



The 15-minute city: A paradigm for urban planning and policy

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ABSTRACT

The concept of 15-minute city (FMC) represents an urban planning and policy paradigm that seeks to focus the attention on the neighborhood as a place rather than a spatial and functional planning unit. The main premise of this concept is that urban services and amenities should be accessible within 15 minutes of walking or cycling from the residence. The principles of urban planning that enable the realization of the FMC include planning in mixed-use neighborhood units, proximity-based planning, transportation planning, citizen participation in planning and innovation, and smart planning. This innovative approach provides important findings and recommendations to the principles of urban planning of FMC, along with the issues of proximity-based planning, using the land and urban form, urban governance, and citizen participation. The aim of this study was examining the concept, characteristics and theoretical literature as well as the emerging themes for urban planning and policy making in the FMC. The FMC and its principles can help achieve sustainable development in environmental, social, and economic dimensions. The greater accessibility, reduce vehicle dependency, improve air quality, equitable planning decision, better health and well-being are the advantages FMC. However, the FMC can be criticized for its physical determination, feasibility in areas with low population density, difficulty in implementation, financing, not taking into account the different geographical features of cities, the conditions of not paying attention to the needs of different social groups, biodiversity, energy efficiency, and culture and heritage.

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1. Introduction

Travel demand is causing in the ever-developing cities causing urban planners and policy makers to find ways to cater this rising demand. In the recent years, more than half of the worlds' population is living in the urban areas and the cities are becoming increasingly dense (Abdullah et al., 2022). It has been projected that around 70% of the total population of the world would be living in the cities if the present growth of the cities continued by the end of 2050 (United Nations, 2019). Many cities around the world have declared goals to improve walkability, partially in response to the global challenges of rapid urban expansion and climate change. With over four billion individuals living in urban areas globally (United Nations Department of Economic and Social Affairs, 2014).

The past policies mainly focused on increasing people's mobility giving rise to car-dependent cities which resulted in several negative consequences including traffic congestion, air and noise pollution, and accidents etc. (Profillidis et al., 2014). Therefore, it is the utmost priority for the urban planners and policy makers to make the cities more sustainable, inclusive, resilient, and safe for the residents where they can access the necessities to live a comfortable life with convenience using non-motorized transport systems. The concept of proximity has always been an essential ingredient when it comes to planning cities. From Jane Jacobs in early '60s onwards, urban theorists consistently argue that bringing people and opportunities closer together allows neighborhoods to flourish (Tomer et al., 2019).



However, in the last few years, talking about proximity and particularly “x-minute-city” has almost become a fashion, sometimes even propaganda. The concept refers to cities where residents can access to most of their needs within a short walk or bike ride from their homes (Logan et al., 2022). Again, this idea is not entirely new as similar models, like Clarence A. Perry’s “neighborhood unit” (1929), used in the architecture and urban planning competition of Chicago in 1923, have been around for almost a century. In the framework of x-minute cities, many similar models were invented as the concept was molded to cities with different needs and structures. However, none of the previous examples of x-minute cities has become quite as popular as the FMC developed for the city of Paris (Olivari et al., 2023). The mayor of Paris, Anne Hidalgo was the one who propagated the idea of the FMC for the re-organization of the urban structure in order to create extensive green areas for the pedestrians who are currently being used by the cars to allow the inhabitants to reach the essential urban services either by walking or bicycling (Duany, 2021). Other cities such as Milan and New York have also started to transform the cities into FMCs. Some other prominent examples are Barcelona –with the Superblock organization, and Milan with a plan called La cittàa 15 minuti (de Valderrama et al., 2020; Pinto and Akhavan, 2022). As a few authors have pointed out, FMC is not an entirely new idea. On the contrary, it is quite rooted in history, as it re-interprets several ideas from earlier planning practices, such as Howard’s Garden city the neighborhood unit by Clarence Perry, the Central place theory by Walter Christaller, the urban vitality approaches of Jane Jacobs, the geography of time by Torsten Hagerstrand the human-scale urban design by Christopher Alexander and Jan Gehl, the pedestrian pocket proposed by Peter Calthorpe around stations in the Transit oriented development approach, the principles of New Urbanism and Smart Growth (Staricco, 2022). The concept of the FMC requires that basic urban amenities should be located within 15 minutes walking or bicycle distances (Pozoukidou and Chatziyiannaki, 2021). Six essential functions, namely, living, working, commerce, healthcare, education, and entertainment, should be fulfilled within a 15-minute distance; hence proximity rather than accessibility is highlighted as one of the

fundamental principles of the FMC concept (Moreno et al., 2021). The idea of FMC provides an opportunity for making the streets car free and increasing the utilization of the open spaces for the promotion of pedestrian and bicycling routes for the city inhabitants. It can also help in reducing the long queues of inhabitants at essential services such as procurement of local foods at markets. In other words, the idea of FMC has rediscovered the conception of city designs for the improvement of the livability of the areas near homes, and has raised the “walking appeal”, an idea which has been propagated by some of the institutional and political domains in the scientific community (Doubleday et al., 2021). FMC is the contemporary synthesis of the renaissance “ideal city”, where the classical “human measure” has now been interpreted, far away from a geometrical perspective, in the framework of current health and environmental risks. “Time” is no longer the twin concept of “space”, the foundation of the 20th century relativism: this timeframe becomes a climate agent, a therapy of a regenerative urban medical science. It is a very innovative model indeed but rooted in history, able to answer to the primary deep demand of community and sense of place, of which the historic center is the icon. The walkability of the public realm is the core of the model. It is a design and management concept: to allow access to the urban life experience (essential facilities and services) in a timeframe of a quarter of an hour from home, by walking or cycling, as defined by Moreno (2020). The city is in fact both polyrhythmic (individuals have different daily life rhythms) and polychromic (how places are used varies according to various schedules); the proposal reconceptualization therefore shifts the lens from ‘urban planning’ to ‘urban life planning’. The policy makers are proposing transformations in search of more humane and sustainable cities which can allow the change in the current urban paradigm where private vehicles play an important and essential role in urban planning. Hence, policy makers are trying to maximize the accessibility to local amenities such as public transport options, health-care, education centers, employment centers, and recreational centers which can be reached by walking or bicycling. However, it is pertinent to mention that a lot of challenges are there when it comes to the implementation of the FMC concept because of the inequity in the history of

urban development. The issues of social polarization and spatial mismatch vary from one city to another across different countries. For example, people who are living in big cities such as Tokyo or New York can get all their daily needs within a 15-minutes traveling as compared with the residents who live in small or medium-sized cities because of the inequity in the urban development. These cities with accessibility to all the necessary amenities within 15 minutes represent a new possibility for the re-organization of the urban systems (Abdullah et al., 2022). The importance of the topic and the increasing number of papers and news articles published on the FMC since the emergence of the concept in 2016 requires a studying its fundamental principles, its sustainability contributions, and potential implementation barriers. For this purpose, and to provide insights for urban development, in this study we highlight the principles of the 15-minute concept and discuss its contributions to social, economic, and environmental sustainability.

1.1. Literature review

Carlos Moreno spreads the concept of the FMC (C15'), and the 30-Minute Territory, linked to the 'city of proximity', which took off strongly in the campaign to Anne Hidalgo's mayor's office in Paris in 2019 and, above all, a year later with the outbreak of the pandemic COVID-19. An idea that goes beyond being a slogan for the city, since it proposes a change in the way of living in cities, so that they are no longer a hostile space and become places to live and enjoy public space. In essence, it is not a

new concept, but it has arrived at the right time (de Lianiz and Lobo, 2023). In the late 2010s, the COVID-19 outbreak led to an unexpected global crisis and many governments imposed unprecedented movement restrictions and quarantine measures, reduced physical contact to a minimum, and identified public transit environments as COVID-19 risk zones. Walking, cycling, and micro-mobility gained widespread popularity because they allowed people to meet their daily needs while maintaining a physical distance [8]. Some local governments redesigned streets to allocate more space for walking and cycling urban health, which had been a secondary concern to urban planners and municipal authorities before the pandemic, became a primary goal, and proximity to urban services and amenities became a focal point of debate among planners and policymakers (Khavarian- Garmsir et al., 2023). Currently, there are already many cities that are adhering to this new approach and its contribution to improving the quality of life of their citizens. In these cities, they try to reinvent themselves by focusing the urban model on proximity', understood not only as the metric distance that separates two points, but also including other forms of proximity, such as affective, cultural, etc., in synergy with active mobility. This model contributes to building more live able cities on a human scale, giving preference to the most vulnerable neighborhoods and groups, while helping cities in the transition to zero carbon. "It is about moving from urban planning to urban life planning where access to six basic needs is provided: living, working, provisioning, caring, learning and resting" (Fig. 1).

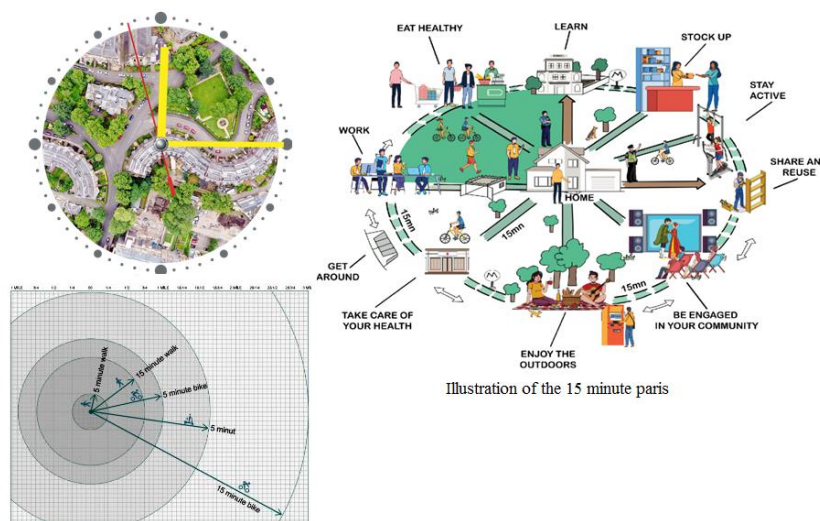


Fig. 1. The 15- minute city. (Source: Khavarian- Garmsir et al., 2023; Author)

To achieve this, it is necessary to rethink the existing model based on the use of private vehicles, avoiding unwanted or unnecessary trips by promoting proximity through coherent urban planning that favors sustainable mobility. All of this to achieve cities that are pedestrian-friendly and integrate nature. In the following, we will refer were studies in field of 15-minute city: Khavarian-Garmsir et al. (2023) concluded that FMC it relies on the seven basic principles of human-scale urban design, density, diversity, flexibility, proximity, digitalization, and connectivity. These principles can contribute to social, economic, and environmental sustainability in various ways. However, the FMC can also been criticized for being physically deterministic, failing to take into account the needs of different social groups, biodiversity, energy-efficiency, clean energies, and culture and heritage. Hosford et al. (2022) in a paper with title Is the FMC within reach? Evaluating walking and cycling accessibility to grocery stores in Vancouver concluded that, Leaders around the world have embraced the idea of a “FMC”. This urban planning concept proposes a city where residents can meet their essential needs within a short walking or cycling trip from their home. This study aims to evaluate local accessibility to grocery stores by walking and cycling in the City of Vancouver. They used a cumulative opportunity measure to count the number of groceries stores available within a 15-minute walk and cycle from people’s homes. To evaluate accessibility from the perspective of younger and older travellers, they considered different travel speeds. Results show there is good accessibility to grocery stores when cycling, with less than 1% of the city’s population not having a grocery store within a 15-minute cycle. When assuming a walking speed of an older pedestrian, around one-fifth of the population did not have access to a grocery store in their local area. The neighborhoods that did not have a store within a 15-minute walk had higher proportions of children, older adults, and visible minorities, and lower rates of employment and post-secondary education attainment. In seeking to improve accessibility via walking and cycling, cities should prioritize grocery store locations and investments in pedestrian and cycling infrastructure to underserved neighborhoods and populations. Moreno et al. (2021) in a study entitled “introducing the “FMC”: sustainability,

resilience and place identity in future post-pandemic cities” Concluded that the socio-economic impacts on cities during the COVID-19 pandemic have been brutal, causing to increasing inequalities and record numbers of unemployment around the world. And leading to the re-emergence of a concept, initially proposed in 2016 by Carlos Moreno: the “FMC”. The concept, offering a novel perspective of “chrono-urbanism”, adds to existing thematic of Smart Cities and the rhetoric of building more humane urban fabrics, outlined by Christopher Alexander, and that of building safer, more resilient, sustainable and inclusive cities. Pozoukidou and Angelidou, (2021) concluded that the 15-minute city represents an increasingly popular urban policymaking and planning paradigm that seeks to shift attention to the neighborhood as a “place” rather merely a spatial and functional planning unit. The core premise of the concept is that critical urban services and amenities should be reachable within 15 min of walking or cycling from a residence. The findings of this paper provide important additions and recommendations to the urban-planning principles of FMC along the themes of proximity-based planning, the use of land and urban form, urban governance and citizen participation, and inclusive digitalization. The paper moves the discussion on the FMC forward and will be helpful for urban planners, policymakers, and scholars seeking to envision and create a more sustainable, inclusive, and vibrant future in cities. Rhoads et al. (2023) in a study concluded that in recent years, the design (and re-design) of cities to encourage walkability has taken on new urgency as part of a wider campaign for sustainable urban development. Complementary to other approaches like infrastructure improvements, increases in residential density, or traffic calming measures, in this paper, they show how planning for walkability can be augmented by the adaptation of tools and approaches from the study of urban networks, by privileging the pedestrian perspective of short-distance access over the car (and rapid transit) perspective of flow and efficiency. Using a recently developed sidewalk network model that moves towards a more realistic representation of the pedestrian environment, they proposed a framework for assessing multi-factor walkability using percolation theory and insights into pedestrian behavior. Caselli et al. (2022) in a study entitled

“introducing the “exploring the 15-minute neighborhoods. An evaluation based on the walkability performance to public facilities” Concluded that Recent trends in urban policies are rediscovering a new focus on different urban life models that exclude the obsolete vehicle model. This vision takes concrete form in the concept of the FMC model, focused on pedestrian accessibility from one's home to nearby urban services and spaces. In this perspective, the paper aims at exploring the theme of FMC through a GIS-based model to evaluate pedestrian accessibility to neighborhood facilities. The implemented methodology integrates the assessment of walking distances, considering the time factor as crucial, and mapping the resident population. The method is then applied to measure the current performances of an existing neighborhood in Parma from the 15 minutes city perspective, assessing accessibility based on home-facility travel times and the resident population distribution within reach. A reflection is proposed on what has been learned and on the possible contribution that the method can bring to monitoring the FMC and to urban planning. Papas and et al. (2023) concluded that in recent years, urban planners have mentioned the importance of implementing alternative city models that encourage short trips and neighborhood-scale activities such as the FMC model. Several studies show that improvements in the transportation networks encourage the citizens to move themselves into their neighborhoods' borders. People seem to respond to these actions by increasing their visits to many local places such as restaurants, bars, sports centers etc. Moreover, the implementation of the FMC model demands the strengthening of transportation networks promoting sustainable solutions that can support the daily walking of the habitants. This paper focuses on a literature review of the implementation of the FMC model in different big cities worldwide, starting from Paris where the model is indeed a well-suited concept and focuses to the need of a cultural change rather than urban planning. The research points out not only the fact that this model can help the neighborhoods to grow up socioeconomically but the fact that the citizens can cooperate with the local authorities and participate in the redesign of their neighborhood based on the FMC model. Pozder et al. (2023) in a paper with title “understanding the principles of the FMC

concept and the repercussion the cities health: the curious of the city of Sarajevo” concluded that Climate change, pollution, profit driven construction, weakened quality of life and poor health of citizens, are cause-and-effect related problems that one can find all over the world. Developed, socially conscious societies entered the twenty-first century determined to dedicate themselves to the path of healing of their cities, so they put the fight against calamities of the modern times. Introduction of green jobs, clean energy, less waste and “novities”, such is the FMC, are often narrative of choice for different and resilient approach. Through the examination the possibilities and limitations of the principles of 15-minute and healthy city in specific circumstances and their comparison with today's approach, this paper aims for understanding of the specific needs of the planning approach in Sarajevo case, as in times of prosper, but also in times of crises. Methodological approach comprises out of several compatible methods, starting with historical overview and descriptive analysis, followed by comparative method of the findings, all combined in a case study for the city.

2. Material and Methods

This study is a practical one and the methods of investigation are both descriptive and analytical. The information and data have been collected including peer-reviewed papers, book chapters, grey literature, online pages, and newspaper articles. We used an inductive method for qualitative content analysis. The inductive content analysis combines data collection/extraction and analysis and gradually builds discussion.

3. Results and discussion

3.1. A new paradigm in urban planning and policy

Recent reports by the Intergovernmental Panel on Climate Change and the United Nations Framework Convention on Climate Change warn that the world is set to exceed the Paris Agreement targeted temperatures of below 2 °C (preferably 1.5 °C), and reach a high of 2.7 °C pre-industrial levels by end of this century, as countries are far below their emissions targets. This underlines a new urgency to avert the already increasing climate

change events, evident with increasing frequency and intensity of events such as storm surges, unpredictable and erratic weather conditions that have prompted flooding, increased desertification, prolonged and harsh drought, and sea level rise to name a few. Those events have increased pressures on communities, prompting new challenges, such as climate induced migrations, with over 30 million people reported to have migrated between 2018 and 2020 alone. (Allam et al., 2022). The anticipated temperature rise would be expected to impact and disrupt the quality of lives of urban communities, especially for those who reside in coastal regions and low-lying lands. This is critical as it is evident that already, the world's population and urbanization are growing rapidly, as today's 54% of the world's population lives in cities, and in the next few decades, the world will witness unprecedented growth in cities, especially in developing countries. It is expected that by the year 2050, 2.5 billion people will add to the world population and the urban population of the world will reach 66%, while in the 1950s it was only 30% (Abedini et al., 2019). Further, urban areas have been reported to be the main engine of different economies (contributing over 70% of the global GDP) across the globe, and any disruption would have a cascading effect on almost all major sectors in global economies. However, it is also noteworthy to understand that urban areas across the globe are responsible for approximately more than 60% of global greenhouse gases (GHG), following trends such as increased consumption of resources such as energy, where 78% of world energy is consumed in sectors such as transport, construction and manufacturing industries based in cities. Also, due to changing global consumption trends, where most of the global population are seen to have high affinity for manufactured goods, urban areas have become a major source of pollution, affecting different parts of the environments (C40 Cities, 2021). Urban players will then be made to play an important role in deep decarbonization agendas, being a key subject at the recent COP26, which called for net-zero commitments by 2050 (Allam et al., 2022). Adding to decarbonization agendas, urban players will further need to urgently consider the targets established in the Sustainable Development Goal 11, emphasizing the need for inclusivity and equitability in urban areas. While urban transitions will require

climate financing, it is noted that the \$100 billion pledged in the Paris Agreement by developed economies will only unfortunately actualize by 2023 (OECD, 2021), prompting the need for alternative urban climate financing strategies. In this case, models highlighting private sector participation, rendering high societal outcomes, can be favored. One viable model include a by-product of the Smart City model: the FMC, initially proposed in 2016 (Moreno, 2019), but gained popularity during global lockdowns prompted by the COVID-19 pandemic (Moreno et al., 2021). The concept not only proposes a reduction in resource use, but also reduces travel needs in urban areas, calling for higher density and urban activities. This renders an urban milieu, calling for a paradigm shift, where different urban nodes could be accessed within 15-minute walks or via cycling. To support this model, it will be key that public services (post offices, banks, etc.) and amenities such as parks and recreation centers be fairly distributed across the city and restructured such that they allow for healthy human interactions, essential to foster social cohesiveness, which in turn would allow for urban communities to gain in higher quality of life. Resilience studies originated among psychologists and psychiatrists. Researchers interested in psychological and social determinants of health picked up the concept and have gradually extended its use from the domain of mental health to health in general. Early work on resilience was concerned with the individual, but more recently researchers have become interested in resilience as a feature of whole communities. The FMC increases the resilience of cities. Urban resilience is the capacity of a city's systems, businesses, institutions, communities, and individuals to survive, adapt, and thrive. In respect to the ecological aspects promoted in the "FMC" concept, modern technologies have been identified as being a proponent in the prospects of achieving sustainability and resilience in cities. For instance, one area that FMC researchers advocate for is the adoption of mixed-use housing models that promote compactness efficient use of resources like energy and water, increase in proximity, and in the promotion of adequate land use (Lehmann, 2016). When compounded, all these factors have a positive bearing in promoting ecological sustainability, while at the same time enhancing the quality of life of the citizens. Further, by

adopting modern technology, especially in the building, planning and construction sectors, modern trends being pursued in the concept encourage the incorporating of green and civic aspects in building and planning (Allam, 2019). That is, encouraging the use of green building and planning systems and technologies, including green spaces in the built environment, embracing use of green roofing and walls among others -through the careful planning, optimization and retrofitting of spaces and built structures.

3.2. Emerging themes for urban planning and policymaking in the 15-minute city

Based on Fig. 1, ten dimensions constitute the FMC: (1) mixed used, (2) proximity, (3) flexibility, (4) density, (5) human scale urban design, (6) diversity, (7) adaptability, (8) digitalization, (9) connectivity, (10) modularity (Fig. 2). These are briefly discussed in the following:

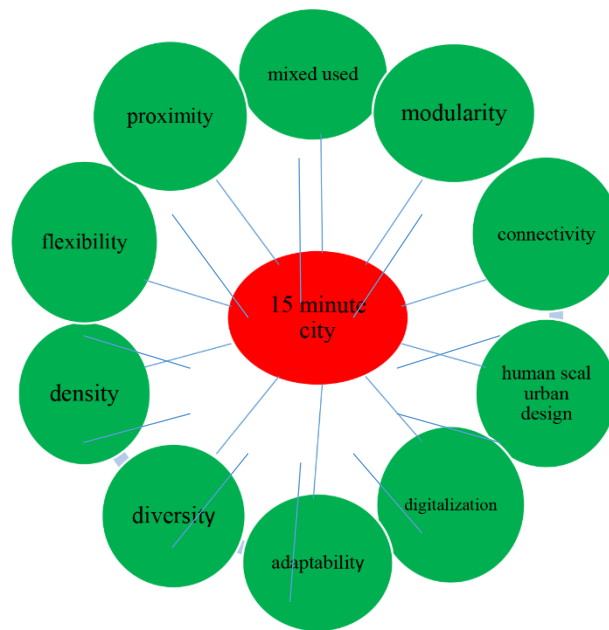


Fig. 2. Framework the 15-minute city (Source: Author).

(1) mixed used. Supporting the integration of mixed land uses in communities as a critical component of achieving better place to live (Mobaraki, 2016). The FMC creates a polycentric city with multi-use neighborhoods, commercial, education, encompassing residential, recreational, health care, and entertainments uses (Khavarian-Garmsiri et al., 2023). Where those functions are to some degree physically and functionally integrated, and that provides pedestrian connections. Mixed-use development may be applied to a single building, a block or neighborhood, or in zoning policy across an entire city or other administrative unit. These projects may be completed by a private developer, (quasi-) governmental agency, or a combination thereof (Raman and Roy, 2019). A mixed-use development may be a new construction, reuse of an existing building or brownfield site, or a combination. The mixed-use development also reduces the number of hours that citizens spend

on daily commutes, resulting in an improvement in their overall quality of life.

(2) Proximity. Proximity refers to the closeness of amenities related to the basic functions of living, employment, healthcare, education, entertainment, and commerce. The concept of proximity thus couples the spatial and temporal dimensions. It informs the improvement of conditions of access to basic amenities at the district scale and the multi-modal use of basic urban infrastructures. More precisely, proximity is related to increased active mobility and reduced car dependency, and increased independence of vulnerable users (Murgante et al., 2024; Cheng et al., 2019; Eildd'ér, et al., 2022; Ewing and Cervero, 2017; Ferrer-ortiz et al., 2022; Gehrke and Wang, 2020). This dimension is critical not only in helping cities reduce the amount of time lost in commuting but also in reducing the environmental and economic impacts of such activity. This also helps in determining social indicators impacting

urban residents, especially in a bid to promote social interactions—as advocated for by urban theorists such as Jane Jacobs, Christopher Alexander, Andres Duany and Nikos Salingaros (Moreno et al., 2021). As a result, proximity is conducive to urban vitality, sustainability, inclusivity, and quality of life.

(3) Flexibility. The concept of flexibility in urban planning is defined as the compatibility and adaptability of planning thought and planning system to the random and daily needs of community. "Flexibility" means creating spatial adaptability and changing the human space organization in order to achieve new conditions, solutions and applications. On the one hand, some spaces provide many activities without reorganizing; on the other hand, some others can be changed to meet different needs (Sanei, 2018). To maximize urban efficiency, the FMC calls for the transformation of single function public spaces into multi-purpose spaces. Overall, flexibility can facilitate decentralization. Cities can reap the benefits of decentralization while also increasing the efficiency of urban services through multiple uses of single-function public spaces. This strategy may also increase the capacity of the neighborhoods (Khavarian-Garmsiri et al., 2023; Pisano, 2020).

(4) Density. Density is the first feature of urban space and without density, urban space will not exist. Density is a crucial dimension of the city and its built environment, and this has been noted by numerous researchers as having a direct link to travel and diversity (Moreno et al., 2021). The following are the advantages of urban density, providing of course that the site is not isolated entirely from public transport, services and amenities. 1) The higher the density, the more land is saved: space is used more efficiently. 2) The higher the density, the bigger range of local shops and services that can be supported. 3) The most significance is the cost of personal transport which diminishes rapidly as density increases. Better transport means better access to jobs, amenities, leisure, etc. At high densities fast, frequent, reliable public transport systems become fully effective with dramatic reductions in energy costs. 4) As density increases the per capita cost of providing services such as water, gas, electricity and waste disposal reduces. 5) The cost of transporting materials and goods also declines. As the costs go down so does the consumption of energy. 6) As density increases, isolation and

social exclusion is reduced for people without a car. 7) Higher density creates more vitality and diversity. "Bigger concentrations of people stimulate and support the provision of more services and facilities making possible a wider choice of restaurants, theatres, cinemas and other recreational opportunities. They support specialist centers and services for minorities, which are not possible where such minorities are dispersed in low density sprawl. 8) All this stimulates interdependent economic development that creates new employment opportunities and greater choice of employment. 9) "Above all, in higher density urban areas, all this diversity is within easy reach of where most people live. Ease of access is a key factor, which has critical implications for a sustainable quality of urban life (Gordon and Withehead, 2016). Through this lens, the stand on this perspective paper is that density is a key component favoring the social sustainability dimension of cities, and when integrated with the other three dimensions (proximity, diversity and digitalization), the "FMC" model would not only help in improving service delivery and improve livability but also benefit from the advanced technological advancements.

(5) Human scale urban design. Human scale urban design help make cities more human-centered, user-friendly, and livable. Designing and building to a human scale means creating spaces optimized for human use. When people can interact with places at their scale, it enhances and improves their experiences in these spaces. The following at some of the benefits of human-scale urban design: 1) Integrate with surroundings. Structures designed and built at a human scale can easily integrate with their surroundings. For example, at Renaissance Square affordable housing project, replaced the existing high-rise structures and designed the new affordable housing buildings on a human scale. The project seamlessly integrated with its environment, and all buildings were grouped around a central, European-style plaza. 2) Make spaces accessible. Human-scale design and buildings provide accessible areas that scale best to the physical constraints of a city. This type of design creates walkable, bike able cities and communities that consider accessibility for people with disabilities or special needs. More importantly, accessible, and walkable areas consume less energy and produce less pollution

by preventing traffic congestion. 3) Encourage social inclusion. Human-scale design and buildings help reduce distances between spaces and people. Due to this closer proximity, people tend to see more of each other and are encouraged to interact and socialize. This social engagement helps create a sense of belonging to people and communities. 4) Bring economic benefits. Since human-scale design and buildings help create bustling public spaces, they can bring commercial value and economic benefits to the areas where they're located. These public spaces attract more visitors, creating more business opportunities for locals. Vibrant public spaces are powerful in city branding, improving tourism, and enhancing a city's competitiveness. 5) Make for successful projects. Human-scale design and buildings aid in the success of property developments and projects, especially in areas where public spaces are scarce or commonly misused. Designing and building at a human scale create accessible, practical, inclusive, feel-good spaces that provide opportunities for communities and cities. More importantly, human-scale design and building can maximize the value of public spaces (Alvarez- Diaz, 2023).

(6) Diversity. Diversity is not just a buzzword; it's the lifeblood of vibrant urban areas. In the context of urban revitalization, diversity can manifest in various forms such as a mix of architectural styles, public spaces that accommodate different activities, and the coexistence of various socioeconomic and cultural groups. Diversity in the context of the above frame and in the advancement of the FMC concept is twofold: (1) the need for mixed use neighborhoods which are primary in providing a healthy mix of residential, commercial and entertainment components and (2) diversity in culture and people (Moreno et al., 2021). Accordingly, the FMC seeks to create a diverse community as a step toward incorporating cultural pluralism into planning and response to decades of modernist urbanism, which has sometimes resulted in deprived and isolated urban districts. Carlos Moreno believes that a neighborhood should be affordable and accessible to all residents, regardless of social and economic class, race, nationality, age, or gender. As a result, the FMC envisions affordable housing, job opportunities, and social services for vulnerable groups. Furthermore, stakeholder participation is critical in neighborhood planning and

development. Local community groups, including low-income individuals and small- and medium-sized businesses, are also involved in the various planning stages, from visioning to project design and implementation (Khavarian-Garmsiri et al., 2023; Zagow, 2020).

(7) Adaptability. The development of cities includes a wide variety of uncertainties which challenge spatial planners and decision makers. In response, planning approaches which move away from the ambition to achieve predefined outcomes. One of them is an adaptive approach to planning (Rauws, 2016). Urban adaptability refers to a city's ability to respond and adjust to new challenges and opportunities. The concept is especially important in the face of the ongoing climate crisis, which poses new challenges to urban environments, such as extreme weather events, rising sea levels, and heat waves.

(8) Digitalization. The digitalization of urban planning brings numerous benefits that enhance efficiency and improve outcomes. Here are some key advantages: Improved decision-making: Digital tools and software provide planners with accurate, real-time data, enabling them to make informed decisions. This dimension is very relevant to the revised FMC concept, especially in ensuring the fulfillment of the other three dimensions. In particular, this dimension corresponds to the concept of the smart city (Sheikhi and Babaei, 2022). To include digitalization as a main component of FMC Local governments can engage with citizens more closely through smart dashboards, interactive maps, transparent governance methods, and meetings streamed online. This can improve connectivity and address concerns about neighborhood isolation in the FMC concept (Moreno et al., 2021).

(9) Connectivity. Connectivity is defined as the measurement of a system of streets with multiple routes and connections serving the same origins and destinations. Simply stated, a high degree of connectivity means there are many ways to get from Point A to Point B. Connectivity is the degree to which networks - streets, railways, walking and cycling routes, services and infrastructure interconnect. Good connections encourage access within a region, city, town or neighborhood. Improving connections and access can have both positive and negative effects. Good transport systems can advantage everyone by supporting economic activity and enhancing land values in

particular locations. But they can also create negative effects such as noise and pollution. Urban design can help minimize these costs (Taiao, 2018). In FMC, active mobility modes, such as walking and cycling, are combined with public transportation to enhance the efficiency of public transportation and reduce car dependency for first/last mile connections (Khavarian-Garmsiri et al., 2023). Also Increased roadway connectivity can result in a safer system for vehicles, pedestrians, and bicyclists. Reduced Congestion: Decreased traffic on arterial streets can result from increased roadway connectivity. Travel Efficiency: More roadway connectivity can result in continuous and more direct routes.

(10) Modularity. With a rapid increase in population, there is an urgent need for the growth of more settlements. The process of undergoing a static infrastructure process leads to great pains. So, adapting the process of installing modular units has been trending for the past few years. Modular structures are an innovative blend of creativity and sustainability. It has certain advantages, from reducing time to increasing the quality and accuracy of the structure. Various architecture firms are trying to implement this idea of 'modular cities' to accommodate a large number of people (Stouhi, 2021). Decentralization is a representation of modularity in which cities develop based on a polycentric pattern, and facilities and services are dispersed in several centers. This modular organization of cities can reduce spatial inequalities by improving an individual's chances of finding a job close to home. The FMC is expected to promote the decentralization of urban services and create multiple sub-centers that provide necessary services to urban citizens.

3.3. Positive and negative points of the 15-minute city

Creating a FMC has many positive consequences. The central advantage of the concept is enhancing accessibility towards living, working, commerce, healthcare, education, and entertainment. This is the primary reason why people choose to live in cities. It is economically and socially fairer for people of all walks of life to be able to access everything they need without having to use private transportation. Another advantage of

this is that the need for transportation is minimized because everything a person needs can be accessed ideally by walking or cycling, by bringing neighborhoods closer, the approach aims to reduce car dependency. This also helps promote physical activity (walking and cycling), thereby improving the health and well-being of citizens. A byproduct of this minimization of transportation is reduced fossil fuel use, which also contributes to a safer and better Earth. More green spaces also ease the urban heat-island effect, reduce flood risk and improve biodiversity. It also contributes significantly to the production of less carbon and the control of greenhouse gases (Rezapour et al., 2022). The concept results in a much more equitable planning decision. Over time, it is likely to make transportation investments less costly, as pedestrians and cyclists are much cheaper to provide infrastructure for. There are numerous physical and mental health benefits of active travel, cleaner air, easy access to healthy food options, and quality green space. The "FMC" is therefore an approach to urban design that aims to improve the quality of life by creating inclusive neighborhoods where a resident's basic needs can be reached in 15 minutes on foot, bicycle, or public transport. One of the key aims is to build a more accessible city and improve the 'walkability' of the neighborhoods. On this matter, many scholars have discussed the relationship between built environment, walkability, health, and quality of life. The key theorist behind the vision "FMC" (originally known as "la ville du quart d'heure") is Carlos Moreno, a professor at the Sorbonne University in Paris and an international expert on smart cities, launching this experimentation in the French capital in collaboration with the municipal administration. His aim was to rethink the "new relationship between citizens and the rhythm of life in cities" and to reduce the presence of cars on the streets. With the aim to create a better urban organization, this new vision of urban living tends to create self-sufficient communities within each neighborhood, where basic goods and services are found within a short walk or ride from home. As for the increase of public spaces, the approach is to reorganize the activities that can be established in existing infrastructures (such as stadiums, libraries, etc.), diversifying them by time and space. Green open spaces are increased by making better use of the open spaces of schools, offices, residential

complexes, and universities, especially during the weekends. In this way, sociality among the residents is flavored, the quality of life in the neighborhood is improved, congestion and pollution in the most central urban areas are alleviated and commuting phenomena are reduced (Pinto and Akhavan, 2022). Besides, it encourages development in existing urban areas to support more efficient use of urban lands and reduce the pressure on suburban and agricultural lands. Therefore, it protects agricultural and rural lands from unregulated urban expansion. The findings of Shannon et al. (2019) in Melbourne showed that this concept can encourage walking and cycling, lowering transportation-related energy consumption.

Better uptake of active mobility modes reduces the per capita energy consumption and lessens the pressure on the public health system (Khavarian-Garmsiri et al., 2023). Finally, active mobility modes are used in conjunction with public transportation in FMC to better connect neighborhoods and address first/last mile connection issue, thereby improving the efficiency of the public transportation system. Therefore, the residents can move with minimum energy use and meet their daily needs locally, resulting in decreased air pollution and carbon emissions. Fig. 3 illustrates the sustainability contributions of the FMC concept.

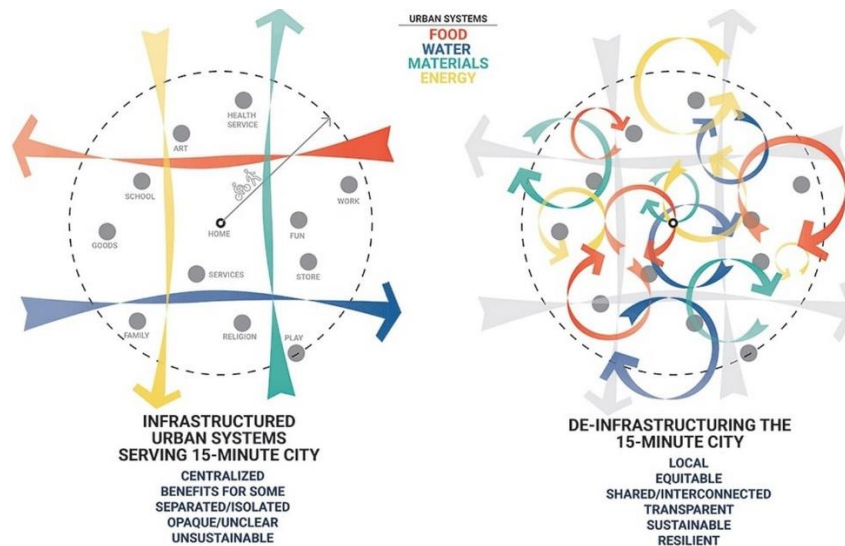


Fig. 3. Positive and negative points of the 15-minute city (Source: Rezapour et al., 2022).

However, there are also some negative results of creating a FMC: Equity: Plans to convert neighborhoods into FMC can lead to gentrification. This means that poorer residents can be forced into less walk able areas of the city. Feasibility in areas with low population density: The concept may not be feasible in areas with low population density or in low-income communities where transportation options are limited. Difficulty in implementation: This is because the land-use patterns and infrastructure of established urban areas are already in place. Financing: Funding for the switch to 15-minute neighborhoods can be a considerable amount in the infrastructural budget, especially if they are to be built from scratch. The lack of diversity in an area and the mixing of communities can create problems outside of their small community. The more common the communities that make up a

neighborhood have, the more effective they can be in reaching an ideal 15-minute neighborhood. Another major concern is that FMC do not include some businesses and their locations. Industrial or agricultural buildings to the reason for being local is that they are far away from the city and therefore cannot be included in the model. The important point that weakens this ideology is that the neighborhood cannot be repeated in all parts of the city because the different shape, location, weather and topography in the parts of a city are aspects that hinder this ideology. Implementing the concept may not be feasible in practice for cities like North American and Australia that are congested, have a car-dependent and sprawling urban structure, and suffer from rigid land use planning and zoning regulations. Cities are dealing with various issues that are not universal, and, as a result, a FMC pattern based

on a one-size-fits-all approach cannot be applied to all cities. Each community requires a neighborhood development plan that takes into account geographic specificities and its unique issues. In reality the FMC concept has been criticized for encouraging physical determinism (Khavarian-Garmsiri et al., 2023). It seeks to improve the current status quo through physical design and urban form modification, similar to classical planning movements, while social and economic concerns cannot be addressed through physical or technological measures (Sharifi, 2016). Implementing the concept may not be feasible in practice for cities like Melbourne that are congested, have a car-dependent and sprawling urban structure, and suffer from rigid land use planning and zoning regulations (Handy, 2020). Cities are dealing with various issues that are not universal, and, as a result, a FMC pattern based on a one-size-fits-all approach cannot be applied to all cities. Each community requires a neighborhood development plan that takes into account geographic specificities and its unique issue. This concept gives little attention to various social and demographic groups' walking behaviors and daily needs. For example, the walking behaviors and speeds of individuals vary with age, and thus the everyday needs of younger people may differ from older adults. The FMC concept fails to account for cities complexities. Cities are systems of systems, with subsystems interacting and affecting each other. As a result, a rigid and simplistic urban structure cannot address critical concerns such as climate change, pandemics, and transportation crises. Finally, the FMC concept ignores some critical issues, such as environmental protection, biodiversity, energy-efficiency, green and clean energies, as well as local vernacular, culture, heritage, and identity.

4. Conclusion

The traditional urban development approach of car-centric planning has led to cities with more cars, more air and noise pollution, as well as several other negative consequences. Urban sprawl has been also observed in most developing cities around the world. Additionally, the COVID-19 pandemic has exposed the vulnerability of existing car-centric planning approaches. Health protocols have restricted people's movement and required the access to basic needs for walking by foot or

cycling. All the negative consequences of car-centric policies along with the effects of COVID-19 pandemic, prompted engineers and planners to propose creative and innovative planning approaches such as the FMC. Various countries have targeted the development of the FMC through improving the access to basic needs by walking and cycling. The FMC is a new holistic model for urban planning that has gained more momentum in discussions regarding the development of sustainable cities. The FMC seeks to humanize the city scale, abandon the approach of motorized vehicles, and struggle with urban sprawl. A city which is based on everyday sub-centers is theorized as a walkable city. The FMC model is an innovative approach with a different movement system for the city. The goal of this approach is to create cities on a human scale where doing things and accessing services is done easily. The FMC is the proposed model for a polycentric city. This model was effective as a new utopia in urban planning during the Covid-19 crisis for urban development and the economy of cities. In this model, the neighborhood plays a vital role as a spatial context in which residents fulfill their needs and the neighborhood is considered as a vital element for the spatial and functional organization of cities. In the FMC, technical issues related to the way of defining and measuring proximity to urban facilities are key and important since they define the core and scope of the effect of the neighborhood unit. Regarding the key urban functions and local facilities, it is necessary to audit and classify the critical infrastructures of society and different areas, as well as other factors related to the principle of proximity. Nowadays, most cities of developing countries, including Iran, have apart but specialized centers for shopping, working, recreation, and education; as a result, the residents of each region have to use motorized transportation to meet their needs in distant locations, which has led to an increase in carbon emissions and its negative consequences. Undoubtedly, changing the design of cities to create 15-minute zones can minimize the negative effects caused by transportations and immobility of people and bring prosperity to them as much as possible. Regarding the concept of FMC, the focus is mainly on creating more dense and multi-purpose areas, wherein, the possibility of walking and cycling is far more than traffic ability. Undoubtedly, reducing communication

through public transportation can minimize the emission of polluting gases, which in turn, can play an important role in improving the environment and the sustainability of regions. People have the least opportunity to interact with each other when transporting through motor vehicles; meanwhile, the possibility of interacting with each other increases while walking and cycling, which in turn, may lead to more benefits such as reducing the sense of social isolation. In addition, areas that are suitable for walking, have often more green spaces, which can play an important role in creating a sense of interaction between citizens. Reducing traffic and increasing urban livability are among the advantages of FMC that can lead to an increase in urban satisfaction. However, easy access to all facilities minimizes the anxiety caused by transporting long distances among citizens. Urban design in the 20th and early 21st centuries has focused more on urban development than any other aspect, which may result in many people's homelessness so that areas could be redesigned. This has led to an increase in the cost of housing and plays an important role in homelessness of people. The creation of FMC can solve the problem of high cost of housing to a great extent, since multi-purpose areas are formed in its design, in which the proximity of homes to urban services and facilities can greatly reduce the cost of housing. Reducing transportation costs through motor vehicles is then approved. Finally, although the FMC and its principles can help achieve many important dimensions of sustainable development (environmental, social, economic) in urban communities, the FMC can be criticized for its physical determination, not taking into account the different geographical features of cities, the conditions of not paying attention to the needs of different social groups, biodiversity, energy efficiency, and culture and heritage.

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