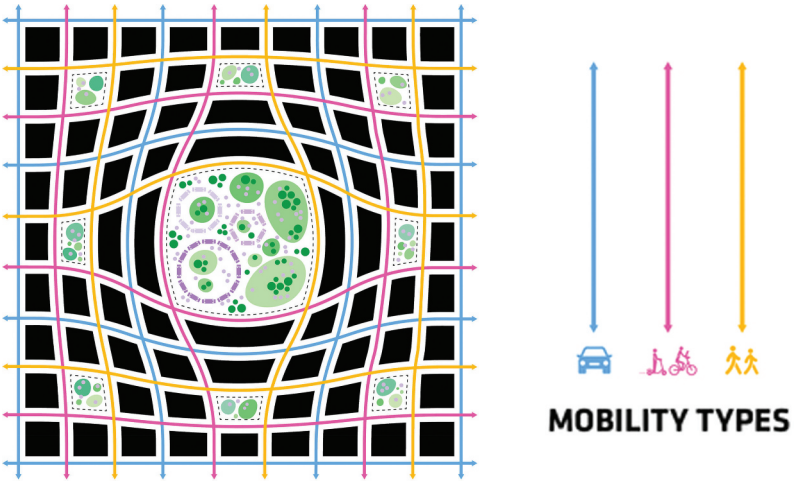

Figure 7. Woven city masterplan diagram and mobility types.
(Source: BIG. https://big.dk/#projects. Toyota Woven City. https://www.woven-city.global/)

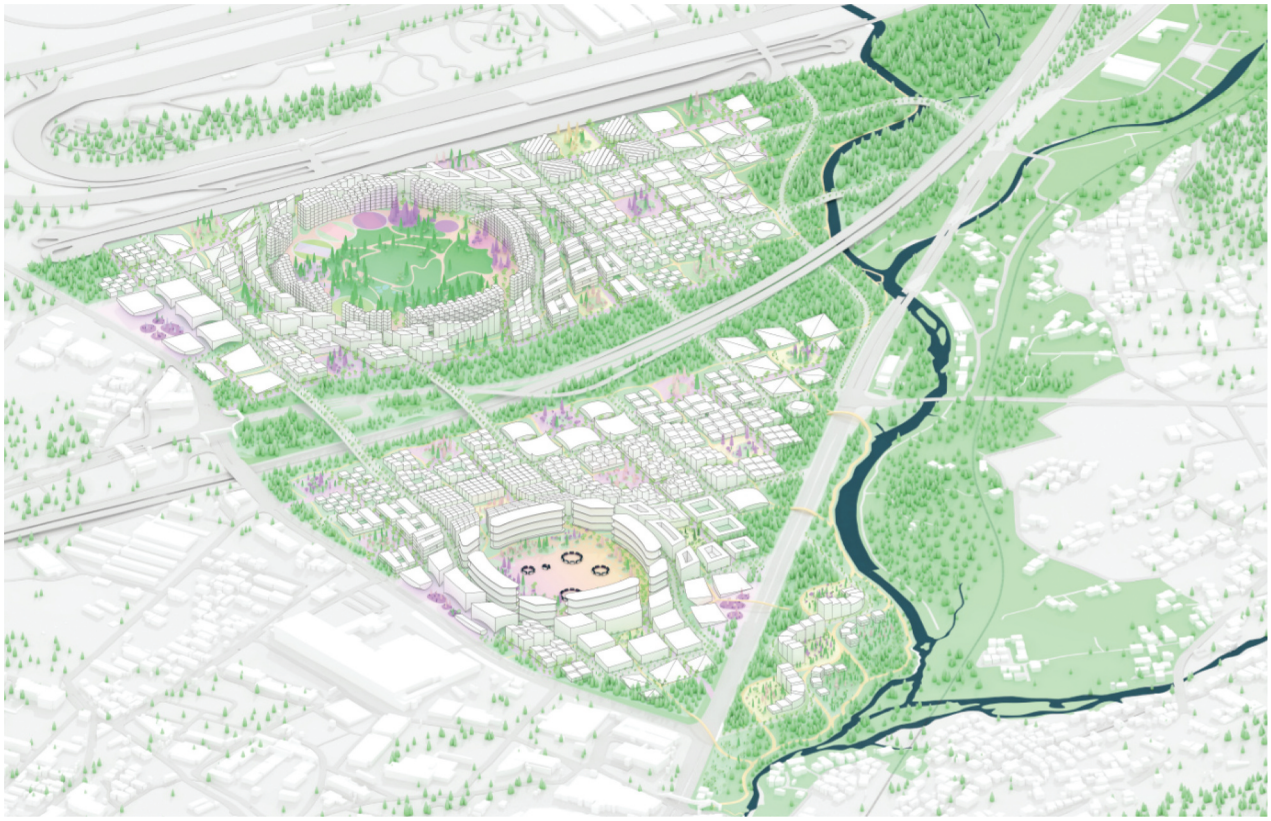

Figure 8. Woven city masterplan 3D visualization.
(Source BIG. https://big.dk/#projects. Toyota, Woven City. https://www.woven-city.global/)

be equipped with smart technologies and would either be trackless or use autonomous driving. In the latter case, the plan described below can assume different configurations.

The transport infrastructures consist of three lines for three different travel speeds, which depend on the number of stops (Figure 17). A high-speed (HS) transport line goes beyond the boundaries of the city and connects Gwangmyeong to international infrastructures, such as the airport. This line has supra-municipal relevance and is being planned by the regional authorities. Waiting for the final layout, the project schematically identifies four interchange points with the urban lines (Figure 17, IS_01–04). The HS transport line is linked to a medium-speed (MS) transport ring, which crosses the linear city center and interconnects the centralized urban functions mentioned above (Figure 15). The MS transport ring intercepts a low-speed (LS) transport circuit at strategic points based on the arrangement of the city territory. The LS transport circuit is articulated into rings to reach all the peripheral neighborhoods and is linked to a "last mile" system, which consists of means of individual transportation and related infrastructures, providing door-to-door public and semi-public services. The location of the stops and stations, where the different circuits intersect, is designed to

Figure 9. Woven city central plaza.
(Source: BIG. https://big.dk/#projects. Toyota, Woven City. https://www.woven-city.global/)

Figure 10. Woven city street crossed by autonomous vehicles.
(Source: BIG.https://big.dk/#projects. Toyota, Woven City. https://www.woven-city.global/)

optimize network efficiency and valorize urban places through additional services (Figure 18).

Besides passenger transport, the trams can become vehicles for waste disposal and transport of goods through specially designed sections housing sealed containers that are loaded and unloaded in collection centers (Figure 19). These functions are supported by strategically distributed facilities throughout the city (Figures 20 and 21). The trams circulate at night to optimize and economize freight transport and waste disposal services.

The abovementioned aspects make the Gwangmyeong system both environmentally and economically sustainable. However, like Woven City, the project pursues the social sustainability of public transport, specifically, decreasing the time wastage during the transfer. Thus, the trams are designed to offer additional collective services. While most of the wagons carry passengers, some refurbished and equipped modules can host classrooms, conference rooms, working or coworking spaces, or commercial and leisure activities (shops, bars, cafes, etc.) (Figure 22). The

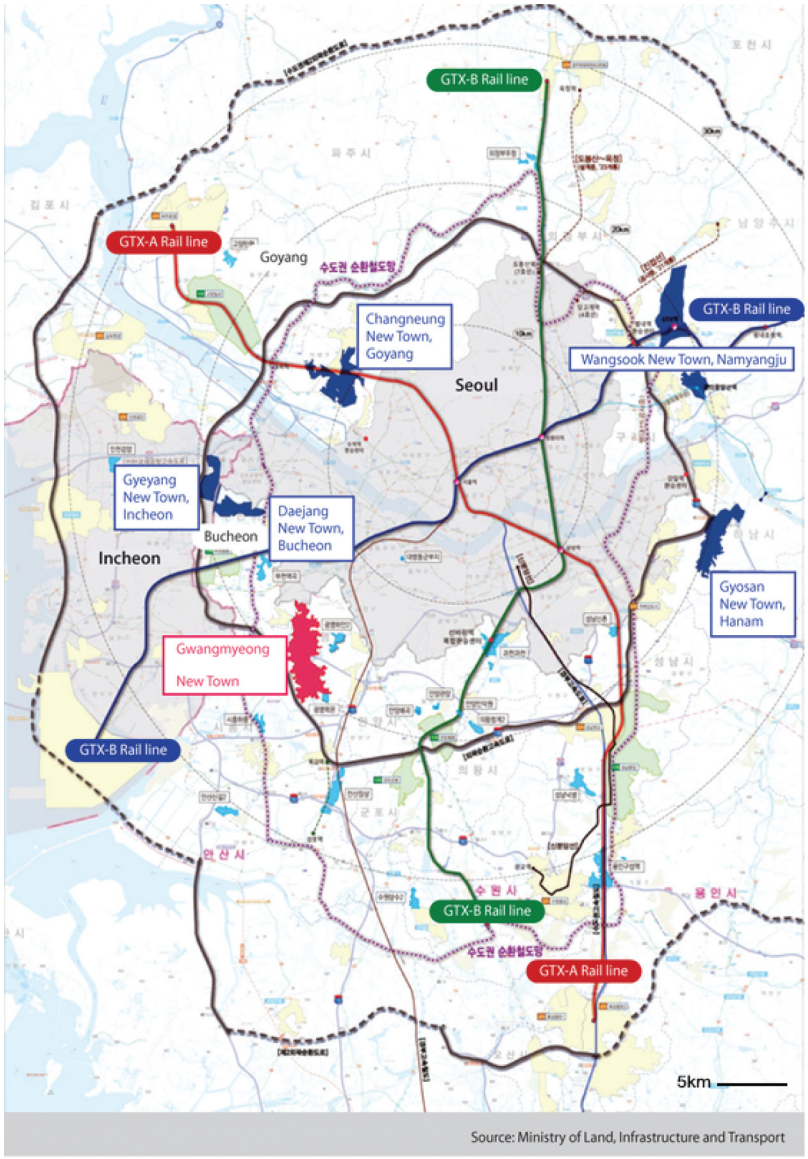

Figure 11. Location of the areas designated for new towns around Seoul in 2018, including Gwangmyeong New Town (in red) (Source: Korea JongAng daily. https://koreajoongangdaily.joins.com/2021/02/24/business/economy/New-Town-GwangmyeongSiheung-Housing-supply/20210224173000518.html).

number of wagons used for this purpose is flexible and depends on the community's requirements. In addition, the path of these special modules can be personalized. In fact, as real "moving rooms," they can detach from the MS ring and travel along the LS rings to reach inhabited areas in a capillary fashion to provide services (Figure 23). For example, people can "call a wagon" at home and continue work, alone or in a group, inside it while the vehicle takes them to their chosen destination. Moving rooms, which collect people from every part of the town, can be booked for "traveling events" (in other words, you do not "go" to the event; instead, the event "comes" to you). Furthermore, study trips or classes with specifically designed routes and stops can be organized.

The abovementioned dynamics can be managed through the most recent "smart" technologies, particularly those belonging to "smart transportation" (Figure 24).[58]

[58]The vehicles have been developed based on current or past case-studies such as cargo trams (Dresden, Zurich) or restaurant/event trams such as ATMosfera, see Azienda Tranviaria Milanese (ATM). *ATMosfera in Milan*, <https://www.atm.it/en/AltriServizi/TempoLibero/Pages/ATMosfera.aspx> [Accessed 1 November 2023]. See also, Wong, Marcus. 27 September 2018. "Freight Trams of Europe" *Euro Gunzel*. <https://www.eurogunzel.com/2018/09/freight-trams-of-europe/> [Accessed 1 November 2023]. The authors of this study are currently working at a Smart Tram prototype commissioned by a European company. Although the technological details of the system are currently under development, this note intends to provide an outline of the most significant technical issues of the project. The vehicles – named with the palindrome expression *Smart Trams*—can be self-driving and remotely controlled, and equipped with the trackless tram system technology (see (Newman et al 2019). "The Trackless Tram: Is it the Transit and City Shaping Catalyst we have been waiting for?" *Journal of Transportation Technologies* 9, 31–55. The choice between these technologies and that of the traditional tram with tracks and driver is still under consideration. Either choice would not change, anyway, the core of the project concept. The autonomous driving system would rely on sensor fusion perception platforms to guarantee road safety. The trackless technology would allow to change the tram routes according to population, goods, and services flows updates. In general, the technical equipment can be divided into "hardware" and "software," which, in turn, is applied "to" the trams and "outside/around" the trams, namely, to their infrastructure. Such equipment is summarized in Figure 20 (where trackless and autonomous driving technologies are envisaged).

Figure 12. View of the current condition of the site.
(Source: Google maps)

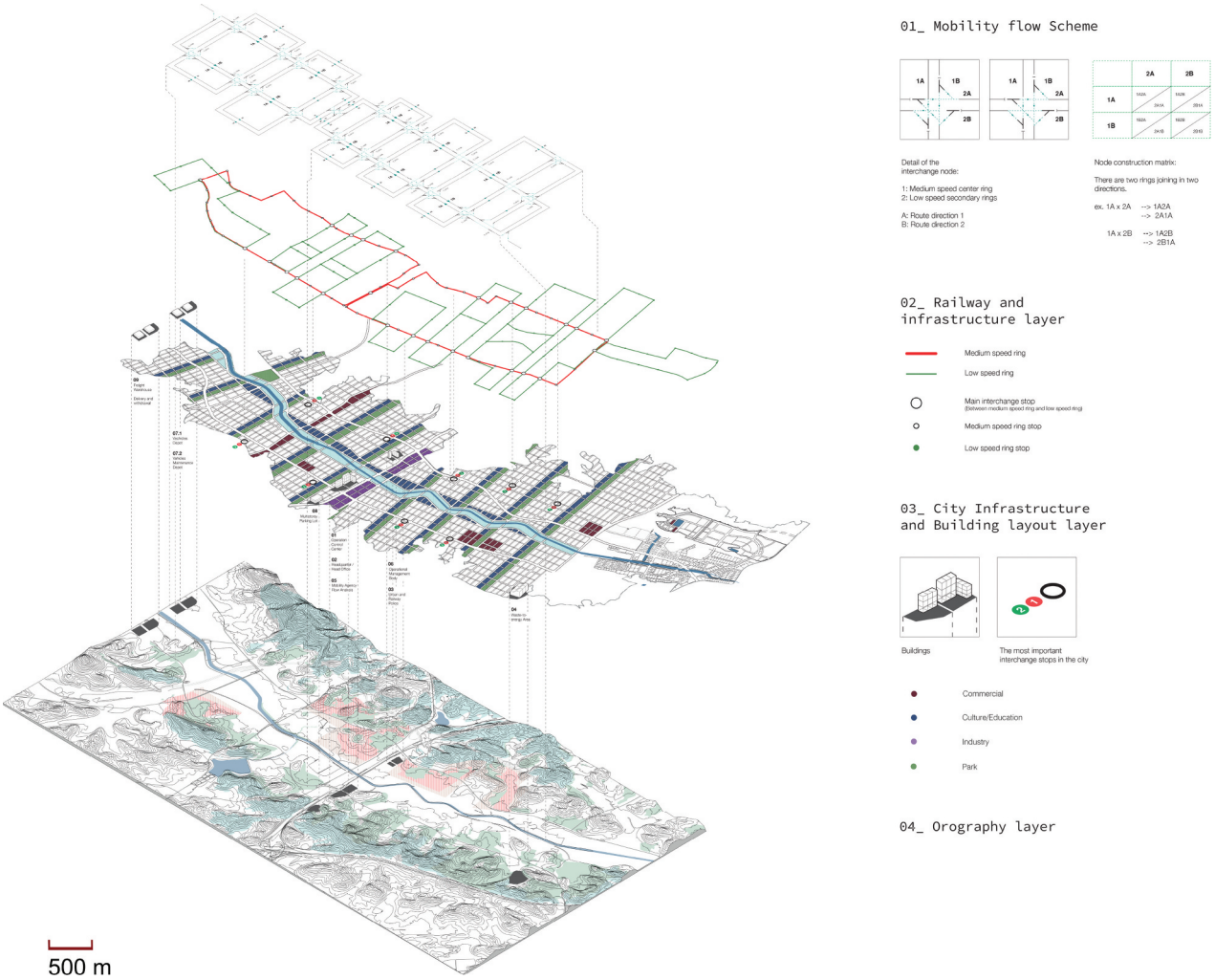

Figure 13. Gwangmyeong New Town project layers (from bottom to top): topography, urban master plan, transport master plan and vehicle circulation systems.
(Source: Authors)

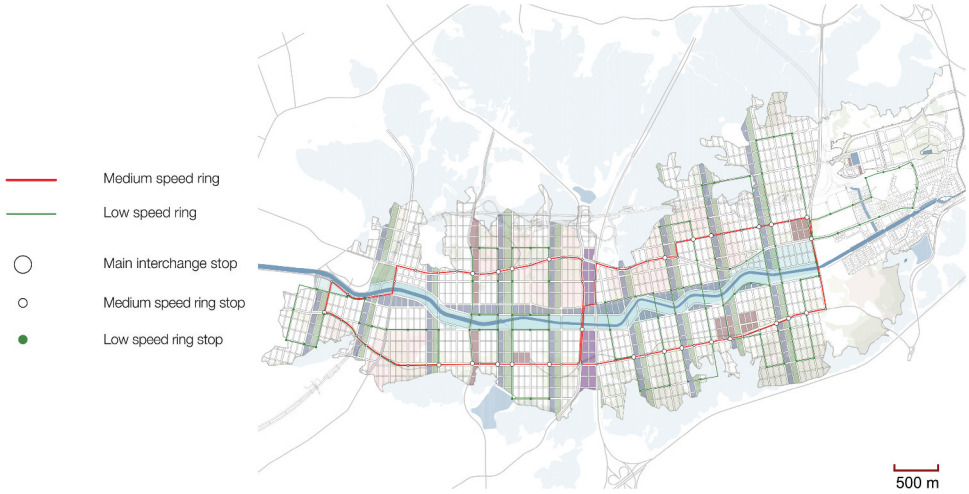

Figure 14. Gwangmyeong New Town transportation plan.
(Source: Authors)

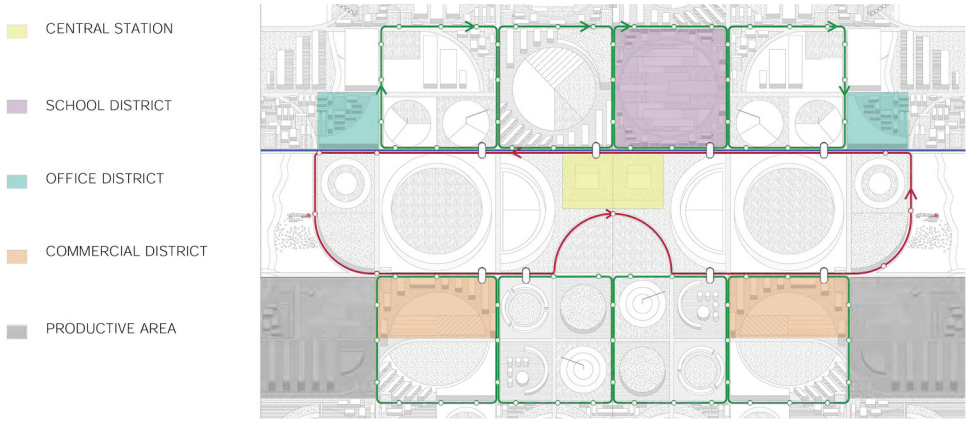

Figure 15. Gwangmyeong New Town areas of centralized functions.
(Source: Authors)

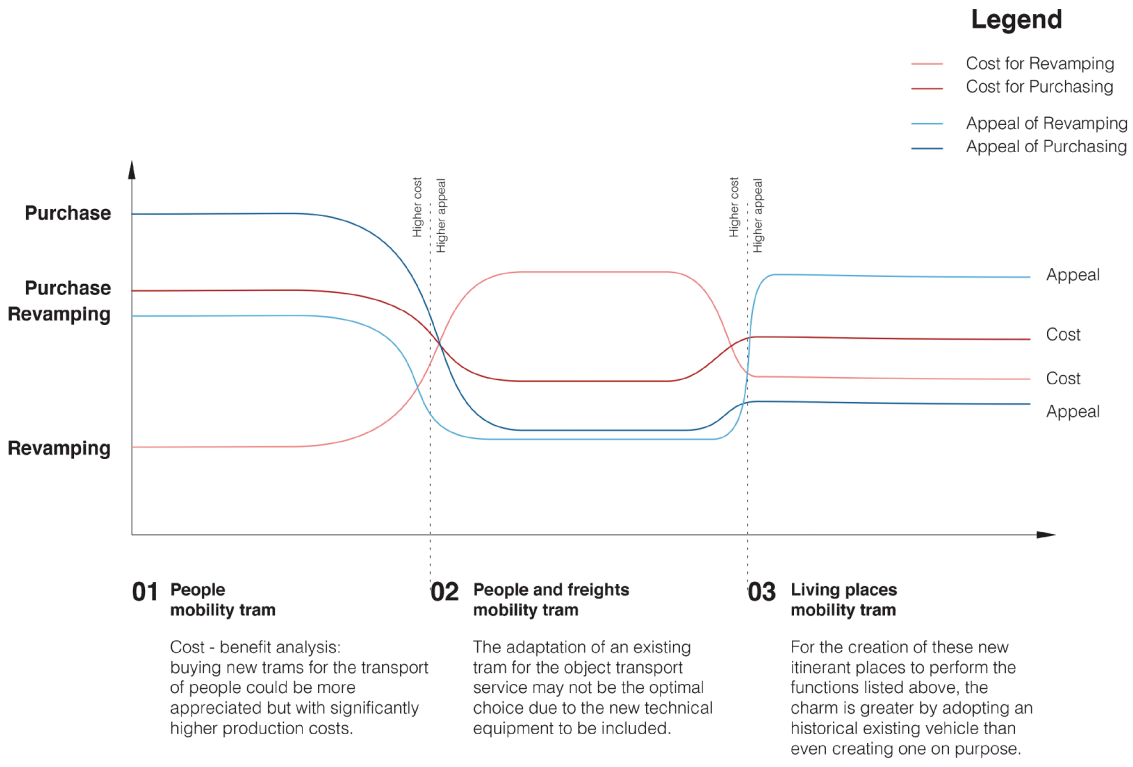

Figure 16. Gwangmyeong New Town feasibility study diagram.
(Source: Authors)

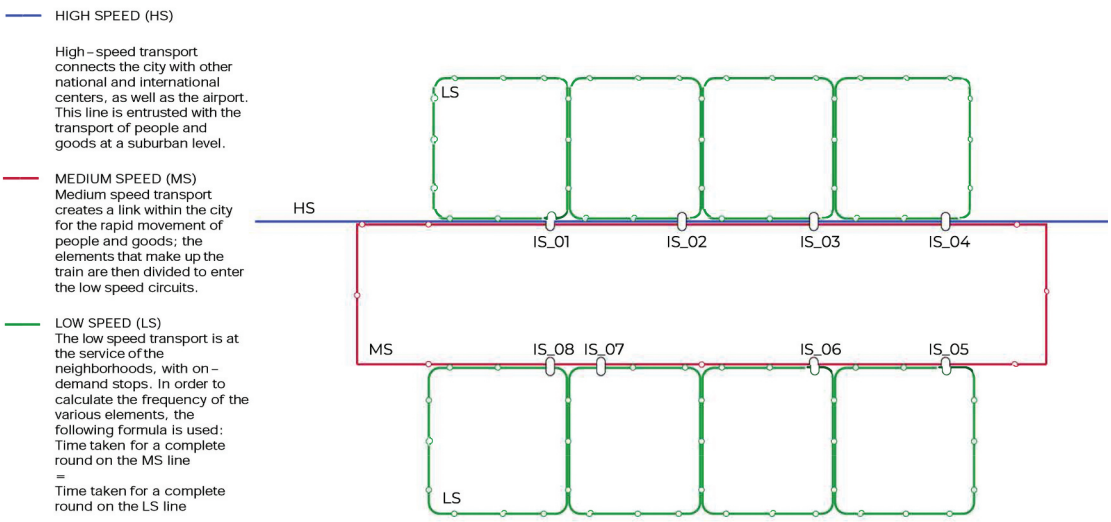

Figure 17. Gwangmyeong New Town mobility flow corresponding to different speeds.
(Source: Authors)

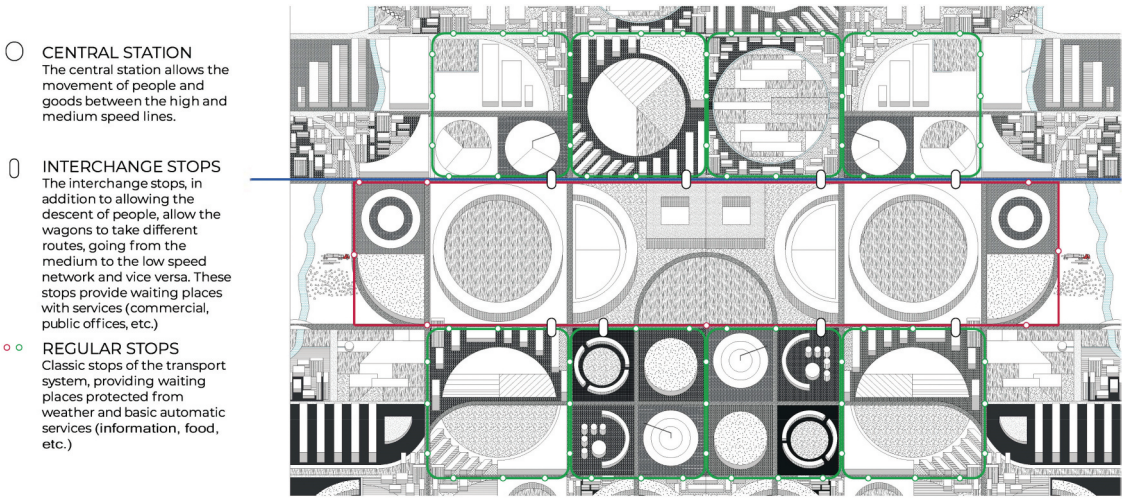

Figure 18. Gwangmyeong New Town stations and stops.
(Source: Authors)

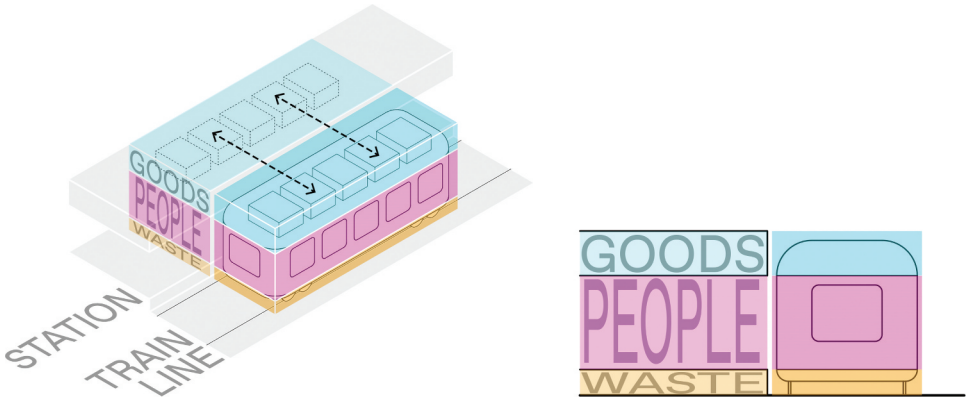

Figure 19. Gwangmyeong New Town management of the integrated systems: waste, goods and people. Sealed containers are also housed in the waste section of the wagon; however, this axonometric representation shows only the containers for goods.
(Source: Authors)

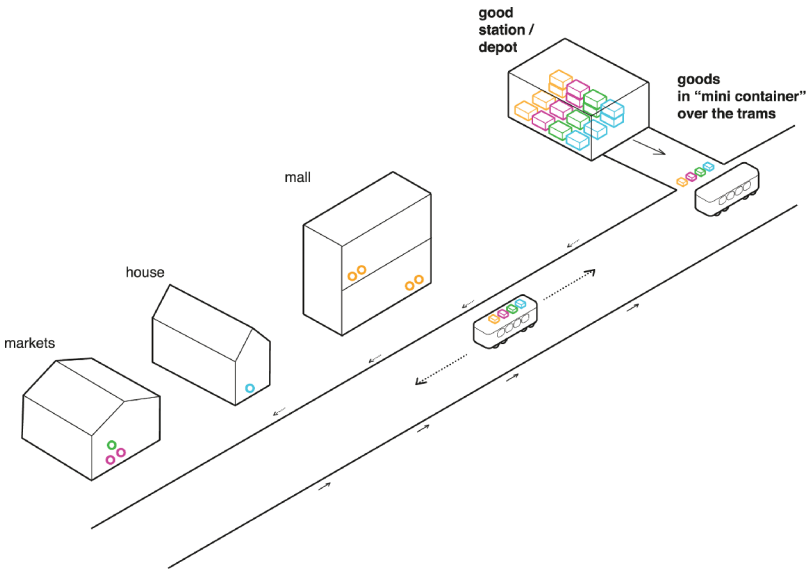

Figure 20. Gwangmyeong New Town management of the integrated systems: goods.
(Source: Authors)

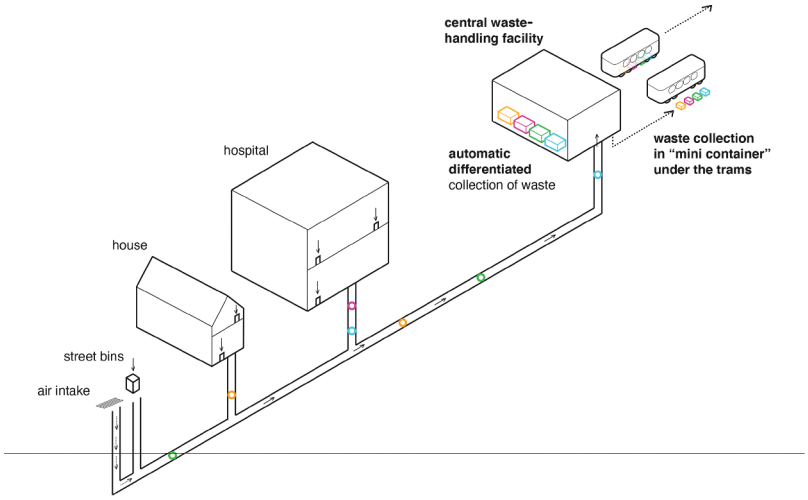

Figure 21. Gwangmyeong New Town management of the integrated systems: waste.
(Source: Authors)

The project acknowledges, though, that the proposed scenario may be inaccessible to a segment of the population due to age or social reasons, preventing them from accessing digital technologies.[59] To prevent exclusion, the project envisions the coexistence of digital and analog methods of use during the initial phases of its implementation. This means that the regular transport service will continue to operate as usual, following established and clearly marked timetables at the stations. Additionally, functions can also be reserved by phone or at special offices.

Finally, as the moving rooms traverse areas of the city with varying social and economic compositions, the Gwangmyeong trams, accessible to all, serve as *inclusive* spaces for meetings, gatherings, and cultural exchanges.[60]

4.4. Observations

Gwangmyeong, like Woven City, is designed to expand indefinitely and adapted to different urban forms and dimensions. Thus, keeping the primary urban functions

[59] See the issues related to "digital inequality" in (Durand et al 2022).: Op cit.
[60] Although a confidential technical document on this issue is currently in development, it can be anticipated that the feasibility studies of the project mentioned earlier (Figure 16) will confirm that choosing the tram, especially the refurbished and adapted one, results in limited long-term service costs, thanks to the minimal maintenance required, thus promoting widespread accessibility. See the issues related to "transport poverty" in (Groth 2019). Op. cit.

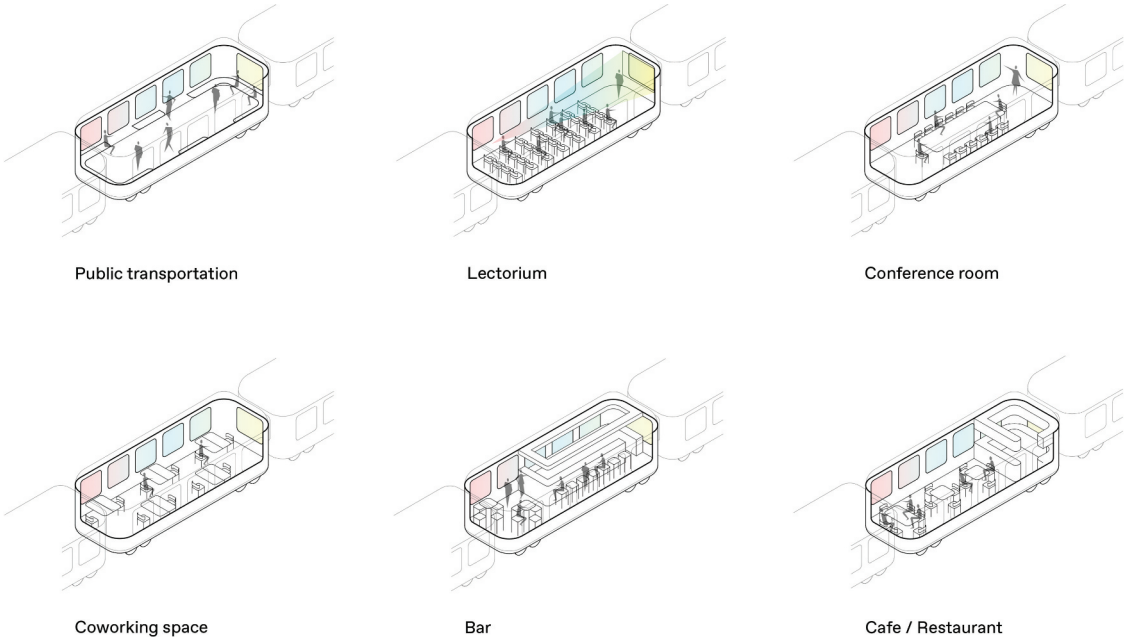

Figure 22. Gwangmyeong New Town activities hosted by the special tram modules (moving rooms). (Source: Authors)

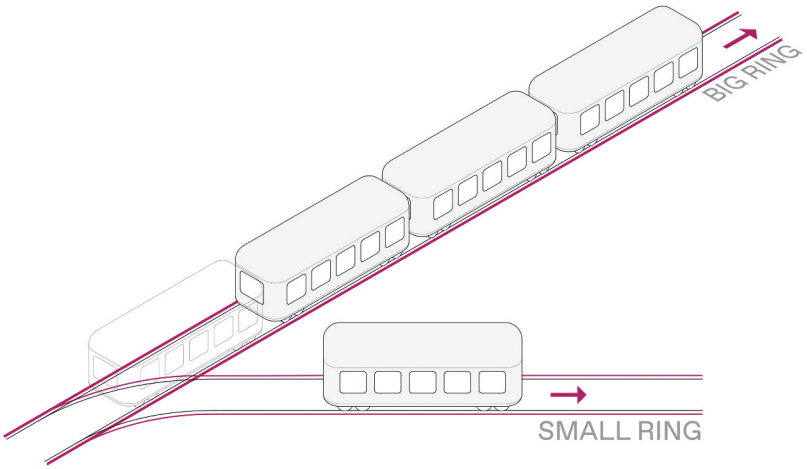

Figure 23. Gwangmyeong New Town detach-attach system of the tram wagons. (Source: Authors)

centralized, the expansion will increase the distance between such functions and the city's neighborhoods. However, while Woven City addresses the problem of wasted social time by minimizing travel time, Gwangmyeong makes that time "usable" by allowing people to use the transport for domestic or para-domestic activities.

> "Time" is the key issue in the projects analyzed in this study. Woven City and Gwangmyeong pursue the objectives of the 15-minute city—pollution reduction and optimal use of time for physical and social sustainability. However, regarding the latter, the two Eastern projects, unlike the 15-minute city, do not envisage an inversion of the role and weight of the space and time variables. In both proposals, space and time are balanced; neither is the form and the vastness of the city relinquished, like in Moreno's model, nor is time subordinated to space, as in the traditional city (cf. Section 2.1). The tool that Woven City and Gwangmyeong use for achieving this equilibrium is "transport" (almost eliminated in the 15-minute city), improved in efficiency and sustainability. The interpretation; however, is different in the two plans. Woven City aims to "reduce" the transfer time through careful infrastructure planning. Elimination of wasted time is, thus, primarily a matter of minimizing traffic congestion and increasing the connection speed between two city points.[61] Gwangmyeong, however, recycles a traditional means of transport and modifies it structurally and functionally to develop a mobile

[61] Guidehouse Insights. 20 February 2020. "Applying Toyota's Woven City Design to Real-World Cities" <https://guidehouseinsights.com/news-and-views/applying-toyotas-woven-city-design-to-realworld-cities> [Accessed 1 November 2023].

Figure 24. Gwangmyeong New Town technical equipment, software, and hardware. (1) vehicles' s equipment (divided into those applied outside the vehicle (infrastructure technologies) and to the vehicle (on means technologies) (2) buildings and public spaces technologies, (3) technologies for data exchange with central control (4) technologies for users. (Source: authors).

> and multipurpose public/common space. The tram retains its primary characteristics, including relatively low speed. Therefore, travel time is not drastically reduced, yet it is made effectively "usable."

The two projects can be differentiated based on another element that do not directly concern time: the adaptability of the concept to different contexts, and in particular, to already existing urban environments. Due to the adoption of a transportation method with a well-established global tradition, such as the tram, which has witnessed two centuries of urban transformations and remained practically unchanged,[62] the Gwangmyeong model can be applied to culturally diverse or existing contexts without causing significant disruptions.[63] This contrasts with Woven City. The most recurrent criticism of the Japanese prototype is that its principles can hardly be applied to an urban context that has not been designed according to the grid and functional zoning elaborated by BIG ab initio.[64] For example, historically established towns, often characterized by narrow and somewhat chaotic street layouts and consolidated land use, can easily accommodate trams. Nevertheless, significant adaptations would be necessary to accommodate the road system developed for Woven.

This argument relates to the ability of these urban systems to adapt themselves to changing or contingent situations. *Adaptability* is one of the principles of the 15-minute city, as discussed in Section 3.3. If we continue with this comparison, we can see that concerning *proximity*, Woven City lacks an explicit proposal, while Gwangmyeong, as explained in Section 4.3, provides diverse and accessible neighborhood services, housed in *flexible* buildings. Furthermore, Woven City does not seem to delve deeply into the theme of social *diversity* within the urban context, whereas on the Gwangmyeong trams, particularly in the "movable rooms" characterized by generous capacity, broad social interactions are possible, making them valuable spaces for cultural exchange and integration (Section 4.3). Regarding the other principles, both Woven City and Gwangmyeong share the concept of a high-*density* city and adhere to the principle of *mixed use*. In contrast to the 15-minute city, the two Asian towns do not prioritize *modularity*. Instead, they emphasize, like Moreno's model, aspects of *human-scale design*, dedicating spaces to active and individual mobility and rely heavily on the *digitalization* of urban

[62](Petkov, Dejan 2020) *Tramway Renaissance in Western Europe. A Socio-technical Analysis*. New York: Springer. In Seoul, a tram service was active from 1899 to 1968: Seoul Museum of History. *The trams of Seoul*. https://museum.seoul.go.kr/eng/board/NR_boardView.do?bbsCd=1042&seq=20191212214227566&q_exhCd=all#:~:text=In%201899%2C%20120%20years%20ago,character%20of%20a%20modern%20city [Accessed 1 November 2023].
[63]Cf. *Adaptability* in Section 3.2. and in (Khavarian-Garmsir et al 2023). Op. cit.
[64](Guidehouse Insights 2020). Op cit.

Table 1. Comparison of Woven city and Gwangmyeong New Town with the principles of the 15-minute city (V= presence of the principle, X= absence).

15-minute city principles	Woven City	Gwangmyeong New Town
Proximity	x	v
Density	v	v
Diversity	x	v
Mixed Use	v	v
Modularity	x	x
Adaptability	x	v
Flexibility	x	v
Human-scale urban design	v	v
Connectivity	v	v
Digitalization	v	v

Table 2. Comparison between Woven city and Gwangmyeong New Town based on urban and transport parameters.

Name/Data	Woven City	Gwangmyeong New Town
Due date of accomplishment	5 October 2021 (start) / 2024 (contruction, Phase 1)	August, 2019 (start) / August, 2021 (permission process)
Area	708,000 sqm	17,367,000 sqm
Population	350 (initial) 2,000 (future)	237,000
Type of transportation means: public	Driverless multi-purpose means (e.g., Toyota e-Palette)	Smart trams
Type of transportation means: private	Driverless means (e.g., Toyota e-Palette) + Personal mobility means (e-bike, e-scooter)	e-car e-scooter e-bike
Public transportation means capacity (people)	20 (maximum capacity)	210 (maximum capacity)
Activities on public transportation besides transferring	Logistic (goods transportation) Mobile commerce (e.g., Amazon, DiDi, Mazda, Pizza Hut and Uber)	Logistic (goods transportation, waste collection) *Moving rooms* (lectorium, conference room, coworking space, bar, cafè/restaurant)

services. Finally, both Woven City and Gwangmyeong, aspiring to vast and centralized urban models, prioritize *connectivity* as their fundamental proposal principle.

The comparison from the previous paragraphs is summarized in Table 1. For a broader perspective on the topics covered in Section 4, Table 2 provides a comparison between Woven City and Gwangmyeong based on urban and transport criteria.

5. Conclusion

This article underlined the evident international success of the 15-minute city concept, briefly describing its characteristics, reviewing the current state of criticism, and highlighting the most skeptical or negative positions on the prototype. The latter was hypothesized as a possible starting point for alternative proposals. Two projects were analyzed in this respect – Woven City (Japan) and Gwangmyeong New Town (South Korea). Although pursuing the objectives of the 15-minute city (physical and social sustainability), such projects do not renounce the large size and centralization of the urban environment. However, by entrusting an innovative role to transport, they offer different approaches to the "time" of travel between urban functions. Woven City tries to minimize time, while Gwangmyeong tries to make it usable and worthwhile.

Reviewing the 15-minute city and illustrating these cases, the article shows how the spectrum of possible solutions for the challenges of contemporary cities is broader than one may believe. If different alternatives achieve positive results, it would allow modifications to the view that the 15-minute city is the best and, perhaps, the "only" solution to the problems of our towns.

As detailed in Section 2.2, Methodology, the argument in this paper is grounded in case studies, one of which aligns with a project developed by the authors

themselves. The research method employed, conducting research through case studies or projects, has faced criticism, especially from proponents of a strictly quantitative and deductive approach to research. Furthermore, the cases analyzed, currently in the process of realization, do not yet provide sufficient statistical data (similar to the 15-minute city itself). This stands as the primary limitation of the study. While the authors believe that architectural research possesses unique characteristics that can be explored through qualitative as well as quantitative analysis methods, they acknowledge this as a potential and valuable limitation of their research.

Future research should continue to address the challenges of the contemporary city and the proposed solutions using the tools of social and economic sciences. This approach has indeed, especially in the last three years, led to the development of a substantial body of materials for debate. However, it seems worthwhile for research to also monitor completed or ongoing cases using the tools, references, and a critical perspective specific to architectural and urban planning, often characterized by its qualitative nature. While it is true that only time will provide statistical and quantitative insights into the success of an urban project, qualitative criticism of ongoing cases, despite its limitations, has the potential to offer valuable insights and influence perspectives and decision-making on the topic.

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